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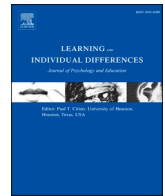
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Profiles and developmental pathways of beginning teachers' intrinsic orientations and their associations with effective teaching behaviour

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ABSTRACT

Prior research has highlighted the importance of intrinsic motivational-affective characteristics in empowering teachers to excel amidst professional complexities. This study sought to move beyond the prevailing focus on cross-sectional relationships between individual motivational-affective factors and specific aspects of effective teaching, seeking to understand their cumulative significance in shaping the longitudinal development of effective teaching. By proposing teachers' intrinsic motivational-affective orientations as profile indicators, this study profiles teachers during their initial two career years. Through surveying and observing 274 Dutch beginning teachers over three data collection waves, the results of latent profile and transition analyses identified two distinct profiles and four developmental pathways. A favorable profile exhibits positive correlations with stimulating learning climate and differentiated instruction. Moreover, the desirable pathways contribute to the development of differentiated instruction, offering valuable insights into sustainable professional growth for beginning teachers.

Educational relevant statement: The present study holds significant educational relevance as it contributes to the theoretical understanding of teacher motivation, identity, and professional development. By identifying distinct profiles and developmental pathways of beginning teachers' intrinsic motivational-affective orientations, the study offers valuable guidance for targeted support strategies in teacher education and professional development programs. Furthermore, the recognition of non-linear associations between teachers' intrinsic orientations and specific effective teaching behaviours highlights the importance of cultivating desirable orientations to enhance teachers' capacity for establishing inclusive and stimulating learning environments. In general, this study carries practical implications for school leadership and educational institutions, offering avenues to foster positive and sustainable learning experiences for both teachers and students.

1. Introduction

The transition from a “student of teaching” to a “teacher of students” presents numerous challenges for beginning teachers (BTs),¹ who typically assume full pedagogical and legal responsibility immediately upon starting their professional practice (Kelchtermans & Ballet, 2002). Rather than providing full support for BTs to assimilate and thrive within the teaching profession, some schools adopt an implicit “swim or sink” approach, assigning BTs less preferred tasks and schedules (Howe, 2006). Some BTs successfully navigate these professional crises, while others struggle to survive (Ainley & Carstens, 2018). To address these concerns and support teachers' flourishing in the teaching profession, scholars emphasize the significance of assessing, tracking, and nurturing

teachers' intrinsic motivational-affective factors, since these factors are believed to positively influence teachers' professional performance and well-being (Kunter & Holzberger, 2014).

In line with this, the existing research has extensively examined a wide array of intrinsic motivational-affective factors (e.g., *autonomous motivation*; Roth et al., 2007; Slemp et al., 2020; *mastery orientation*; Butler, 2007; Butler & Shibaz, 2008; *expectancy-value*; Drossel et al., 2019; Richardson & Watt, 2014; *interest*; Schiefele et al., 2013; *enthusiasm*; Keller et al., 2018; Kunter et al., 2011; *commitment*; Mart, 2013). While recognizing their distinct theoretical underpinnings, these factors also share certain fundamental assumptions regarding their contributions to teachers' functioning and adaptability at workplace (Kunter, 2013). Consequently, alongside their individual examination, these

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¹ The term, beginning teachers (BTs), refers to teachers who have attained three years or less of teaching experience after being officially employed by a school.

factors are frequently encompassed within heterogeneous higher-order constructs, such as *intrinsic orientation(s)* (Kunter & Holzberger, 2014) and the intrinsic aspect of teacher *motivation* (Han & Yin, 2016) and teacher *identity* (Hanna et al., 2019). Due to a multitude of operationalizations and labels and the proliferation of various measurement approaches, gaining comprehensive understanding of these constructs proves challenging. The variations in research focus across these studies also hinder the capacity to establish meaningful links and distinctions among their subordinate domains.

In response to these inherent conceptual and methodological challenges, Feng et al. (2021, 2023) have embraced an integrative approach that seeks to consolidate and harmonize diverse intrinsic factors. The integration involves subsuming the conceptual overlap into a higher-order construct termed “*teachers’ intrinsic orientation towards the profession*”² (TIOP), which is characterized by the fundamental components of *high meaningfulness* and *positive feelings* experienced by teachers in their professional roles. Divergent from the traditional synthesis approach, which typically amalgamates a restricted range of motivational-affective concepts into an exclusive model (e.g., Linnenbrink-Garcia & Worthington, 2019; Neves de Jesus & Lens, 2005; Thommen et al., 2021), this integrative framework zooms in on the “shared essence” that emerges from a multitude of theoretical perspectives. By pinpointing the common core, the TIOP framework aims to facilitate a holistic examination of the complex phenomenon of teachers’ “love” and potential “ambivalence” towards the teaching profession, which may wield considerable explanatory power concerning certain professional performances of teachers. Moreover, the framework embraces the diverse manifestations and etiologies of such teacher orientations, providing a balanced and coherent perspective on the intricate web of contributing factors.

Given the inconclusive nature of associations between diverse intrinsic motivational-affective variables and effective teaching, as evidenced in previous cross-sectional (e.g., Kunter, 2013; Kunter et al., 2008; Zee & Koomen, 2016) and longitudinal studies (e.g., Daumiller et al., 2021; Lazarides & Schiefele, 2021), the specific contribution of the TIOP framework to teachers’ effective teaching (development) warrants further investigation. While previous research has hinted at the potential interaction between TIOP and BTs’ positive outlook on the profession-related selves (i.e., self-efficacies) in influencing specific effective teaching behaviour (Feng et al., 2023), there remains a need for a more comprehensive and in-depth exploration of their dynamics. To address this research gap and to gain a deeper understanding of the interconnectedness between these intrinsic orientations and their potential contributions to effective teaching, the present study adopts a longitudinal person-centered approach. Unlike variable-centered approaches that focus on isolated factors, the person-centered approach provides a

² The term “profession” is preferred over “occupation,” “job,” “work,” or “tasks” in this context because it commonly refers to jobs/occupations of special power and prestige performed by a disciplined group of specially-trained individuals. Particularly in the teaching profession, educators are expected to possess the necessary education and training to fulfill their major responsibility of fostering the growth, learning, and development of young generations. Teachers handle various tasks both inside and outside the classroom, interacting with multiple stakeholders (e.g., students, colleagues, parents, policy-makers) and assuming diverse roles (e.g., instructor, supervisor, tutor, mentor, counselor, coordinator, researcher), which tend to expand with professional experience. Nevertheless, the primary and essential obligation shared by all teachers is the education of students. Thus, this study focuses on the core of the teaching profession by defining “profession” in the context of TIOP as encompassing teaching responsibilities, including classroom instruction, extracurricular supervision/tutoring, and class management, among others. This conceptualization serves as a theoretical foundation for viewing TIOP as a generic teacher trait applicable to the entire teacher population and transferable across various contexts. Moreover, empirically, it allows for cross-sectional comparisons and longitudinal tracking of TIOP.

framework that interprets teachers’ intrinsic orientations towards the profession and their profession-related selves as an integrative system within individual teachers. By simultaneously accommodating the examination of multiple variables, this approach identifies meaningful patterns and configurations within teachers, affording a comprehensive opportunity to assess their collective influence on effective teaching behaviour. This analytical advantage is of particular relevance in situations where prior understanding of the complexities governing these interactions remains limited. Furthermore, the incorporation of a longitudinal design facilitates the tracking of the developmental trajectories of BTs’ intrinsic orientations, alongside their dynamic relationships with effective teaching behaviour as BTs progress in the initial career years. The discernment of these distinctive profiles assumes significance towards improving interventions and support mechanisms to enhance the professional development and well-being of BTs, to ultimately contribute to their long-term success in the profession.

2. Theoretical framework

2.1. Teachers’ intrinsic orientations: an integrative perspective

2.1.1. Teachers’ intrinsic orientation for the profession

Within the scholarly discourse on teachers’ intrinsic motivational-affective characteristics, Kunter and Holzberger (2014) have undertaken a praiseworthy endeavor to consolidate and disentangle the intricately intertwined, yet distinct, intrinsic factors inherent in teachers. They encapsulate these factors into a compound trait termed as *teachers’ intrinsic orientation(s)*, signifying the habitual inter-individual variations among teachers with regard to the degree of positive emotions and high meaningfulness experienced in their profession (Kunter & Holzberger, 2014). Building upon the foundational work of Kunter and Holzberger, Feng et al. (2021, 2023) have further refined and crystallized the construct by operationalizing the shared essence derived from an array of teachers’ intrinsic factors, culminating in the higher-order construct—TIOP. In contrast to the traditional synthesis approach which frequently construe such concepts as teacher motivation or identity as a multidimensional construct comprising numerous correlated intrinsic factors (e.g., Lazarides & Schiefele, 2021; Neves de Jesus & Lens, 2005; Thommen et al., 2021), Feng et al. (2021, 2023) advocate for the interpretation of TIOP as a unified and overarching construct that encompasses two fundamental sub-dimensions: firstly, the profound sense of meaningfulness that teachers attribute to their profession; and secondly, the positive emotional experiences that teachers derive from their active involvement in the teaching processes, which include both teaching activities and the subject matter they teach (see Fig. 1).

Methodologically, the measurement of the former component can be achieved by scrutinizing the characteristics of motivational-evaluative factors, such as autonomous motivation (Dörnyei & Ushioda, 2011; Iridayanti et al., 2020), social utility value (Thomson & Palermo, 2018; Watt & Richardson, 2007), value-related valence of objects (Schiefele, 2009; Schiefele et al., 2013), and mastery orientation (Parker et al., 2012; Retelsdorf et al., 2010), all of which offer insights into teachers’ intrinsic valuation of their calling. The latter component of TIOP can be measured through affective-evaluative factors, such as experienced enthusiasm (Keller et al., 2018; Kunter et al., 2011), harmonious passion (Carbonneau et al., 2008), feeling-related valence of objects (Schiefele, 2009; Schiefele et al., 2013), and trait/state enjoyment and pride (Keller et al., 2014), all providing a window into teachers’ positive emotional encounters throughout their professional endeavors. So far, the construct validity of TIOP has been empirically tested in terms of its dimensionality, using teachers’ self-reported autonomous motivation as the representative of cognitive-evaluative factors and experienced enthusiasm for teaching and for the subject as the representatives for affective-evaluative factors.

According to preliminary evidence from Feng et al. (2021), TIOP remains highly stable in the first year of teachers’ careers, with male

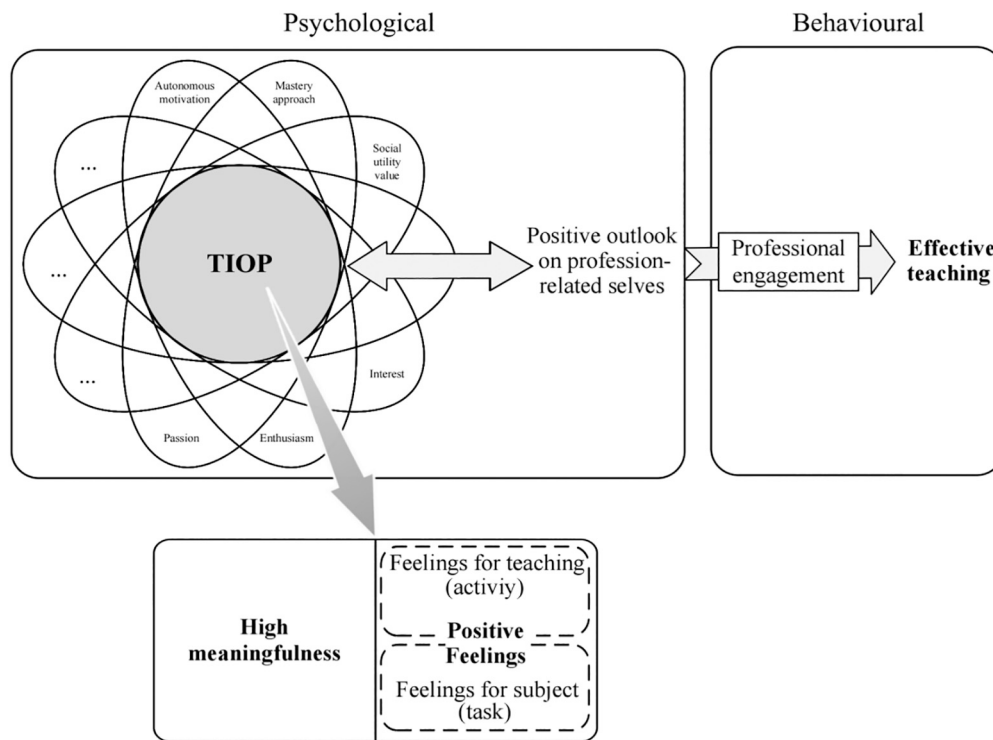


Fig. 1. TIOP framework adapted from Kunter and Holzberger's (2014) theory.

teachers consistently reporting higher levels compared to females. Moreover, TIOP demonstrates a strong correlation with teachers' positive outlook on their profession-related selves, i.e., teachers' self-efficacies in effectively carrying out teaching tasks (e.g., instruction, classroom management) and achieving desired student outcomes (e.g., student engagement) (Tschannen-Moran & Hoy, 2001). Due to the conceptual proximity between TIOP and teachers' positive outlook for their profession-related selves, this study classifies both of them as *intrinsic orientations* that deeply influence teachers' practices and outcomes in the educational context. However, they also exhibit unique characteristics of intrinsic orientations due to their distinct objects of focus (profession versus self).

2.1.2. Teachers' intrinsic orientations and effective teaching

According to the theoretical framework put forth by Kunter and Holzberger (2014), teachers' intrinsic orientations serve as crucial determinants of their professional efforts within the workplace, leading to potential beneficial outcomes of effective teaching and student achievements (see Fig. 1). In more specific terms, teachers exhibiting robust intrinsic orientations are more likely to demonstrate heightened levels of volition and self-regulation, essential attributes for effectively navigating the demanding and dynamic nature of the teaching (Richardson et al., 2014). Teachers' capacity to sustain focus and engagement in the classroom is pivotal for executing goal-oriented actions while remaining adaptable to students' diverse needs and unforeseen incidents (Feldon, 2007). Additionally, the teaching profession entails long-term commitment to continuous professional development, requiring teachers to persistently engage in learning activities and confront themselves with new challenges (Oser, 1998). In this context, intrinsic orientations play a vital role in nurturing teachers' sense of vocation and self-regulatory capabilities, thereby empowering them to proactively embrace opportunities for personal and professional growth.

To empirically examine the influence of TIOP on BTs' effective teaching, Feng et al. (2023) conducted a variable-centered study, which yielded substantial evidence highlighting the interaction between teachers' intrinsic orientations towards the teaching profession and their

profession-related selves. This interaction was found to be linked to varying levels of effective teaching behaviour exhibited by BTs at career entry. Additionally, the study discerned that this interaction was subjected to moderation by teacher characteristics, including gender, age, and qualification, and some implicit school-level factors. Such findings imply a complex interplay between teachers' intrinsic orientations, their individual characteristics, and the situational contexts they encounter, which together influence the transformation of cognitive resources into a multifaceted array of qualities and manifestations of displayed behaviour (Kunter, 2013). However, certain limitations of this study, stemming from the absence of longitudinal insights, impede comprehensive assumptions regarding the enduring influence of BTs' intrinsic orientations on their effective teaching practices over an extended temporal span. Furthermore, the presumed homogeneity of teacher profiles, while informative, necessitates cautious interpretation, as it may overlook the potential existence of heterogeneous teacher subgroups and non-linear relationships that underlie the complex dynamics between intrinsic orientations and effective teaching outcomes.

2.2. Profiling teachers' intrinsic orientations: a longitudinal person-centered approach

2.2.1. Merits of a person-centered approach

Investigating individual differences in motivational-affective characteristics presents inherent complexities within the framework of social cognitive theory (Schunk & DiBenedetto, 2020). In the context of teacher research, this complexity is further compounded by their conceptual overlap and their multiplicative effects on effective teaching (Holzberger et al., 2014; Osman, 2017). Prior studies have predominantly employed a variable-centered approach to depict teachers' "average" motivational and/or affective profiles. This approach facilitates the examination of individual and collective associations between these profiles and effective teaching using general linear models (e.g., correlation analysis, regression analysis with multiplicative interaction terms, and factor analysis; Hickendorff et al., 2018). These methods are valuable for theory-based deductive investigations encompassing the

entire target population (Bauer & Shanahan, 2007). Nevertheless, they are also accompanied by several limitations, including the necessity for a robust theoretical foundation, constraints on the number of links that can be tested, the disregard of potential non-linear relationships, and the presumption of homogeneity in teachers' motivational-affective characteristics within samples (Thommen et al., 2021).

To address these limitations, our study adopted a person-centered approach, simultaneously considering multiple teacher attributes, including teachers' intrinsic orientations towards the profession (i.e., *endowed professional meaningfulness, positive feelings for teaching activities and for the subject matter*) and profession-related selves (i.e., *self-efficacy for instruction, classroom management, and student engagement*). By employing a person-centered approach, we aimed to identify naturally occurring subgroups of teachers within cross-sectional data and their discontinued or non-linear development pathways within longitudinal data (Hickendorff et al., 2018). Specifically, latent profile analysis (LPA) was utilized to explore and model the unobserved heterogeneity in teachers' intrinsic orientations arising from the interplay of the above six indicators. Latent transition analysis (LTA) was employed to identify the intra-individual variation of teachers' intrinsic orientations over time (see Hickendorff et al., 2018). Moreover, by comparing these static profiles and development pathways and their prevalence within the sample, we could subsequently investigate beyond the linear relationships between teachers' intrinsic orientations and effective teaching.

2.2.2. Possible intrinsic orientation profiles

A limited number of studies have investigated teachers' motivational-affective profiles from a person-centered perspective. For instance, Rodríguez et al. (2014) examined self-efficacy among university teachers and identified three distinct profiles: high, medium, and low self-efficacy. Similarly, Thommen et al. (2021) explored the interplay between enthusiasm, self-efficacy, and goal orientation, yielding a three-profile solution differing primarily in terms of goal orientation. Holzberger et al. (2021) extended their investigation to include both motivational-affective and cognitive characteristics, resulting in the identification of three profiles: (1) highly knowledgeable and engaged, (2) below-average knowledge, and (3) below-average beliefs, motivation, and self-regulation. Given the presence of multiple motivational and emotional profiles identified in existing research (e.g., Bergey & Ranellucci, 2021; Keller et al., 2018; Kunst et al., 2018; Lohbeck & Frenzel, 2022; Rodríguez et al., 2014; Thommen et al., 2021; Watt et al., 2021), this study anticipates the identification of at least two subgroups of teachers characterized by distinct profiles of intrinsic orientations. These differences may manifest in varying levels (quantitative; e.g., low, medium/moderate/average, high) and configurations (qualitative; e.g., externalized, internalized, high avoidance, success-oriented) of key variables.

Compared to the static profile research, investigations into the dynamic developmental pathways of teachers' motivational-affective factors remain scarce. To address this research gap, the present study endeavors to investigate such dynamics. Prior person-centered research has demonstrated high levels of stability in work motivation profiles (Fernet et al., 2020), efficacy profiles among pre-service teachers (Ward, 2009), and burnout profiles among in-service teachers (Xie et al., 2022) over time. These findings align with the trait-like nature of teacher motivational-affective factors documented by numerous variable-centered studies (e.g., Feng et al., 2021; Kunter et al., 2011). For this reason, the present study assumes a certain degree of constancy in the profiling of teachers' intrinsic orientations across different time points throughout their teaching careers. However, considering the potential impact of professional practices and social interactions on teachers' motivational factors over time (Richardson & Watt, 2018), this study also expects within-teacher changes in the static profile membership. This approach aims to unveil the adaptive and dynamic processes of intrinsic orientations in response to experiences and the passage of time.

2.3. Intrinsic orientation profiles and effective teaching

2.3.1. Operationalization of effective teaching

The terminology surrounding effective teaching (skills) and teaching quality has been used interchangeably within the extensive literature, often regarded as a crucial factor contributing to the improvement of students' academic achievements (Carter et al., 2021). A review of the relevant theoretical frameworks reveals the intricacy and multidimensionality of this concept, comprising various quality dimensions (Klieme et al., 2009; Pianta & Hamre, 2009; Praetorius et al., 2020; van de Grift, 2014; van de Grift et al., 2017). For instance, Pianta and Hamre (2009) identified *emotional supports, classroom organization, and instructional supports* as fundamental elements of effective teaching within their conceptual framework for classroom interactions. Klieme et al. (2009) summarized another three dimensions to embrace the most generic features of effective teaching: *supportive climate, classroom management, and cognitive activation*. On top of these trichotomies, van de Grift (2014) and colleagues (van de Grift et al., 2017) characterized effective teaching in the classroom through a more elaborate set of generic effective teaching behaviours, including *safe and stimulating learning climates, classroom management, instructional clarity, activating teaching, differentiating instruction, and teaching learning strategies*. Numerous studies have provided empirical evidence supporting the identification of these theoretically defined aspects of effective teaching (Burić & Kim, 2020; Fauth et al., 2019; Göllner et al., 2018; Hamre et al., 2007).

In order to capture the characteristics of various aspects of effective teaching, we have chosen to utilize van de Grift's (2014) framework known as the International Comparative Analysis of Learning and Teaching (ICALT). Compared to the aforementioned trichotomies, ICALT operationalizes effective teaching in classrooms through a more elaborated set of domains. These domains include the following: *Safe and stimulating learning climate*, which pertains to teaching practices that foster a positive and respectful environment, nurturing students' self-confidence and promoting effective learning; *Classroom management*, involving adept management of classroom activities and student behaviour to ensure optimal teaching and learning conditions; *Instructional clarity*, entailing the provision of clear and effective instructions that scaffold students' learning processes; *Activating teaching*, aiming to promote active learning and engagement, thereby optimizing students' academic outcomes; *Differentiating instruction*, encompassing teaching practices that address individual variations in student readiness levels, interests, and learning profiles to maximize their learning potential; and *Teaching learning strategies*, referring to heuristics facilitating students' metacognitive skills for more advanced levels of learning (van de Grift, 2014; van de Grift et al., 2017) (see Appendix A). The first three domains are fundamental while the latter three are relatively complex. The distinct categorization of these six analytically exclusive domains facilitates the assessment of teachers' levels of and changes in multiple aspects of their effective teaching over time (e.g., Maulana et al., 2013, 2015; Opendakker et al., 2012). Particularly regarding BTs, past research has found that they rarely exhibit comparable levels of effective teaching compared to their experienced colleagues (Van de Grift, 2010). This is especially evident in terms of skills centered on student learning (Van der Lans et al., 2018). Despite the general trend of BTs' cumulative progression in effective teaching, empirical studies detect varying developmental patterns and pace of certain teaching behaviour during the initial career years (Maulana et al., 2013, 2015; Opendakker et al., 2012).

2.3.2. Dynamics between orientation profiles and effective teaching behaviour

Past research has shown varying predictive values of motivational profiles for effective teaching and student outcomes (e.g., Keller et al., 2018; Órdenes et al., 2022; Thommen et al., 2021; Watt et al., 2021). For example, Órdenes et al. (2022) examined the motivational profiles of Chilean teachers using data from TALIS 2018 and identified three

distinct profiles: utility-laden, modal, and socially-laden. They found that teachers with the modal profile demonstrated better teaching quality compared to the other profiles. In a study by [Thommen et al. \(2021\)](#), three motivational profiles were identified among secondary mathematics teachers: low performance goal-oriented, high performance goal-oriented, and high performance-avoidance goal-oriented. However, the study did not find a significant link between motivational profile membership and student-rated teaching quality. Similarly, [Watt et al. \(2021\)](#) investigated goal combinations among mid-career primary and secondary teachers and identified four goal profiles. They found that profiles with stronger ability than task goals were maladaptive for teachers and teaching, while profiles with stronger task than ability goals were more adaptive and linked to a more positive school climate. In the study by [Keller et al. \(2018\)](#), patterns of teacher-reported enthusiasm and student-reported enthusiastic teaching behaviours were examined, revealing four distinct lesson profiles. The profile where experienced enthusiasm and enthusiastic teaching coincided at a high level was superior to other profiles in terms of students' emotions and enjoyment. Together, these studies highlight the complexity and diversity of motivational profiles among teachers and their potential impact on effective teaching. Based on the empirical evidence presented, we posit that favorable intrinsic orientation profiles generally exhibit a positive correlation with teachers' overall effective teaching. However, it is important to note that these favorable profiles may only exert positive impacts on specific domains of effective teaching behaviour. In comparison to the extensive research on the relationship between motivational-affective profiles and levels of effective teaching, investigations into the association between motivational-affective profiles and the development of effective teaching remain limited. To address this research gap, the present study endeavors to explore such dynamics. In light of the divergent patterns of development in specific teaching behaviours observed in the early stages of teachers' careers (e.g., [Maulana et al., 2015](#); [Malmberg et al., 2010](#)), it is imperative to explore the extent to which intrinsic orientation profiles may account for this variability in development.

3. Research questions

In general, the primary aim of this study is to investigate the intricate interplay between BTs' intrinsic orientations for the profession and for their profession-related selves, and its potential impact on the development of BTs' effective teaching behaviour during the initial two years in the career. To achieve this objective, a person-centered approach is adopted, with a focus on identifying distinctive orientation profiles of BTs and tracking the developmental trajectories of their intrinsic orientations. These trajectories will be examined in relation to their dynamic associations with effective teaching as BTs progress in their early career years. To address these research objectives, this study formulates the following research questions:

Research question 1: What are the discernible intrinsic orientation profiles among BTs at the start of their careers and at the end of two consecutive years?

Research question 2: Which developmental pathways of teachers' intrinsic orientation profiles can be identified over the initial two-year period?

Research question 3: How are these intrinsic orientation profiles associated with the levels of effective teaching behaviour exhibited by BTs at each time point?

Research question 4: How are these intrinsic orientation profiles and developmental pathways associated with the development of various teaching behaviour domains during the initial two career years?

4. Methods

4.1. Participants and procedure

This study is affiliated with a national project *Inductie in het Noorden (INO)* (Project Number OCW OND/ODB-13/19888 U, Mandatory Number 804A0-42807). It was reviewed by the Teacher Education Department Ethics Committee of the University of *anonymized for blind review* following the Netherlands Code of Conduct for Academic Practice (2014) and the Code of Ethics for research in the Social and Behavioural Sciences involving Human Participants (2016) (Reference Number EC 2023-2). 274 BTs from 33 secondary schools in the north of the Netherlands voluntarily participated in the research ($N_{\text{female}} = 167$, $M_{\text{age}} = 28.87$, $SD_{\text{age}} = 7.68$, $N_{\text{uncertified}} = 29$). Teacher questionnaires were administered at the outset (Time point 1) and end (Time point 2) of teachers' first career year as well as at the end of their second year (Time point 3). Due to participant mobility, sample sizes and response ratio varied across time points, resulting in 239 participants at Time point 1, 190 at Time point 2, and 146 at Time point 3. In addition to using self-reports, the study also involved classroom observations of teachers in natural classroom settings. Well-trained observers assessed the six domains of effective teaching behaviour during one typical lesson for each participating teacher. These observations encompassed the entire lesson, allowing for a comprehensive assessment of the teacher's interactions with the entire class of students. The training of observers followed a systematic three-step approach, which includes preparation, implementation, and evaluation. Trainees were first instructed to study the theoretical framework and the observation instrument. Then, they participated in in-person discussions and evaluations of two videotaped lessons, striving to attain a minimum consensus level of 70 % for inter-rater reliability ([Maulana et al., 2021](#)). In the evaluation phase, identified rating patterns and deviations were examined. The inter-rater reliability cut-off criterion was maintained throughout the subsequent research phase.

4.2. Measures

4.2.1. Intrinsic orientations

BTs' intrinsic orientations for the profession was measured using a validated TIOP scale ([Feng et al., 2021, 2023](#)), which consists of a 4-item subscale of *Affection for teaching*, a 4-item subscale of *Affection for the subject matter*, and a 3-item subscale of *Endowed professional meaningfulness* (see [Appendix B](#)). Teachers responded to a four-point Likert scale, ranging from 1 (completely disagree) to 4 (completely agree). Reliability coefficients of omega (0.91–0.92) and omega hierarchical (0.78–0.79) suggest that TIOP scale predominantly captures the characteristics of the general factor ([Feng et al., 2021, 2023](#)). BTs' positive outlook and self-affirmation for their profession-related selves were measured by Teachers' Sense of Efficacy Scales (TSES; [Tschannen-Moran & Hoy, 2001](#)). TSES includes three subscales of teachers' *Self-efficacy for instruction* (8 items), *Self-efficacy for classroom management* (8 items), and *Self-efficacy for student engagement* (8 items). Teachers' response was scored on a five-point Likert scale, with 1 indicating "nothing" and 5 "a great deal". Past studies have proven good internal consistency of these scales ($\alpha > 0.62$) ([Feng et al., 2021, 2023](#); [Helms-Lorenz et al., 2018](#); [Tschannen-Moran & Hoy, 2001](#)).

4.2.2. Effective teaching behaviour

ICALT instrument ([van de Grift, 2014](#); [van de Grift et al., 2017](#)) was used by well-trained observers to rate teachers' effective teaching behaviour displayed in the classroom. The instrument consists of 120 low-inference good practices, which are clustered into 32 high-inference indicators of six effective teaching behaviour domains: *Stimulating Learning Climate*, *Classroom Management*, *Instructional Clarity*, *Activating Teaching*, *Differentiated Instruction*, and *Teaching Learning Strategies*. Each indicator was rated on a four-ordinal-response category (1 = "mostly

weak”, 4 = “mostly strong”). Generally, a domain mean between 1 and 2 is considered insufficient, between 2 and 3 is sufficient, and between 3 and 4 is good. Substantial empirical evidence has been gathered in existing studies on the validity and reliability of this instrument across countries (e.g., Netherlands, Indonesia, South Africa, South Korea, England) ($\alpha > 0.74$) (e.g., Maulana et al., 2021; van de Grift et al., 2017). The instrument has also been calibrated for various teacher groups (e.g., BTs, experienced teachers, subject teachers, lecturers), education levels (e.g., elementary, secondary, and higher education) and measurement types (e.g., observation, questionnaires) (André et al., 2020; Authors, 2019a, 2019b, 2019c; Maulana et al., 2021). Teachers’ demographic information (i.e., age, gender, qualification³) was also collected by the supervision monitor and the questionnaires on teaching behaviour.

4.3. Data analysis

4.3.1. Preliminary analysis

Given the variability in response rates among survey and observation data across the three time points, it was imperative to address both cross-sectional and longitudinal missingness to ensure unbiased estimation of parameters and enhance the generalizability of the findings. Provided that the conditions of Missing Completely at Random (MCAR) for cross-sectional data and Missing at Random (MAR) for longitudinal data were met, subsequent confirmatory factor analysis (CFA) could be conducted. Additionally, measurement invariance tests were performed to assess the longitudinal validity of the scales across the different time points. Factor scores of the profile indicators (*endowed professional meaningfulness, positive feelings for teaching and for the subject matter, self-affirmation for instruction, for classroom management, and for student engagement*) were calculated in strong or strict invariance models. Subsequently, correlation analyses were conducted between all profile indicators and the domains of effective teaching behaviour, as well as teacher demographics (i.e., gender, age, qualification), within a multivariate model at each time point.

4.3.2. Intrinsic orientation profiles and development pathways

4.3.2.1. Static profiles at each time point (Research question 1). Cross-sectional LPA employing Mplus 8.3 software was conducted to identify teacher subgroups with homogeneous profiles. No constraints were set to the means and variance of profile indicators, allowing them to vary across time points. A series of models with the number of profiles ranging from 2 to 5 were tested to iteratively assess which model best fits the data at each time point. The most appropriate model was identified based on statistical criteria (Nylund et al., 2007) and theoretical interpretations (Lubke & Muthén, 2005). The former includes (1) information criteria (IC)-based relative fit indices such as Akaike Information Criteria (AIC), Bayesian Information Criterion (BIC), and Adjusted BIC (ASBIC), (2) maximum likelihood-based likelihood ratio tests, such as Lo-Mendell-Rubin test (LMR) and adjusted LMR, (3) entropy-based criterion, and (4) proportions of membership. Lower IC-based indices suggest a better model fit (Raftery, 1995). Significant *p*-values of likelihood-based indices indicate that the K_0 -profile model fits the data significantly better than the k_{-1} -class solution. An entropy value > 0.80 is considered an indication of good classification between identified profiles (Ramaswamy et al., 1993). Furthermore, profile solutions with membership proportions lower than 5% ($N = 14$) were not applied. In addition to statistical criteria, distinguishability and interpretability of separate profiles were also examined (Lubke & Muthén, 2005). Kruskal-Wallis tests with Bonferroni post hoc comparisons were conducted to

³ Teacher qualification is categorized as: 1 (uncertified), 2 (certified and with experience < 2 years), and 3 (certified and with experience > 2 years). Uncertified teachers are permitted to work in the same Dutch secondary schools for up to two years (van der Grift & Helms-Lorenz, 2013).

test differences in profile indicators between the identified profiles.

4.3.2.2. Developmental pathways over three time points (Research question 2). After the selection of static profile membership at each time point, we conducted LTA to examine the consistency of static profiles over three time points. On the condition that similar profile solutions (i.e., profile number, profile characteristics) were found across time points, longitudinal profile similarity tests (Morin & Litalien, 2017) were used to examine the within-sample stability (Kam et al., 2016). To achieve this, profile-solutions at different time points were first included into one LPA model without equivalence constraints (configural similarity). Then, means of the profile indicators were set invariant across time points (structural similarity). No constraints were imposed on the indicator variance (dispersion similarity) and profile probabilities (distribution similarity) to allow for free within-profile variability. A varied structural similarity model was compared with the configural model using the Likelihood Ratio Difference Test. Upon confirming that the same number of static profiles appeared in similar configurations across time points, we proceeded to identify distinct development pathways and their prevalence.

4.3.3. Orientation profiles and developmental pathways and effective teaching behaviour

4.3.3.1. Cross-sectional associations (Research question 3). To explore potential variations in the levels of all effective teaching behaviour domains among the identified intrinsic orientation profiles at each time point, we employed one-way ANOVA tests. Through these tests, our aim was to ascertain whether certain profiles displayed significantly higher or lower levels of specific effective teaching behaviours compared to others. By conducting this statistical analysis, valuable insights were obtained regarding the potential cross-sectional associations between teachers’ intrinsic orientations and their effective teaching behaviour.

4.3.3.2. Longitudinal relationships (Research question 4). We first employed Hierarchical Linear Modeling (HLM) to analyze the developmental trajectory of each effective teaching behaviour domain, enabling a simultaneous examination of intra-individual changes over time and inter-individual differences (see Fig. 2). The data was structured into two levels: time and teachers, with measurement times nested within teachers. Then, we included time-varying predictors (i.e., static orientation profiles, teacher characteristics of age and qualification) and time-invariant predictors (i.e., developmental pathways of orientation profiles, teacher gender) into the model. To account for the relatively small proportions of maladaptive and progressing pathways, the categorization of larger profiles, i.e., progressive and regressive pathways, was selected a predictor. Furthermore, all categorical variables were recoded, with each category represented by a separate dummy variable. The dummy variable was assigned a value of 1 if the observation belonged to that particular category, and 0 otherwise. By incorporating these predictors, we examined the contributions of teachers’ intrinsic orientation profiles and their developmental pathways to the changes in each teaching behaviour domain, while also accounting for key teacher characteristics.

5. Results

5.1. Preliminary analyses

Little’s MCAR tests results ($p > .100$) indicate that cross-sectional missingness was distributed randomly and independent of other (un) measured factors relevant to the study. However, *t*-tests of longitudinal missing values found that the mobility of survey participants over time is related to their age, gender and levels of positive feelings for the subject, self-efficacies, and Stimulating learning climate. In general, it is

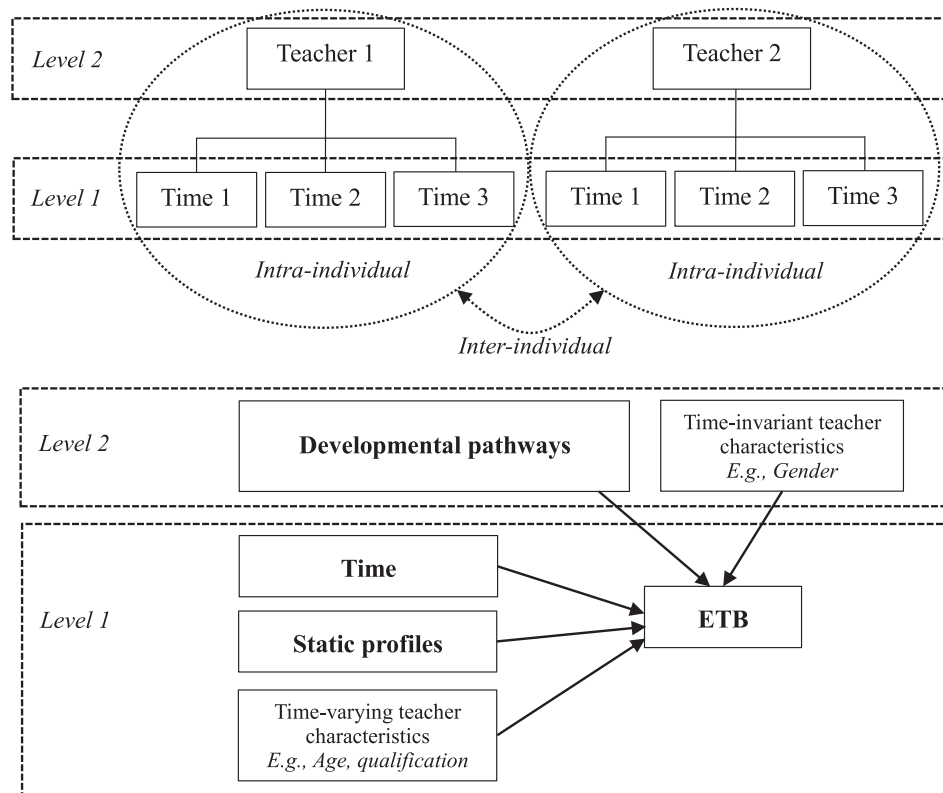


Fig. 2. Illustration of a multilevel hierarchy (top) and model (bottom).
 Note. ETB = one domain of effective teaching behaviour.

recommended that interpretation of longitudinal results be made with caution. CFA results confirmed the factorial structures of TIOP as a second-order construct with three sub-dimensions (i.e., endowed professional meaningfulness, positive feelings for teaching, positive feelings for the subject) and of self-efficacies as a collection of three highly correlated sub-domains (self-efficacy for instruction, self-efficacy for classroom management, and self-efficacy for student engagement) after removing one item (see Table 1). Invariance test results proved that the measurement of these two constructs did not differ significantly over three time points (see Table 2). In this case, the factor scores in unique factor models were estimated. Multivariate correlations shown in Table 3 indicate that the TIOP sub-factors demonstrated either low or moderate correlations with self-efficacies ($r = 0.187\text{--}0.499, p < .001$), but not with effective teaching behaviour during the first career year. At the end of the second year, more correlations were found between TIOP sub-factors and effective teaching behaviour domains ($r = 0.134\text{--}0.187, p < .10$). The means and standard deviations of the item scores for each

domain of effective teaching behaviour are presented in Appendix C. The mean scores of all behavioural domains consistently increase when comparing the latter time point with the former.

5.2. Teachers' intrinsic orientation profiles (Research question 1)

As shown in Table 4, all profile solutions exhibited entropies > 0.80 , indicative of a good classification of identified profiles. Despite relatively lower IC-based relative fit indices for the 2-profile solution compared to other options, it emerged as the only solution demonstrating a significantly improved fit to the data compared to solutions with one fewer profile at each time point ($p < .05$). In light of the comprehensive evaluation considering AIC, BIC, LMR, and membership proportion, the two-profile solutions for all three time points were deemed statistically appropriate, striking an optimal balance between data fit and parsimony (see Table 4).

The unstandardized indicator means of both profiles are displayed in

Table 1
 Fit indices of the CFA models at three waves.

Model	Wave	Robust χ^2 goodness-of-fit						
		Value	df	CFI	TLI	RMSEA	SRMR	
Self-efficacy (3 correlated factors)	All items	Wave 1	481.442*	249	0.963	0.958	0.062	0.064
	SE1 excluded	Wave 1	454.653*	227	0.963	0.959	0.065	0.064
	All items	Wave 2	396.473*	249	0.966	0.963	0.056	0.071
	SE1 excluded	Wave 2	359.169*	227	0.970	0.966	0.055	0.069
	All items	Wave 3	NA	NA	NA	NA	NA	NA
	SE1 excluded	Wave 3	407.571*	227	0.948	0.942	0.074	0.082
TIOP (second-order factor with 3 sub-dimensions)	All items	Wave 1	83.841*	41	0.986	0.981	0.066	0.055
	All items	Wave 2	71.621*	41	0.984	0.979	0.063	0.052
	All items	Wave 3	158.422*	41	0.959	0.945	0.140	0.083

Note. NA = not applicable. SE1 means the first item in the TSES Scale.
 * $p < .001$.

Table 2
Model fit indices of measurement invariance tests.

TIOP (higher-order construct)	Robust goodness-of-fit					
	Value	df	CFI	TLI	RMSEA	
1. Baseline	764.179*	454	0.957	0.950	0.050	
2. Loading invariance	771.532*	474	0.959	0.954	0.048	
3. Threshold invariance	780.179*	502	0.962	0.960	0.045	
4. Unique factor invariance	787.733*	524	0.964	0.963	0.043	
Nested models comparisons	ΔCFI	ΔTLI	ΔRMSEA	DIFFTEST		
				Value	df	p
Baseline versus loading invariance	0.002	0.004	-0.002	15.929	20	0.721
Loading versus threshold invariance	0.003	0.006	-0.003	23.725	28	0.696
Threshold versus unique factor invariance	0.002	0.003	-0.002	31.137	22	0.093
Baseline versus unique factor invariance	0.007	0.013	-0.007	73.554	70	0.363
Self-efficacy (three correlated factors)	Robust goodness-of-fit					
	Value	df	CFI	TLI	RMSEA	
1. Baseline	2617.982*	2172	0.959	0.955	0.027	
2. Loading invariance	2653.498*	2213	0.959	0.957	0.027	
3. Threshold invariance	2751.160*	2319	0.960	0.959	0.026	
Nested models comparisons	ΔCFI	ΔTLI	ΔRMSEA	DIFFTEST		
				Value	df	p
Baseline versus loading invariance	0.000	0.002	0.000	45.050	41	0.306
Loading versus threshold invariance	0.001	0.002	-0.001	109.968	106	0.376
Baseline versus threshold invariance	0.001	0.004	-0.001	154.460	147	0.320

* $p < .001$.

Table 5. Consistent patterns of between-profile variation emerged across all time points, underscoring a high degree of consistency over time regarding the two-profile solution (see Fig. 3). Considering this remarkable stability, the two static profiles identified at each time point were interpreted and labeled simultaneously. These profiles exhibited quantitative differences and demonstrated similar prevalence, ranging from 42 % to 58 %. Results from Kruskal-Wallis tests revealed statistically significant differences in the latent means of all indicators between the two profiles ($p < .001$). These quantitative differences were used to guide the labeling of profiles.

The slightly larger subgroup of teachers (54 %–58 %) is characterized by lower levels of all profile indicators, particularly evident in their positive feelings for teaching and the subject and self-efficacy for classroom management. This profile was thus labeled as the “Low Profile”. The relatively lower levels of intrinsic orientations was largely attributed to the reported less affection teachers derived from teaching experience and a perceived lack of self-affirmation in classroom management skills. Conversely, the second teacher profile (42 %–46 %) exhibited an overall strength in all profile indicators (see Table 5 and Fig. 3) and was appropriately labeled as the “High Profile.” Members of this profile displayed a significantly higher level of intrinsic orientations, notably evident in their heightened positive feelings, particularly for the subject matter.

5.3. Developmental pathways of the orientation profiles (Research question 2)

Grounded on the LPA findings, LTA was conducted, with the two-profile model held invariant across all three time points. The results of difference tests indicated that imposing equivalence constraints on indicator means, except for four indicators at Time point 3 (i.e., positive feelings for teaching, positive feelings for the subject, endowed professional meaningfulness, and self-efficacy for classroom management), did

not significantly compromise the model fit ($\chi^2(20) = 26.25, p = .158$). This means that the High Profile was structurally invariant across three time points and thus can be set as a time-invariant “normative” profile. However, the Low Profile exhibited equivalence between the first two time points but displayed slight changes in shape at Time point 3, attributed to the decrease in the means of three indicators (i.e., endowed professional meaningfulness, positive feelings for teaching, positive feelings for the subject) and an increase in the mean of one indicator (i.e., self-efficacy for classroom management) (see Table 6 and Fig. 4). Since the profiles were primarily labeled based on their quantitative differences (i.e., the relative levels of all indicators distinguished in between-profile comparisons of indicator means), the Low Profile at Time point 3 was still considered invariant in terms of its relative shape (see Fig. 4). As a result, this profile was included as one end of the developmental pathway.

In general, the developmental pathways of teachers’ intrinsic orientations exhibited both a high degree of consistency and substantial heterogeneity. Four consequential transition patterns were identified and labeled as follows: (1) *Low Pathway* (1-1-1; $N = 150, 54.7\%$), (2) *Maladaptive Pathway* (2-1-1; $N = 3, 1.1\%$), (3) *Progressing Pathway* (1-1-2; $N = 12, 4.4\%$), and (4) *High Pathway* (2-2-2; $N = 109, 39.8\%$) (see Table 7 and Fig. 5). The majority of teachers (54.7 %) followed the Low Pathway, maintaining a relatively lower level of intrinsic orientations. A slightly lower proportion of teachers (39.8 %) corresponded to *High Pathway*, holding consistently higher levels of intrinsic orientations over time. In sum, teachers included in these two pathways accounted for 94.5 % of the sample, indicating a high degree of stability in their developmental trajectories. In contrast, the remaining two pathways included only a small minority of teachers (5.5 %). The *Maladaptive Pathway*, corresponding to the smallest subgroup (1.1 %), consisted of teachers who initially displayed a relatively advantageous High Profile of intrinsic orientations but regressed to the Low Profile within the first year of their career. Conversely, the *Progressing Pathway* included a

Table 3

Multiple correlations of the factor scores of profile indicators with ETB and teacher demographics across three waves (significant correlations are in bold).

	SE1	SE2	SE3	TB1	TB2	TB3	TB4	TB5	TB6	Gender	Age	Qualification
Wave 1												
TIOP- Affection for teaching	0.460**	0.394**	0.438**	0.079	0.131*	0.064	0.096	0.083	0.000	-0.066	0.079	-0.081
TIOP- Affection for the subject	0.432**	0.309**	0.428**	0.007	0.091	0.036	0.081	0.094	0.015	-0.100	0.126*	-0.080
TIOP- Endowed professional meaningfulness	0.349**	0.187**	0.355**	0.056	-0.031	-0.011	0.066	0.012	0.041	0.003	0.031	-0.256*
SE1: Self-efficacy for instruction		0.702**	0.940**	0.064	0.059	0.068	0.132⁺	0.138*	0.120⁺	-0.167*	0.009	-0.013
SE2: Self-efficacy for classroom management			0.589**	0.080	0.170*	0.108	0.103	0.084	0.014	-0.197*	0.038	0.015
SE3: Self-efficacy for student engagement				0.041	-0.003	0.019	0.122⁺	0.123⁺	0.127*	-0.164*	0.026	-0.021
TB1: Stimulating Learning Climate					0.549**	0.597**	0.469**	0.162⁺	0.113	0.000	-0.262**	-0.058
TB2: Classroom Management						0.642**	0.478**	0.318**	0.202*	0.068	-0.186*	0.039
TB3: Instructional Clarity							0.706**	0.276**	0.294**	0.002	-0.165*	0.037
TB4: Activating Teaching								0.508**	0.585**	0.045	-0.145⁺	0.070
TB5: Differentiated Instruction									0.494**	0.160⁺	-0.080	0.088
TB6: Teaching Learning Strategies										0.081	-0.066	0.098
Wave 2												
TIOP- Affection for teaching	0.456**	0.402**	0.433**	-0.049	0.057	0.012	-0.054	0.135	0.116	-0.071	0.103⁺	-0.106
TIOP- Affection for the subject	0.427**	0.297**	0.406**	-0.148*	0.009	-0.075	-0.104	0.090	0.083	-0.089	0.145*	-0.131⁺
TIOP- Endowed professional meaningfulness	0.346**	0.251**	0.327**	-0.096	-0.046	-0.089	-0.087	0.069	0.050	0.018	0.085	-0.077
SE1: Self-efficacy for instruction		0.679**	0.876**	-0.019	0.071	0.032	0.136⁺	0.158*	0.118⁺	-0.181*	-0.005	-0.047
SE2: Self-efficacy for classroom management			0.473**	0.069	0.211*	0.125	0.170*	0.157⁺	0.100	-0.218*	0.034	-0.013
SE3: Self-efficacy for student engagement				-0.021	0.081	-0.012	0.100	0.153*	0.084	-0.185*	-0.010	-0.067
TB1: Stimulating Learning Climate					0.315**	0.529**	0.404**	0.142	0.174*	-0.046	0.012	0.187⁺
TB2: Classroom Management						0.590**	0.347**	0.349**	0.125	0.194⁺	-0.039	0.125
TB3: Instructional Clarity							0.717**	0.448**	0.430**	0.022	0.025	0.179⁺
TB4: Activating Teaching								0.594**	0.584**	-0.066	-0.013	0.186⁺
TB5: Differentiated Instruction									0.577**	0.103	0.016	0.076
TB6: Teaching Learning Strategies										-0.159	0.055	0.057
Wave 3												
TIOP- Affection for teaching	0.489**	0.413**	0.499**	0.134⁺	0.046	0.183*	0.167*	0.187*	0.127	-0.042	0.134*	-0.107
TIOP- Affection for the subject	0.459**	0.346**	0.480**	0.143*	0.053	0.149⁺	0.126	0.130	0.099	-0.074	0.154*	-0.102
TIOP- Endowed professional meaningfulness	0.461**	0.368**	0.485**	0.159*	0.042	0.164*	0.140⁺	0.090	0.082	-0.041	0.164*	-0.144⁺

(continued on next page)

Table 3 (continued)

	SE1	SE2	SE3	TB1	TB2	TB3	TB4	TB5	TB6	Gender	Age	Qualification
SE1: Self-efficacy for instruction		0.702**	0.965**	0.211*	0.140⁺	0.203*	0.243*	0.296*	0.187*	-0.189*	0.000	-0.055
SE2: Self-efficacy for classroom management			0.683**	0.235*	0.223*	0.246*	0.180*	0.219*	0.180*	-0.180*	0.055	-0.001
SE3: Self-efficacy for student engagement				0.203*	0.090	0.192*	0.200*	0.243*	0.173*	-0.202*	0.020	-0.072
TB1: Stimulating Learning Climate					0.586**	0.677**	0.469**	0.308*	0.335**	0.110	0.039	-0.041
TB2: Classroom Management						0.690**	0.469**	0.384**	0.319*	0.146	-0.017	0.121
TB3: Instructional Clarity							0.688**	0.473**	0.448**	0.251*	-0.156⁺	0.080
TB4: Activating Teaching								0.631**	0.608**	0.210⁺	-0.046	0.164
TB5: Differentiated Instruction									0.554**	0.218⁺	-0.057	0.517**
TB6: Teaching Learning Strategies										0.073	0.106	0.082

⁺ $p < .10$.
^{*} $p < .05$.
^{**} $p < .001$.

Table 4
 Fit indices and model comparisons for estimated latent profile analysis models.

N. Profiles	Log-likelihood	AIC	BIC	SABIC	LMR (p)	Adjusted LRT (p)	Entropy	Proportions of membership
Wave 1								
2	-2505.776	5049.553	5118.202	5057.958	0.000	0.000	0.846	0.58; 0.42
3	-2445.069	4942.138	5036.079	4953.639	0.042	0.045	0.871	0.11; 0.54; 0.35
4	-2372.945	4811.890	4931.123	4826.487	0.023	0.025	0.904	0.14; 0.32; 0.53; 0.02
5	-2319.863	4719.726	4864.251	4737.420	0.061	0.065	0.865	0.13; 0.32; 0.20; 0.32; 0.02
Wave 2								
2	-2398.557	4835.115	4903.764	4843.519	0.000	0.000	0.834	0.57; 0.43
3	-2322.303	4696.605	4790.547	4708.106	0.147	0.154	0.840	0.19; 0.54; 0.28
4	-2264.421	4594.842	4714.075	4609.439	0.111	0.116	0.828	0.18; 0.39; 0.22; 0.22
5	-2220.281	4520.562	4665.087	4538.256	0.241	0.250	0.849	0.05; 0.22; 0.14; 0.37; 0.22
Wave 3								
2	-2497.612	5033.224	5101.873	5041.628	0.001	0.001	0.858	0.54; 0.46
3	-2386.552	4825.104	4919.045	4836.605	0.432	0.438	0.867	0.19; 0.52; 0.29
4	-2290.955	4647.910	4767.143	4662.508	0.125	0.129	0.896	0.08; 0.38; 0.18; 0.36
5	-2237.161	4554.321	4698.847	4572.015	0.327	0.333	0.877	0.08; 0.30; 0.18; 0.27; 0.17

Note. Significant p values (<0.05) are in bold.
 Membership proportions lower than 5 % are in grey.

small number of teachers (4.4 %) who started with lower intrinsic orientations at career-entry but gradually progressed to the more desirable High Profile after two years of teaching. Considering the nature of these pathways and their marginal proportions, they can be further classified as either Progressive (Progressing and High pathways) or Regressive pathways (Maladaptive and Low pathways).

5.4. Orientation profiles and developmental pathways and effective teaching behaviour

5.4.1. Cross-sectional associations (Research question 3)

The ANOVA tests revealed non-significant differences in all domains effective teaching behaviour between two static profiles ($p > .10$), with the exception of three domains at Time point 3. Specifically, teachers in the High Profile demonstrated significantly higher levels of Stimulating teaching ($F(1, 117) = [4.13], p = .044, \Delta = 0.17$) and Instructional clarity ($F(1, 117) = [4.82], p = .030, \Delta = 0.20$). In addition, the levels of their Activating teaching was also marginally significantly higher than

Table 5
Unstandardized means of profile indicators across profiles and waves.

	Wave 1	Wave 2	Wave 3	Model label/ interpretation
Profile 1				
TIOP- Affection for teaching	-1.04	-1.03	-1.49	Low profile Very low
TIOP- Affection for the subject matter	-1.48	-1.37	-2.25	Very low
TIOP- Endowed value for the profession	-0.29	-0.27	-0.45	Low
Self-efficacy for instruction	-0.34	-0.24	-0.11	Low
Self-efficacy for classroom management	-0.96	-0.64	-0.23	Very low
Self-efficacy for student engagement	-0.40	-0.42	-0.43	Low
Profile 2				
TIOP- Affection for teaching	1.55	1.61	1.65	High profile Very high
TIOP- Affection for the subject matter	2.28	2.22	2.50	Very high
TIOP- Endowed value for the profession	0.45	0.47	0.47	High
Self-efficacy for instruction	0.51	0.54	0.70	High
Self-efficacy for classroom management	1.35	1.33	1.65	Very high
Self-efficacy for student engagement	0.61	0.50	0.59	High

the *Low Profile* ($F(1, 117) = [3.81], p = .053, \Delta = 0.30$).

5.4.2. Longitudinal relationships (Research question 4)

The results of HLM revealed that all domains of effective teaching behaviour exhibited predominantly linear growth trajectories rather than quadratic or other non-linear forms (see Appendix D). In general, more complex domains demonstrated larger slopes of growth ($\beta = 0.141-0.146, p < .001$). Regarding the time-varying static profiles of intrinsic orientations, the results indicated positive associations only with the levels of teachers' abilities to establish a Safe and stimulating learning climate ($\beta = 0.102, p = .069$) and implement Differentiated instruction ($\beta = 0.168, p = .061$), while no significant associations were observed with other domains (see Table 8). Regarding the developmental pathways of teachers' intrinsic orientation profiles, a marginal positive effect was found on the growth of Differentiated instruction ($\beta = 0.086, p = .062$), but no significant effects were observed on other domains (see Table 9). Moreover, no statistically significant effects were found concerning teacher qualification. However, teachers' age exhibited a negative association with the growth of relatively more basic domains of effective teaching behaviour.

6. Conclusion and discussion

The present study endeavors to contribute to the extant knowledge regarding teachers' intrinsic motivational-affective attributes by employing an integrative approach. In particular, the investigation centers on an in-depth exploration of the intricate interplay between BTs' intrinsic orientations towards the teaching profession and their profession-related selves. The primary objective is to elucidate how this complex interplay can potentially influence and contribute to the development of teachers' effective teaching behaviour over the course of time.

6.1. Teachers' intrinsic orientation profiles

This study identified two distinct profiles of BTs' intrinsic orientations (Low Profile and High Profile). These profiles exhibited remarkable stability over the first two years of the teachers' careers. Notably, the two profiles exhibited significant quantitative differences across all six

indicators, which aligns with previous research indicating the presence of profiles with varying levels of all profile indicators, such as the low, moderate, and high profiles (Hartl & Holzberger, 2022; Rodríguez et al., 2014), or following the continuum hypotheses, which categorize individuals as autonomous, strongly motivated, poorly motivated, or controlled (Gillet et al., 2017). This finding confirms the interconnectedness of intrinsic motivational-affective factors, a pattern observed in both variable-oriented studies (e.g., Neves de Jesus & Lens, 2005) and person-oriented investigations (e.g., Thommen et al., 2021). Additionally, the results are partially consistent with prior research that revealed qualitatively distinct profiles (e.g., Keller et al., 2018; Kunst et al., 2018; Thommen et al., 2021; Watt et al., 2021). Among the orientation indicators, the differentiation between the two profiles was most pronounced in teachers' positive feelings for the subject, followed by positive feelings for teaching and self-efficacy for classroom management. These findings contribute to a more comprehensive understanding of the nuanced interrelations between teachers' intrinsic orientations.

6.2. Developmental pathways of the orientation profiles

Four developmental pathways of BTs' intrinsic orientations were identified, with a majority of teachers following the two pathways demonstrating high degrees of profile stability (Low and High Pathways) in our sample. This finding corresponds with the high consistency coefficients of TIOP found in Feng et al. (2021) and the absent longitudinal change of self-efficacy in Künsting et al. (2016), indicating that teachers' intrinsic orientations are rather stable over time. However, the presence of two additional pathways (Maladaptive and Progressing) also discloses a modest degree of plasticity in teachers' intrinsic orientations. This finding is, to some extent, in line with Richardson and Watt's (2018) claim regarding the dynamic reshaping process of teachers' motivational factors during their professional practices and social interactions. The predominance of BTs with highly stable pathways underscores the importance of building desirable intrinsic orientations before entering the teaching profession. At the same time, the existence of fluctuating pathways denotes room for improvement for teachers who have not yet established desirable career-entry orientation profiles as well as the possibility of regression for teachers with initial signs of progression. Considering the nature of all four pathways, they were further classified into the desirable progressive pathways and undesirable regressive pathways. The outnumbering of undesirable over desirable pathways to come extent reflects the prevalence of reality shock among BTs.

6.3. Cross-sectional associations between orientation profiles and effective teaching behaviour

The present study revealed that there were no significant between-profile differences in effective teaching behaviour observed at the beginning or conclusion of the first year of teachers' careers. This suggests that BTs' intrinsic orientations exhibit limited immediate alignment with their levels of effective teaching at the initial stage of the careers. However, at the end of the second year, teachers in the High Profile demonstrated higher levels of Stimulating learning climate, Instructional clarity, and Activating teaching, while no significant differences were observed in the other domains. The observed variation over time implies that with the accumulation of teaching experience, BTs' foundational teaching behaviours gradually align more closely with their intrinsic professional orientations. The transformation of such intrinsic orientations into exhibited effective teaching requires sustained resilience from BTs, rather than relying solely on the "idealism" they bring from their teacher education and student experiences. To consistently maintain high levels of complex and student-centered teaching behaviours, such as Differentiated instruction and Teaching learning strategies, BTs may need to enhance both their intrinsic professional orientations and their professional knowledge and skills (Bromme, 2008), thereby expanding their capacity to meet continuous challenges

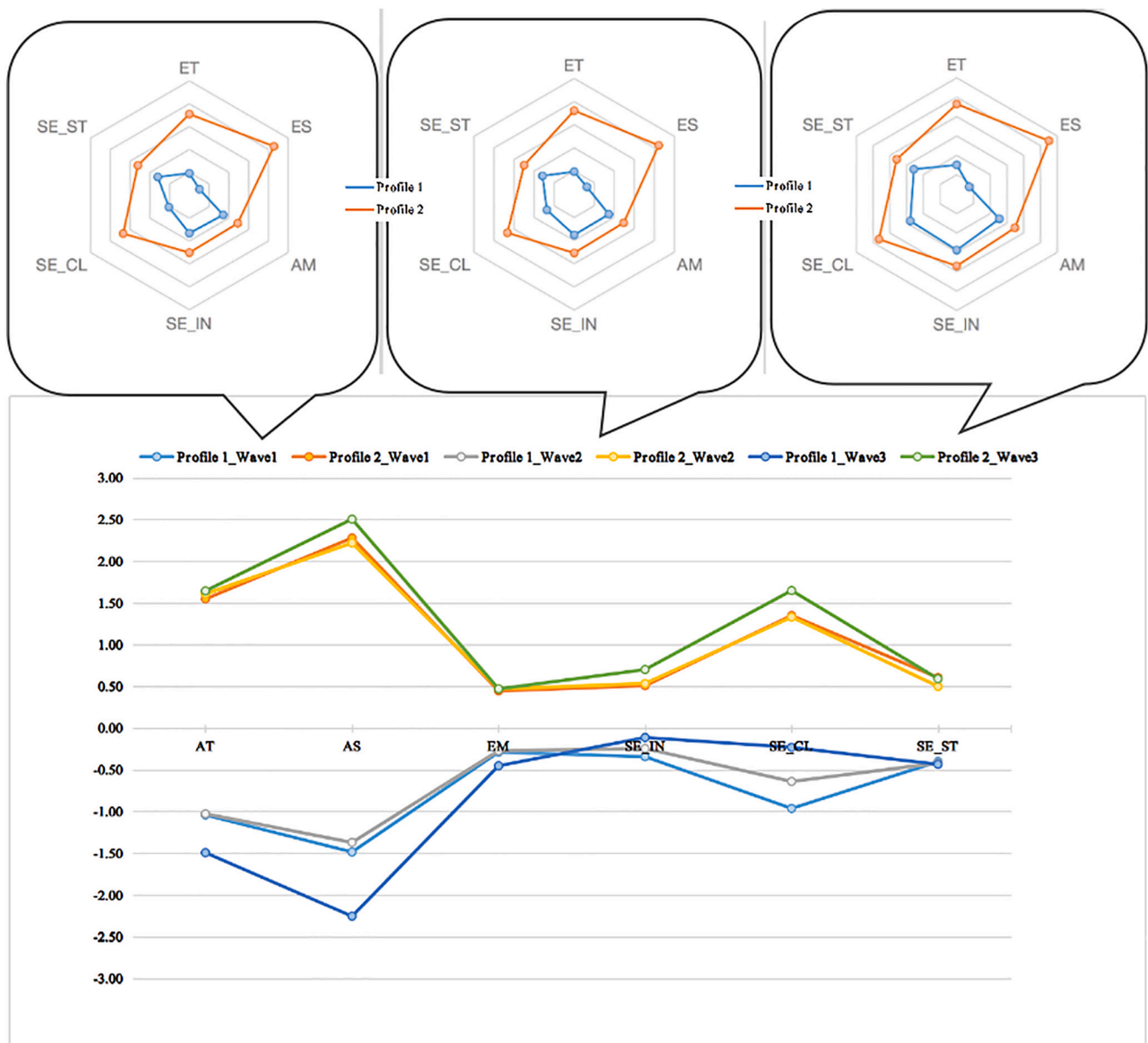


Fig. 3. Comparisons of profile indicators means across two profiles.
 Notes. AT = Affection for teaching; AS = Affection for the subject; AM = Endowed professional meaningfulness; SE_IN = Self-efficacy for instruction; SE_CL = Self-efficacy for classroom management; SE_ST = Self-efficacy for student engagement.

and rigorous demands in the classroom.

6.4. Dynamics between orientation profiles and developmental pathways and effective teaching behaviour

The findings regarding the relationship between static orientation profiles and only two domains of effective teaching behaviour (Safe and stimulating learning climate and Differentiated instruction) across three time points demonstrate partial alignment with previous research investigating the heterogeneous effects of teachers' motivational-affective characteristics on specific facets of effective teaching (e.g., Feng et al., 2023; Kunter et al., 2013; Zee & Koomen, 2016). In general, this finding can be interpreted from multiple angles. Firstly, High Profile teachers may exhibit a stronger sense of purpose and dedication to their profession, leading to a deeper understanding of the importance of their roles as teachers. Consequently, they tend to be more dedicated to their students' growth and well-being (Dörnyei & Ushioda, 2011), creating a safe and supportive classroom climate that goes beyond their regular

teaching duties. These teachers are more likely to demonstrate greater empathy and understanding of students' diverse backgrounds and needs, fostering an inclusive space where students feel valued and respected. Secondly, High Profile teachers may experience heightened enthusiasm and engagement in their profession. Their enthusiasm for teaching cultivates a positive, dynamic, and engaging classroom atmosphere (Fauth et al., 2019). Additionally, their positive emotional connection to the subject matter contributes to a deeper comprehension and appreciation of the content they teach (Kunter et al., 2008). This enables them to approach teaching with both passion and expertise, facilitating their ability to adapt instructional content and materials to address individual differences in students' readiness levels, interests, and learning profiles. Thirdly, High Profile teachers tend to exhibit more confidence in designing and delivering effective instructional strategies that actively engage students in the learning process. This belief empowers them to create engaging and meaningful learning experiences for their students. They are more likely to use diverse and innovative teaching methods (Ghaith & Yaghi, 1997) and persist with challenging

Table 6
Unstandardized indicators means across profiles in the partial structural similarity model.

	Latent means		Model label/ interpretation
Profile 1 (55.8 %–60.2 %)	Wave 1–2	Wave 3	Low profile
Enthusiasm for teaching	–1.03	–1.53	Very low
Enthusiasm for subject	–1.42	–2.31	Very low
Autonomous motivation	–0.28	–0.46	Slightly low
Self-efficacy for instruction	–0.24		Slightly low
Self-efficacy for classroom management	–0.79	–0.25	Low
Self-efficacy for student engagement	–0.42		Slightly low
Profile 2 (39.8 %–44.2 %)	Wave 1–3		High profile
Enthusiasm for teaching	1.59		Very high
Enthusiasm for subject	2.31		Very high
Autonomous motivation	0.46		Slightly high
Self-efficacy for instruction	0.58		Slightly high
Self-efficacy for classroom management	1.46		High
Self-efficacy for student engagement	0.56		Slightly high

strategies (Hani et al., 1996; Wolters & Daugherty, 2007) that cater to various learning styles and preferences, leading to increased student interest and active participation. Their strong sense of control over classroom dynamics fosters a sense of safety and security among students, encouraging them to freely engage in academic activities without fear of disruptions or negative peer interactions.

The discovery of the positive influence of progressive pathways of

orientation profiles on the growth of BTs’ Differentiated instruction can also be interpreted from several perspectives. Differentiated instruction necessitates teachers to adapt their instructional approaches effectively to cater to individual student differences (Smale-Jacobse et al., 2019). Consequently, teachers following progressive pathways, characterized by a strong sense of responsibility to meet the diverse needs of their students, align well with the philosophy of Differentiated instruction. Their high professional meaningfulness and unwavering commitment to creating a positive learning experience drive them to prioritize Differentiated instruction during the early stages of their careers. Moreover, teachers with high intrinsic motivation and positive feelings towards teaching may perceive the intricacies of implementing Differentiated instruction as invigorating rather than overwhelming. Their belief in self-efficacy for teaching may encourages them to embrace challenges as opportunities for growth, resulting in a more proactive adoption and exploration of Differentiated instructional practices.

In interpreting the study findings, it is also crucial to recognize that the absence of significant associations between static orientation profiles and their developmental pathways and other domains of effective teaching behaviour does not imply a lack of influence of intrinsic orientations on these domains. Effective teaching behaviour constitutes a multifaceted and intricate construct, shaped by numerous factors encompassing teachers’ pedagogical knowledge, teaching and learning beliefs, and situational contexts (Kunter, 2013). While intrinsic orientations undeniably exert a significant influence on the above two domains, their impact on other aspects of effective teaching behaviour may be influenced by some unmeasured or unobserved contextual and individual factors. Consequently, their relationships may not be straightforward and uniform, but rather contextually nuanced and contingent upon various factors. Moreover, other teaching behaviour domains, such as Classroom management, Instructional clarity, and Teaching learning

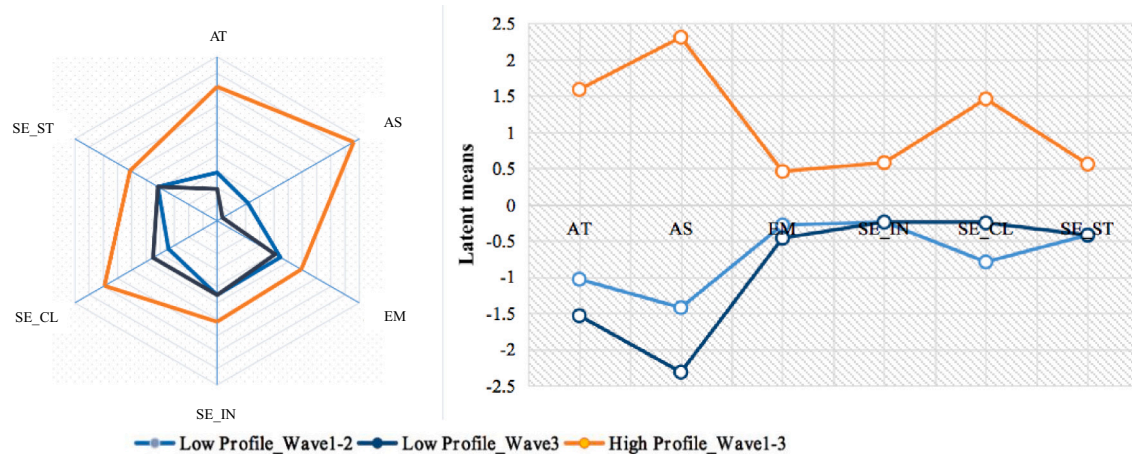


Fig. 4. Comparisons of profile indicators means in the structural similarity model.

Notes. AT = Affection for teaching; AS = Affection for the subject; AM = Endowed professional meaningfulness; SE_IN = Self-efficacy for instruction; SE_CL = Self-efficacy for classroom management; SE_ST = Self-efficacy for student engagement.

Table 7
Proportions of profile membership and transition between profiles over three waves.

LTA profile membership proportion		Latent transition probabilities (%)		Development Pathway			
Wave 1	N of members (%)	Wave 1 profiles (rows) by Wave 2 profiles (columns)		Categories	Pathway labels	Path	Prevalence (%)
Profile 1	162 (59.1 %)	Profile 1	Profile 2	Regressive	Low Pathway	1-1-1	150 (54.7 %)
Profile 2	112 (40.9 %)	Profile 1	0.8 %		Maladaptive Pathway	2-1-1	3 (1.1 %)
Wave 2		Profile 2	96.7 %	Progressive	Progressing Pathway	1-1-2	12 (4.4 %)
Profile 1	165 (60.2 %)	Wave 2 profiles (rows) by Wave 3 profiles (columns)			High Pathway	2-2-2	109 (39.8 %)
Profile 2	109 (39.8 %)	Profile 1	Profile 2				
Wave 3		Profile 1	93.4 %				
Profile 1	153 (55.8 %)	Profile 2	6.6 %				
Profile 2	121 (44.2 %)	Profile 1	0.0 %				
		Profile 2	100 %				

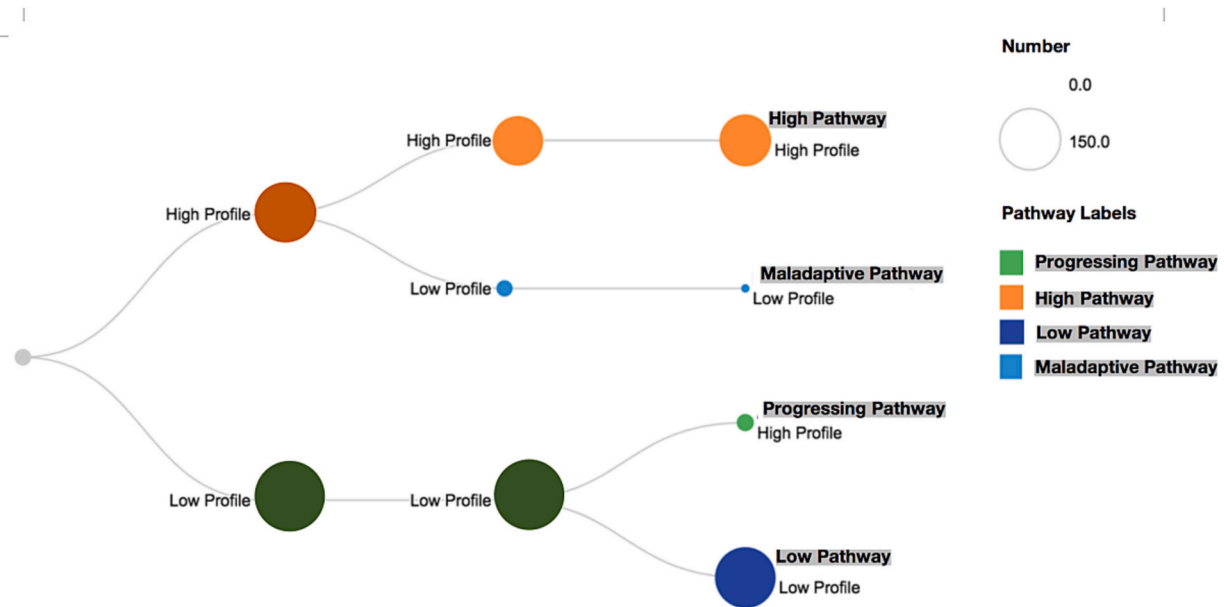


Fig. 5. Transition paths and prevalence of four developmental pathways.

Table 8
Hierarchical Linear Modeling results regarding the influence of static orientation profiles.

	TB1		TB2		TB3		TB4		TB5		TB6	
	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value
Fixed effect												
Intercept	3.542**	0.000	3.380**	0.000	3.333**	0.000	2.857**	0.000	1.990**	0.000	2.069**	0.000
Time	0.090**	0.001	0.106**	0.000	0.143**	0.000	0.146**	0.000	0.144**	0.000	0.141**	0.001
Qualification 1 (0 = certified, 1 = uncertified)	0.024	0.918	-0.165	0.557	-0.184	0.394	-0.178	0.487	-0.237	0.465	-0.307	0.391
Qualification 2 (0 = uncertified + certified > 2 yr)	0.059	0.784	0.014	0.266	0.088	0.152	0.070	0.320	-0.036	0.906	-0.238	0.486
Age	-0.011*	0.017	-0.010 ⁺	0.056	-0.010	0.015	-0.011*	0.029	-0.009	0.133	-0.004	0.545
Static profiles (0 = Low, 1 = High)	0.102 ⁺	0.069	0.068	0.300	0.088	0.152	0.070	0.320	0.168 ⁺	0.061	0.046	0.620
Gender (0 = female, 1 = male)	-0.009	0.763	-0.057 ⁺	0.094	-0.028	0.376	-0.039	0.271	-0.126**	0.008	-0.016	0.754
Random effect												
Individual	0.058		0.038		0.025		0.100		0.013		0.116	
Time	0.147		0.184		0.170		0.157		0.248		0.283	
Model fit												
LL	-273.642		-341.201		-313.019		-343.876		-437.900		-466.501	
AIC	575.284		710.401		654.038		715.752		903.799		961.001	
BIC	632.339		767.456		711.093		772.806		960.854		1018.056	

TB1 = Safe and stimulating learning climates, TB2 = Classroom management, TB3 = Instructional clarity, TB4 = Activating teaching, TB5 = Differentiating instruction, TB6 = Teaching learning strategies.

** $p < .001$.

* $p < .05$.

⁺ $p < .1$.

strategies, may necessitate an extended period to fully develop and demonstrate substantial growth over time. Conversely, the alignment of high professional meaningfulness, positive feelings, and self-efficacy with differentiated instruction may yield more immediate effects on this particular domain of behaviour. Although intrinsic orientations may also influence other domains of behaviour over time, their specific impact on Differentiated instruction is more pronounced during the critical period of BTs' professional development. As teachers amass experiential insights and expertise, their influence in alternative behaviour domains may gradually converge and demonstrate more substantial advancement, thus engendering a more equitably distributed influence of these motivational factors across multiple facets of effective

teaching behaviour. However, the observation of a negative effect of teachers' age on the growth of relatively fundamental teaching behaviour domains raises salient inquiries regarding some potential mitigating factors, such as reduced emphasis on professional development, resistance to change, and a perception of career stagnation along the trajectories of teachers' vocational paths, which may impede the realization of the beneficial effects of intrinsic motivational factors.

7. Implications

The present study holds significant theoretical implications within the realm of teacher motivation, identity, and professional development.

Table 9
Hierarchical Linear Modeling results regarding the influence of developmental pathways.

	TB1		TB2		TB3		TB4		TB5		TB6	
	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value
Fixed effect												
Intercept	3.567**	0.000	3.393**	0.000	3.351**	0.000	2.862**	0.000	2.143**	0.000	2.065**	0.000
Time	0.074**	0.009	0.095**	0.004	0.129**	0.000	0.140**	0.000	0.105*	0.014	0.130**	0.004
Qualification 1 (0 = certified, 1 = uncertified)	0.028	0.903	-0.164	0.561	-0.277	0.233	-0.299	0.272	-0.294	0.332	-0.300	0.390
Qualification 2 (0 = uncertified + certified > 2 yr)	0.057	0.894	-0.019	0.943	-0.184	0.392	-0.178	0.486	-0.129	0.655	-0.231	0.482
Age	-0.010*	0.022	-0.009 ⁺	0.069	-0.010*	0.019	-0.010*	0.037	-0.009	0.129	-0.004	0.576
Gender (0 = female, 1 = male)	-0.010	0.732	-0.058 ⁺	0.091	-0.029	0.361	-0.039	0.277	-0.126**	0.008	-0.018	0.722
Developmental pathways (0 = Regressive, 1 = Progressive)	0.044	0.107	0.030	0.361	0.038	0.213	0.017	0.620	0.086 ⁺	0.062	0.031	0.527
Random effect												
Individual	0.057		0.040		0.029		0.105		0.070		0.114	
Time	0.147		0.185		0.170		0.158		0.255		0.283	
Model fit												
LL	-273.972		-341.247		-313.211		-344.224		-440.241		-466.344	
AIC	626.924		708.494		652.422		714.448		906.482		958.688	
BIC	585.669		761.219		705.401		767.427		959.461		1011.668	

TB1 = Safe and stimulating learning climates, TB2 = Classroom management, TB3 = Instructional clarity, TB4 = Activating teaching, TB5 = Differentiating instruction, TB6 = Teaching learning strategies.

** $p < .001$.
* $p < .05$.
⁺ $p < .1$.

The adoption of a person-centered approach, wherein several conceptually exclusive components of teachers’ intrinsic orientations were considered, contributes to the theoretical understanding of these constructs. Through the identification of quantitatively distinct orientation profiles among BTs, the study reinforces the interconnected nature of teachers’ intrinsic motivational-affective characteristics. Additionally, the recognition of stable and fluctuating developmental pathways sheds light on the dynamics of teachers’ motivational development during their early career years, providing further support for existing theories of teacher development. By unraveling the non-linear associations between BTs’ intrinsic orientations for the teaching profession and their profession-related selves and specific domains of effective teaching behaviour (development), the study emphasizes the significance of cultivating desirable intrinsic orientations before entering the teaching profession and advocates for sustained growth and improvement throughout teachers’ careers.

Furthermore, the present study bears notable practical implications for teacher education, professional development programs, and school leadership. Through the identification of distinct profiles and developmental pathways of BTs’ intrinsic orientations, the findings offer valuable guidance for devising targeted support strategies aimed at optimizing teachers’ overall commitment and dedication to the profession, while also alleviating any potential ambivalence they may have towards it. Specifically, teachers exhibiting characteristics of the High Profile, characterized by high professional meaningfulness, positive affect, and self-efficacy, can assume pivotal roles as role models and mentors, thereby facilitating the fostering of a stimulating and inclusive learning environment for their fellow BTs and students alike. Additionally, the presence of fluctuating pathways underscores the necessity for providing supplementary assistance and resources to BTs facing challenges in establishing desirable orientation profiles. School administrators and teacher educators can customize professional development initiatives to cultivate teachers’ intrinsic motivational factors, thereby promoting effective teaching behaviours such as Creating stimulating and safe learning climate and Differentiated instruction, which are considered essential for educational equity and inclusiveness.

Furthermore, comprehending the time frame for the relationships between intrinsic orientations and certain effective teaching behaviours enables the design of targeted interventions during the critical early stages of teachers’ careers. By actively addressing teachers’ intrinsic orientations and providing sustained support, educational institutions can cultivate a positive and sustainable teaching environment, ultimately benefiting both teachers and students alike.

8. Limitations and suggestions for future studies

The present study acknowledges several limitations, which, nevertheless, provide valuable directions for future investigations. Operationally, the study confines its examination to a limited range of intrinsic motivational-affective factors as representatives of the fundamental components of teachers’ intrinsic orientations. To advance the theoretical understanding, it is recommended that future studies incorporate a more comprehensive selection or adopt an inductive approach to validate the hypothesized TIOP framework. Moreover, the exclusive reliance on self-reports to assess teachers’ intrinsic orientations introduces potential concerns regarding common-method variance, social desirability, and self-assessment bias. To mitigate these issues, future research is advised to employ measurement triangulation, encompassing alternative perspectives such as student perception, peer evaluation, and workplace observation. Thirdly, the research scope is constrained to the intrinsic orientations of BTs. Assessing them at various career stages will provide a more comprehensive understanding of their dynamic interplay with effective teaching over time. Considering the inherent intricacy of these teacher characteristics, incorporating innovative methodologies, such as trace methods (e.g., eye-tracking, log-files, physiological data, screen recording), and discourse analysis alongside traditional approaches (e.g., retrospective interviews, document mining, observation) is recommended. Additionally, while the sample size of 274 teachers is deemed sufficient for a longitudinal mixed methods study, it remains relatively small given the number of parameters estimated in LPA and LTA models. The voluntary nature of participation in the research may introduce bias towards a positively selected group,

potentially excluding less motivated and efficacious teachers. To strengthen the robustness and generalizability of the study’s findings, it is suggested that replicated studies be conducted with more representative samples, particularly in regard to exploring the stability and applicability of the Maladaptive and Progressing pathways.

CRedit authorship contribution statement

Xiangyuan Feng: Conceived and designed the study, conducted data analysis, drafted the initial manuscript, and provided critical revisions to the manuscript.

Michelle Helms-Lorenz: Collected and processed the data, contributed to data interpretation, and provided critical revisions to the manuscript.

Mary Johnson: Collected and processed the data, contributed to data interpretation, and provided critical revisions to the manuscript.

All authors have reviewed and approved the submitted version of the manuscript and agree to be accountable for the accuracy and integrity of the work.

Declaration of competing interest

No potential conflict of interest was reported by the authors.

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Appendix A. Six domains of effective teaching behaviour

Category	Concepts	Definition	Good examples
Relatively basic behaviour <i>Teacher/task-centered</i>	Safe and stimulating learning climate	Aspects of teacher-student relationships such as creating a safe and relaxing classroom climate, showing respect to students and ensuring that students respect the teacher and their peers, and encouraging self-confidence of students.	<ul style="list-style-type: none"> • Respect for students; • Relaxed atmosphere; • Promotion of confidence; • Mutual respect
	Classroom management	Teaching practices ensuring that the lesson begins and ends on time, managing lesson transition efficiently, minimizing time for task-unrelated matters, dealing with students’ misbehaviour efficiently, preparing the lesson well, and managing an efficient lesson structure.	<ul style="list-style-type: none"> • Orderly conduct of the lesson; • Proper completion of assignments; • Expedient classroom management; • Efficient use of learning time
	Instructional clarity	Aspects of instructional quality that are important for students’ learning such as clear lesson structure, good interchange of explanations and lesson presentations, management of independent work, and clear assignment of individual and group works.	<ul style="list-style-type: none"> • Clear explanation of the study material; • Giving feedback to the students; • Involving all students in the lesson; • Checking whether the assignments are understood; • Stimulating students to do their best • Well-structured teaching; • Explaining the use of didactic tools and instructions
Relatively advanced behaviour <i>Student-centered</i>	Activating teaching	Teaching practices that optimize learning outcomes such as promotion of active learning, intensification of instructions, avoiding excessive work seats, activation of prior knowledge, making use of “advance organizers”, and making sure that pupils are aware of the relevance of the lesson content.	<ul style="list-style-type: none"> • Using activating working methods; • Stimulating the self-confidence of weak students; • Stimulating students to think about solutions; • Asking questions to activate their thinking; • Having students think out loud; • Providing interactive instruction comparing lesson goals
	Differentiated instruction	Teachers recognize and effectively address variance in students’ readiness levels, interests, and learning profile preferences to maximize the learning potential of each student;	<ul style="list-style-type: none"> • Checking whether the goals of a lesson are being achieved; • Offering weak students extra study and instruction time; • Adjusting the instruction to differences between students; • Adjusting the processing of study material to the differences between students;
	Teaching learning strategies	Heuristics that serve to support students’ metacognitive learning skills, facilitating the development of internal procedures that enable them to perform higher-level learning;	<ul style="list-style-type: none"> • Simplifying complex problems; • Stimulating the use of control activities; • Teaching students to check their solutions; • Promoting the application of that which has been learned; • Encouraging critical thinking; • Letting students think about strategies by approach;

Note. This is an adaptation of the original introduction provided by *anonymized website name*. Please refer to the website for more details about the effective teaching behaviour domains.

Appendix B. Scales measuring the motivational-affective profile indicators

Sub-scales		Items
TIOP	Positive feelings for teaching	01. I teach [this subject] with great enthusiasm.
		02. I always enjoy teaching students new things.
		03. I enjoy interacting with students.
		04. It's a pleasure to teach.
	Positive feelings for the subject	05. I find my subject exciting and try to convey my enthusiasm to the students.
		06. Engaging in my subject is one of my favorite activities.
		07. I engage in my subject because I enjoy it.
	Endowed professional meaningfulness	08. Because engaging in my subject is fun, I wouldn't want to give it up.
		09. ... because through this work I can achieve my career goals.
		10. ... because I think it is important for the academic success of my students
		11. ... because work with interesting challenges gives me satisfaction.
Teacher self-efficacy	Instruction	01. To what extent can you use a variety of assessment strategies?
		02. To what extent can you provide an alternative explanation or example when students are confused?
		03. To what extent can you craft good questions for your students?
		04. How well can you implement alternative strategies in your classroom?
		05. How well can you respond to difficult questions from your students?
		06. How much can you do to adjust your lessons to the proper level for individual students?
		07. To what extent can you gauge student comprehension of what you have taught?
		08. How well can you provide appropriate challenges for very capable students?
	Classroom management	01. How much can you do to control disruptive behaviour in the classroom?
		02. How much can you do to get children to follow classroom rules?
		03. How much can you do to calm a student who is disruptive or noisy?
		04. How well can you establish a classroom management system with each group of students?
		05. How well can you keep a few problem students from ruining an entire lesson?
		06. How well can you respond to defiant students?
		07. To what extent can you make your expectation clear about student behaviour?
		08. How well can you establish routines to keep activities running smoothly?
	Student engagement	01. How much can you do to get students to believe they can do well in schoolwork?
		02. How much can you do to help your students' value learning?
		03. How much can you do to motivate students who show low interest in schoolwork?
		04. How much can you assist families in helping their children do well in school?
		05. How much can you do to help your students think critically?
		06. How much can you do to foster student creativity?
		07. How much can you do to get through to the most difficult students?
		08. How much can you do to improve the understanding of a student who is failing?

Appendix C. Means and standard deviations of six effective teaching behaviour domains

Effective teaching behaviour domains	Time point 1		Time point 2		Time point 3	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Safe and stimulating learning climate	3.383	0.521	3.558	0.416	3.592	0.474
Classroom management	3.160	0.578	3.342	0.531	3.410	0.564
Instructional clarity	2.996	0.554	3.147	0.536	3.281	0.497
Activating teaching	2.485	0.590	2.715	0.590	2.754	0.625
Differentiated instruction	1.813	0.676	2.035	0.791	2.044	0.852
Teaching learning strategies	1.811	0.688	2.143	0.825	2.109	0.857

Appendix D. Hierarchical linear modeling results

	TB1				TB2				TB3			
	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value
Fixed effect												
Intercept	3.280**	0.000	3.217**	0.000	3.067**	0.000	3.011**	0.000	2.848**	0.000	2.910**	0.000
Time	0.112**	0.000	0.191	0.187	0.112**	0.000	0.183	0.316	0.143**	0.000	0.068*	0.672
Time ²			-0.021	0.574			-0.018	0.692			0.019	0.646
Random effect												
Individual	0.312		0.254		0.250		0.237		0.331		0.230	
Time	0.113		0.106		0.168		0.168		0.132		0.128	
Model fit												
LL	-295.772		-293.867		-369.974		-369.269		-342.839		-342.305	
AIC	603.545		605.735		751.949		757.269		722.478		739.505	
BIC	609.303		642.935		776.749		794.906		703.436		710.942	

	TB4				TB5				TB6			
	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value
Fixed effect												
Intercept	2.351**	0.000	2.219**	0.000	1.726**	0.000	1.594**	0.000	1.698**	0.000	1.514**	0.000
Time	0.147**	0.000	0.314 ⁺	0.061	0.121**	0.001	0.289	0.193	0.157**	0.000	0.392	0.115
Time ²			-0.043	0.311			-0.044	0.437			-0.061	0.335
Random effect												
Individual	0.273		0.242		0.281		0.218		0.090		0.127	
Time	0.139		0.137		0.243		0.232		0.313		0.293	
Model fit												
LL	-378.119		-376.928		-489.941		-488.450		-503.417		-500.984	
AIC	768.238		771.857		991.882		994.900		1018.834		1019.968	
BIC	793.038		809.057		1016.682		1032.101		1043.634		1057.169	

TB1 = Safe and stimulating learning climates, TB2 = Slassroom management, TB3 = Snstructional clarity, TB4 = Sctivating teaching, TB5 = Sifferentiating instruction, TB6 = Seaching learning strategies.

** p < .001.
 * p < .05.
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