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## Student teachers' participation in learning activities and effective teaching behaviours

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Teacher learning is essential to the teaching profession, because it has been strongly linked to improved teaching practices and teacher quality. The source for teacher learning is initial teacher education, a crucial phase in the learning-to-teach continuum. To gain insight into this influential period for student teachers' long-term professional lives, this exploratory study investigates student teachers' participation in learning activities and explores whether it is connected to their own effective teaching behaviours in a school-based teacher education setting for secondary education in the Netherlands. The results indicate that student teachers vary in their self-reported learning and that this learning relates positively to observations of their effective teaching behaviour. These findings have several implications for teacher education programmes that aim to enhance the likelihood that their student teachers will become career-long learning professionals.

**Keywords:** student teachers; teacher learning; teacher effectiveness

Teacher learning offers an important means to increase teacher effectiveness and improve the quality of teaching practices and student learning, thus making it an essential and integral part of the teaching profession (Beijaard, Korthagen, and Verloop 2007; Day 1999; Feiman-Nemser 2001; Verloop 2003). Teacher learning entails a self-directed, active, career-long process during which teachers engage in various formal and informal learning activities, on and off the job, in line with their professional goals to adjust their knowledge, beliefs and/or teaching practices (Bakkenes, Vermunt, and Wubbels 2010; Beijaard 2009; Feiman-Nemser 2001; Webster-Wright 2009). Specific important learning activities for teachers include (1) the development and updating of knowledge and skills, (2) reflection on teaching experiences and (3) collaboration with colleagues (Schraw 1998; Timperley et al. 2007; Verloop 2003).

Over the past 20 years, teacher learning increasingly has been viewed as a continuum (Feiman-Nemser 2001), typically represented by 'the 3Is': it begins with initial teacher education (year 1), continues to induction (years 2 and 3) and culminates with in-service learning during the remaining years of an educator's teaching career (Conway et al. 2009). Although teachers' tasks, roles and learning needs will differ at various stages as they learn to teach over time (Hargreaves and Fullan 2012; Richter et al. 2014), these phases are related, and threads of continuity, among

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other things, form the learning activities of development and updating, reflection and collaboration (Buitink and Beijaard 2007; Feiman-Nemser 2001).

The first, relatively short stage of the learning continuum is often viewed as crucial because it is the most influential for student teachers' professional development (Conway et al. 2009; Endedijk et al. 2012). During initial teacher education, student teachers are likely to determine whether they want to engage in learning, and it is during this stage that they develop their personalised pattern of teacher learning (Buitink and Beijaard 2007; Eraut 1994; Hammerness et al. 2005). We therefore assume that student teachers in initial education who engage in the learning activities of development and updating, reflection and collaboration are more likely to pursue these activities in subsequent stages of the learning-to-teach continuum and consequently are more likely to become career-long learning teachers.

In the Netherlands, however, not all teachers are career-long learning professionals. Because in-service learning is an optional professional duty (Scheerens 2010), experienced Dutch teachers vary widely in the extent to which they participate in learning activities (Bakkenes, Vermunt, and Wubbels 2010; Diepstraten et al. 2011; Vogels 2009; de Vries, Jansen, and Van de Grift 2013). In particular, experienced teachers seem to engage relatively less often in reflective activities than in activities that involve updating knowledge and skills or collaborating with colleagues (Dijkstra 2009; Kwakman 2003; Van Eekelen 2005; de Vries, Jansen, and Van de Grift 2013). Furthermore, different teacher profiles seem to exist reflecting varying levels of participation in the three learning activities (de Vries, Jansen, and Van de Grift 2013). This study addresses this tendency among Dutch student teachers in school-based teacher education programmes, in an effort to determine the extent to which they develop their knowledge and skills, reflect on their own teaching experiences and collaborate with colleagues, which should establish a foundation for the rest of their working lives. Although student teacher learning has been the subject of several studies (Endedijk et al. 2012; Hagger et al. 2008; Mansvelder-Longayroux, Beijaard, and Verloop 2007; Oosterheert and Vermunt 2001), none has specifically addressed student teachers' participation in career-long learning activities. Accordingly, the first goal of this exploratory study was to identify student teachers' actual participation in learning activities that are important for career-long learning.

The importance of teacher learning is evidenced in its connection with improved teaching practices, teacher quality and student learning quality. For experienced teachers, there is an increasing body of research on the main features of teacher learning associated with improved teaching practices and learning outcomes for students (e.g. Bransford, Brown, and Cocking 2000; Darling-Hammond et al. 2009; Desimone 2009; Timperley et al. 2007; Van Veen et al. 2010), yet no research has considered whether this relationship between learning and teaching practice differs for student teachers. Therefore, the second goal of this exploratory study was to obtain information about student teachers' participation in learning activities in relation to their teaching behaviours.

A good understanding of student teachers' participation in learning activities and its relation to their teaching behaviours will give us insight into this crucial, brief, initial teaching stage, during which teachers should establish a pattern of active career-long learning to develop and refine their teaching practices over time (Endedijk et al. 2012; Eraut 1994; Hammerness et al. 2005).

### Teacher learning

In the 1980s, largely because of changing economic, social and educational developments around the world, teachers began to be expected to learn over the course of their careers (Beijaard, Korthagen, and Verloop 2007; Hargreaves 2000). Previously, the dominating view was that of an autonomous, teaching-oriented professional who makes his or her own decisions about the curriculum, teaching, learning, assessment and personal professional development. Teachers then had the choice of being 'restricted' or 'extended' professionals (Hoyle 1980; restricted indicates thoughts and practices that are largely intuitive and classroom based; extended takes into account a broader educational context and wider range of professional activities). In contrast, contemporary teachers are expected to be learning-oriented 'adaptive experts', able to teach increasingly diverse learners; knowledgeable about new understandings and conceptualisations of learning, knowledge, curriculum and assessment; competent in complex core academic content; and skilful in the craft of teaching (Vermunt and Verloop 1999; Wei et al. 2009). The knowledge, skills and attitudes required for this complex teaching profession cannot be developed fully in pre-service education programmes (Feiman-Nemser 2001; Hammerness et al. 2005), so career-long learning is expected of all teaching professionals (Day and Sachs 2004).

Research on teacher learning has identified several characteristics associated with improved teacher quality and student learning outcomes (e.g. Bransford, Brown, and Cocking 2000; Darling-Hammond et al. 2009; Desimone 2009; Timperley et al. 2007; Van Veen et al. 2010). At the school level, general principles require that teacher learning should be sustained and coherent with the needs, concerns and interests of both individual teachers and the school and be supported by organisational conditions, such as leadership and a school learning culture. At the individual level, teacher learning should focus on content and instruction involving applicable materials and pedagogy; relate directly to student learning and learning outcomes and require active and inquiry-based learning (e.g. observing and receiving feedback, analysing student work) together with collaboration and collegiality (e.g. sharing problems, setting common goals, using instructional planning). These individual-level characteristics correspond with important adult learning principles such as reflecting on practical experiences and interacting and collaborating with others (Bolhuis 2004, 2009; Eraut 1994; Gravani 2012; Merriam 2008). To these key principles for adult learning, Bolhuis (2004, 2009) and Eraut (1994) add reading publications and studying theory. Although these three groups of learning activities are not exhaustive, they seem to encompass teachers' overt, observable learning activities (Vermunt and Endedijk 2011). We therefore consider developing and updating knowledge and skills, reflecting on experiences and collaborating with colleagues as important career-long learning activities for the whole continuum of teacher learning – not only for teachers in the induction and in-service phases but also for student teachers in initial teacher education.

As in many countries, initial teacher education in the Netherlands is provided by school-based teacher education programmes, increasingly organised as partnerships between colleges/universities and schools (Conway et al. 2009; OECD 2005). This applies to the role of schools in hosting teaching practice with an experienced teacher as mentor of the student teachers. Student teachers work (and are sometimes paid) as teachers in schools and continue their learning activities both in the schools and in their teacher education institute. Thus, the sources for learning are diverse

and include not only theory and literature offered through the institute but also the student teachers' own experiences during practice teaching at the school, as well as their interactions with a mentor, a school-based teacher educator and other colleagues at the practice school (Buitink and Beijaard 2007; Feiman-Nemser 2001). The three key learning activities (developing and updating knowledge and skills, reflecting on teaching experiences and collaborating with colleagues) are integral to school-based teacher education (Bolhuis 2004; Buitink and Beijaard 2007; Feiman-Nemser 2001).

First, with regard to the development of knowledge and skills, student teachers need to acquire a practical and theoretical knowledge base in the subject matter they teach, along with general pedagogical knowledge and pedagogical content knowledge (Verloop, Van Driel, and Meijer 2001). Student teachers' practical knowledge, which often is implicit (Zanting, Verloop, and Vermunt 2001), expands through experience and teaching practice. The development of their theoretical knowledge base also requires intentional activities, which in turn are conducive to other professional activities; for example, a sufficient theoretical knowledge base is necessary for meaningful reflection (Hagger and McIntyre 2006; Korthagen and Buitink 2010; Verloop 2001) and supports collaboration (Cheetham and Chivers 2001). We therefore consider reading (e.g. professional literature, textbook manuals, educational websites) and schooling (e.g. courses and training sessions in or outside the practice school and teacher education institute) as tactics for developing student teachers' knowledge and skills.

Second, reflective activities refer to professional tasks that require a specialised form of thinking to confront and clarify a puzzling or curious situation (Dewey 1933). Schön (1983) refers to such activities as reflection-on-action, because they entail a deliberate process to reconsider existing (implicit) knowledge, beliefs, possibilities, ideas and actions. In contrast, reflection-in-action implies a subconscious process that experts refine on the basis of their learning through experience, which initially may be difficult for student teachers (Korthagen and Buitink 2010). Reflection is a critical professional activity (Eraut 1994; Schön 1983) that helps student teachers 'see differently' and reframe a situation (Schön 1983), such that they might gain insights into how to better understand the situation and act on it (Korthagen, Loughran, and Russell 2006). The importance and value of reflection are such that it has been adopted as a foundation for many teacher education programmes (Loughran 2002). In this study, we focus on reflection-on-action, which is possible either individually (e.g. analysing samples of students' work, examining problems, observing the impact of instruction on students) or with colleagues and students, and it can include practical (individual or collaborative) research (Kallenberg et al. 2007; Ponte 2002).

Third, collaborative activities are essential for learning to teach; they take place both in the practice school with experienced teachers as colleagues and in the teaching institute with peers (Korthagen, Loughran, and Russell 2006). Collaborative learning with colleagues within and across schools is a highly effective form of learning (Bakkenes, Vermunt, and Wubbels 2010; Clement and Vandenberghe 2000) that also leads to improvements in both teaching and learning (Cordingley et al. 2005; Westheimer 2008). We distinguish two collaborative activities by student teachers (OECD 2009): exchange activities (e.g. discussing problems, exchanging instructional materials) and professional collaboration (e.g. developing educational materials, team teaching).

In summary, student teachers in school-based teacher education should take the initiative and actively pursue learning processes, thereby setting a foundation for their career-long learning (Buitink and Beijaard 2007) by participating in all three types of learning activities. We accordingly include all three activities as manifest factors of the latent construct of student teachers' learning in our theoretical model (Figure 1). However, just like experienced teachers, student teachers presumably vary in the extent to which they participate in each learning activity. To identify and specify differences in participation for experienced teachers, previous research has found teacher profiles that reflect different levels of participation in the three learning activities (de Vries, Jansen, and Van de Grift 2013). For student teachers, some relevant attempts to define student teacher types include Oosterheert, Vermunt and Denessen's (2002) study, in which they cite four learning orientations or patterns: 'survival', 'closed reproduction', 'closed meaning' and 'open meaning'. The first orientation is barely engaged in learning, whereas the latter uses all available sources to understand learning and teaching. Hagger et al. (2008) focus on learning from experience (comparable with 'reflection on teaching experiences') and find that whereas some student teachers' orientations towards the process of learning from experience can result in experiences that are potentially 'miseducative', others are happy to cast themselves in the role of learners. The latter orientation and the 'open meaning' orientation towards learning often are considered the most preferable orientations and essential in preparing for further professional development (Hagger et al. 2008; Oosterheert, Vermunt, and Denessen 2002). However, these previous studies pertain to the specific nature of student teacher learning or to only one learning activity (reflection on teaching experiences) and do not specifically address

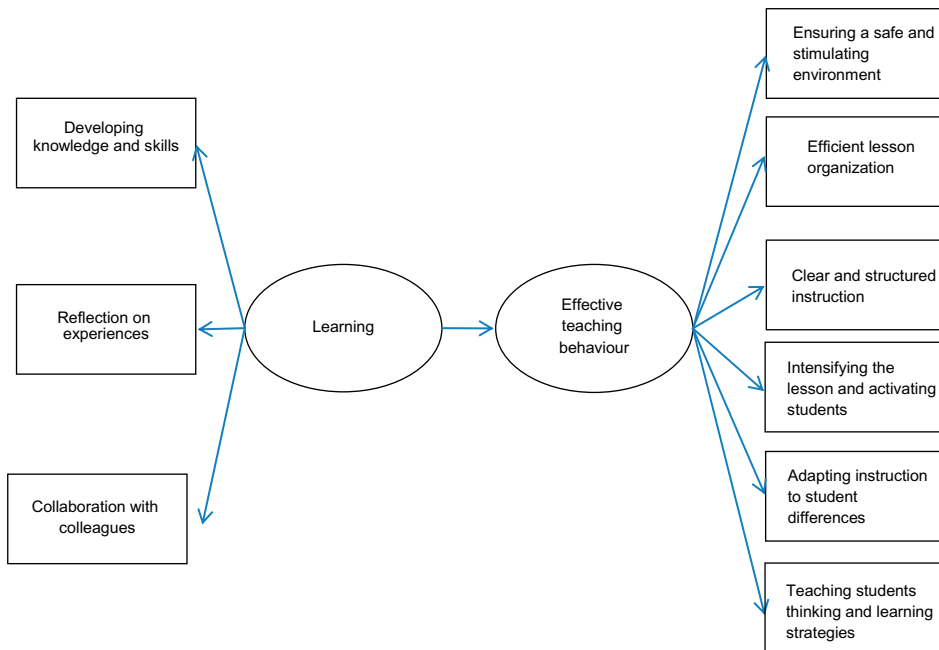


Figure 1. Theoretical model of learning and effective teaching behaviours.

student teachers' participation in several career-long learning activities. With this study, we examine student teacher profiles that reflect their participation in the three learning activities important for career-long learning.

### Effective teaching

A major argument for career-long teacher learning is its connection with the improvement of teaching practice. Teaching is a complex activity, in which at least three dimensions can be distinguished: the teacher as (1) instructional manager, (2) caring and moral person and (3) generous expert learner (Seifert 1999). The notion of the teacher as instructional manager is most visible and has received much attention. For example, in the past 40 years, it was the focus of much of the research on teacher effectiveness (e.g. Brophy and Good 1986). In this strand of research, effective teaching is successful inasmuch as identifiable and observable teacher behaviours lead to enhanced student achievement. However, effective teaching and good teaching should not be confused with one another (Fenstermacher and Richardson 2005). Effective teaching implies that students have learned; good teaching should involve morally defensible and rationally sound principles of instructional practice. Furthermore, Fenstermacher and Richardson (2005) argue that whether teaching is effective and good is not located solely in the teacher as individual but should be conjoined with contextual factors, such as student motivation and the presence of a supportive social environment. Against this background, we focus on the observable, effective behaviours of the teacher as an instructional manager.

For this instructional dimension of the teaching practice, consistently replicated findings from the teacher effectiveness research tradition confirm the importance of teachers' behaviours (e.g. Hattie 2009; Marzano 2008; Muijs et al. 2014; Scheerens and Bosker 1997; Seidel and Shavelson 2007; Wayne and Youngs 2003) and link student achievement to a business-like and supportive classroom climate, effective classroom management, the provision of structured and clear information, the quantity and pacing of instruction, student activation by asking questions and participating in small group tasks, the provision of feedback and adaptive teaching (Creemers and Kyriakides 2012). To evaluate teaching effectiveness, teachers' classroom performance is usually assessed in observations. Although observations have some disadvantages – in that they are snapshots, and the presence of an observer undoubtedly influences the teacher's behaviour (an 'observer effect') – they also offer the promise of objectivity of outside observers, who are likely to be trained and experienced with observing classrooms and teachers and are able to judge teachers' behaviours relative to those of other teachers (Muijs 2006). Multiple observation instruments also exist to assess the quality of teaching behaviours (e.g. Kyriakides, Creemers, and Antoniou 2009; Stronge, Ward, and Grant 2011; van de Grift 2007). van de Grift's (2007) observation instrument features six standards and indicators, including 'a safe and stimulating environment' (SAFE), 'efficient lesson organisation' (EFFICIENT), 'clear and structured instruction' (CLEAR), 'intensifying the lesson and activating students' (ACTIVATING), 'adapting instruction to student differences' (ADAPTING) and 'teaching students thinking and learning strategies' (STRATEGIES).

Research into these teaching behaviours has shown that almost all teachers with at least 15 years of teaching experience can perform the first three teaching behaviours, but not all teachers succeed in performing the last three (Van de Grift 2010).



According to a cross-sectional study of the long-term development of teaching skills in German primary education, student teachers generally still lag behind the performance levels attained by a teacher with average experience. Student teachers seem able to perform the SAFE and EFFICIENT teaching behaviours in a satisfactory manner, but they cannot yet perform CLEAR effectively, and they seem unable to achieve ACTIVATING, ADAPTING and STRATEGIES (Van de Grift, Van der Wal, and Torenbeek 2011). These findings are consistent with research into the level of difficulty of different teaching behaviours. Van de Grift, Van der Wal and Torenbeek (2011) show that activities in the SAFE and EFFICIENT domains reflect easy competences, whereas the CLEAR and ACTIVATING domains create intermediate difficulty, and ADAPTING and STRATEGIES are the most difficult. These findings are congruent with teacher development theories (Berliner 1994, 2001; Fuller and Bown 1975; Huberman 1989) that describe beginning teachers as focusing more on their own position, classroom management and subject matter content knowledge rather than on students' needs and learning processes.

In this study, we focus on initial teacher education for secondary schools and explore the levels of student teachers' performance to relate these behaviours to student teachers' participation in learning activities. For a more complete picture, we include all six effective teaching behaviours as manifest factors of the latent construct of student teachers' effective teaching behaviour in our theoretical model (Figure 1).

### **Study aim**

This study considers student teachers' participation in activities that are important for career-long learning and the relationship between student teachers' learning and their teaching behaviour. In the Netherlands, initial teacher education is school-based, and the three groups of learning activities (developing and updating knowledge and skills, reflecting on teaching experiences and collaborating with colleagues) are integrated into school-based teacher education programmes (Bolhuis 2004; Buitink and Beijaard 2007), making them available for all student teachers. However, several studies on the specific nature of student teacher learning have found individual differences in learning to teach between student teachers, such as varied orientations to learning associated with the quality of their individual learning (Hagger et al. 2008; Oosterheert and Vermunt 2001), as well as differences in the regulation of their learning. Most student teachers reduced their self-regulation efforts over the course of their programmes, such that only one-third of the student teachers at the end of a one-year post-graduate teacher education programme exhibited self-directed and active learning tactics (Endedijk et al. 2012). For participation in career-long learning activities, it thus seems plausible to expect that student teachers tend to vary in their participation. We also assume that student teacher profiles could be identified to reveal and specify existing differences in participation across student teachers.

For the relationship between student teachers' learning and effective teaching behaviour, we could glean insights from studies on adult learning and effective learning for experienced teachers and assume some congruity between experienced teachers and student teachers. Accordingly, the more a student teacher participates in learning activities, the more effective his or her teaching behaviour might be. However, student teachers' teaching behaviour is in such an early stage that eventual

better teaching behaviours might not be observable to researchers. The relationship between student teachers' participation in learning activities and effective teaching behaviour thus remains to be explored, both in general and more specifically, on the basis of student teacher profiles. This need leads to the research questions (RQs) for this study:

- (1) How do student teachers describe their participation in the three learning activities important for career-long learning (development of knowledge and skills, reflection on experiences and collaboration with colleagues)?
- (2) What patterns are discernible in student teachers' participation in the three career-long learning activities?
- (3) What is the relationship between student teachers' participation in learning activities and their observed level of effective teaching behaviour?
- (4) What is the relationship between the level of participation in the three learning activities reflected in student teachers' profiles and their observed levels of effective teaching behaviour?

In addition, RQ3 appears in our theoretical model, which we use to depict the relationship between learning and effective teaching behaviour (Figure 1).

## Methods

### Participants

This research is part of a national, longitudinal research project, 'Effects of educating teachers at school', funded by The Netherlands Organisation for Scientific Research (NWO<sup>1</sup>). The project aims to compare teacher preparation routes to determine their effects on teacher effectiveness and retention. All schools in the Netherlands were approached to participate, and student teachers participated voluntarily. Among secondary education schools, in the 2011–2012 school year, the total sample featured 297 student teachers, 67 of whom agreed to complete the learning survey and be observed in 27 schools across the country. This response rate (23%) is average (Sheehan 2001). We provide descriptions of the final sample of 67 student teachers in Table 1.

Table 1. Sample description ( $N = 67$ ).

Gender	Men: 46% Women: 54%
Age	$M_{\text{age}} = 26.4$ years (SD = 7; range 20–56 years)
Years of experience	$M_{\text{teaching experience}} = 1$ year (SD = 0.8; range 0–3 years)
Subject matter taught	Languages: 28% Sciences: 31% Social studies: 37%
Qualification	Master's programme for a grade-one qualification (i.e. qualification to teach all forms of secondary education): 43% Bachelor's programme for a grade-two qualification (i.e. qualification to teach junior forms of secondary education): 53%

Notes: The percentages in the table do not add up to 100% because there were some missing cases (i.e. student teachers who did not respond to all items).

### ***Instrumentation***

To measure student teachers' participation in the three *learning activities* important for career-long learning, we used three reliable sets of items from a study of teachers' learning (de Vries, Jansen, and Van de Grift 2013). The items related to developing knowledge and skills (11 items; e.g. 'I read professional journals'), reflecting (13 items; e.g. 'I ask students to fill out surveys for feedback on my lessons') and collaborating (16 items; e.g. 'I share learning experiences with colleagues') appeared as three separate sets, all measured on four-point Likert scales (1 = 'never', 2 = 'rarely', 3 = 'regularly' and 4 = 'very often'). Reliability analyses of the respective sets indicated that all three scales were reliable (development: Cronbach's  $\alpha = 0.77$ ; reflective: Cronbach's  $\alpha = 0.75$ ; collaborative: Cronbach's  $\alpha = 0.83$ ).

To evaluate student teachers' teaching effectiveness, we used the *observation instrument* originally developed for the International Comparative Analysis of Learning and Teaching project (van de Grift 2007). Although developed for primary education settings, this measure is suitable for observing teachers' behaviours in secondary education (Canrinus 2011). The observation instrument consists of 32 items related to the aforementioned 6 teaching behaviours: SAFE (4 items; e.g. 'The teacher ensures a relaxed atmosphere'), EFFICIENT (4 items; 'The teacher ensures the orderly progression of the lesson'), CLEAR (7 items; 'The teacher gives clear instructions and explanations'), ACTIVATING (7 items; 'The teacher makes use of teaching methods that activate the pupils'), ADAPTING (4 items; 'The teacher adapts the instruction to the relevant differences between pupils') and STRATEGIES (6 items; 'The teacher stimulates the use of control strategies'). Every item is complemented by several examples of good practices to help the observers focus on the same practices. The items were scored on a four-point Likert scale (1 = 'predominantly weak', 2 = 'more weaknesses than strengths', 3 = 'more strengths than weaknesses' and 4 = 'predominantly strong'). The reliability analyses indicated that all six scales achieved good reliability (SAFE: Cronbach's  $\alpha = 0.81$ ; EFFICIENT: Cronbach's  $\alpha = 0.84$ ; CLEAR: Cronbach's  $\alpha = 0.87$ ; ACTIVATING: Cronbach's  $\alpha = 0.81$ ; ADAPTING: Cronbach's  $\alpha = 0.77$ ; STRATEGIES: Cronbach's  $\alpha = 0.88$ ). In each participating school, the trained observers observed the student teachers during their teaching activities. One observer visited each participating student teacher's classroom to observe for one hour. The observers' training occurred in sessions of 5–12 participants each, and the trainers were lecturers in the department of teacher education. The head of the department participated in developing and executing these training sessions, in which the observers received background information about the items as well as information about effective teacher behaviours. The sessions also included reviews of the scoring procedure, which the trainees practised by scoring a video fragment of a teacher conducting a 15-min lesson. After the participants revealed their judgments, they discussed any differences and similarities and defended their scores, with the aim of reaching consensus. A second video fragment followed, with the same procedure. The resulting forms revealed inter-rater reliability levels; any observers who attained less than 70% consensus did not participate in the research.

### ***Data analysis procedures***

We began by computing the mean scores, standard deviations, minimum and maximum scores and paired sample *t*-tests to assess student teachers' participation in the

three learning activities (RQ1). To investigate the occurrence of different student teacher profiles (RQ2), we followed a cluster analysis technique, in which we created subgroups (i.e. profiles) of relatively homogeneous cases, using the scores on the scales for the three activities. Independent sample *t*-tests served to assess the differences between the three activities for each learning profile. Then, to determine the link between these activities and effective teaching behaviours (RQ3), we computed the mean scores and standard deviations for student teachers' effective teaching behaviours, as well as the correlations for all nine variables (i.e. three professional activities and six teaching behaviours) to inform our structural equation model (SEM), implemented in LISREL 8.8 (Jöreskog and Sörbom 2007). The two measurement models involve the relationships of the three learning activities (indicators) with the learning construct (latent variable) and the relationships of the six teaching behaviours (indicators) with the effective teaching behaviour construct (latent variable). To test the structural model, we considered the relationship of the learning construct (exogenous variable) with the effective teaching behaviour construct (endogenous variable). We used several indices to evaluate the fit of our model, all of which are relatively insensitive to sample sizes (Hooper, Coughlan, and Mullen 2008). To investigate the relationship between the student teacher profiles and effective teaching behaviours (RQ4), we conducted independent sample *t*-tests.

## Results

### *Student teachers' learning activities*

We standardised all the scale scores; in Table 2, we provide the mean scores, standard deviations and the minimum and maximum scores for the three learning activities. In their learning, student teachers participate rarely to regularly in developing and collaborating activities, whereas they participate more regularly in reflecting activities. That is, their participation in reflecting activities ( $M = 0.71$ ) was significantly higher than their participation in developing activities ( $M = 0.66$ ;  $t(66) = 3.48$ ,  $p = 0.001$ ,  $r = 0.16$ ) or collaborating activities ( $M = 0.65$ ;  $t(66) = 4.55$ ,  $p < 0.001$ ,  $r = 0.26$ ), though the effect sizes were rather weak. The standard deviations and differences between the minimum and maximum scores indicated that student teachers also varied in the extent to which they participated in learning activities, in support of our expectation.

### *Student teacher profiles*

We ran the cluster analysis on the scores of the three learning activity scales for all 67 cases. A hierarchical cluster analysis using Ward's method provided some sense of the possible number of clusters, and two clusters emerged from the dendrogram.

Table 2. Mean standardised scores, standard deviations and minimum and maximum scores for student teachers' learning activities ( $N = 67$ ).

Scale	<i>M</i>	SD	Min.	Max.
Developing knowledge and skills	.66	.11	.41	.98
Reflecting on experiences	.71	.07	.54	.90
Collaborating with colleagues	.65	.09	.45	.91

By re-running the clustering with the k-means method, we iteratively estimated the cluster means and assigned each case to the cluster for which its distance from the cluster mean was the smallest. Thus, two profiles were created, each containing relatively homogeneous cases. Table 3 presents the mean scores of the learning activity scales of both clusters. Independent sample *t*-tests showed that the clusters differed significantly from each other on the development scale ( $t(65) = 8.52, p < 0.000$ ), the reflection scale ( $t(65) = 2.81, p > 0.01$ ) and the collaboration scale ( $t(65) = 6.33, p < 0.000$ ).

The scores for the clusters in Table 3 enable us to categorise two types of student teachers who differ in their participation in career-long learning activities, referring to their relative positions on the three scales. The first cluster (Cluster 1 = 64%) was characterised by relatively high (close to regular) participation in career-long learning activities (High Participation, or HP profile). The second cluster (Cluster 2 = 36%) was characterised by relatively low (mainly close to rare) participation in the three learning activities (Low Participation, or LP profile). As we expected, the student teacher profiles we identified paralleled those of experienced teachers.

### *Learning and effective teaching behaviour*

To test the link between learning and effective teaching behaviour, we computed the mean scores, standard deviations and the minimum and maximum scores for student teachers' effective teaching behaviours (Table 4). On average, the observers noted that student teachers engaged strongly in the first three teaching behaviours ( $M_{\text{SAFE}} = 0.79, M_{\text{EFFICIENT}} = 0.75, M_{\text{CLEAR}} = 0.72$ ). Their scores on ACTIVATING behaviours ( $M = 0.68$ ) were close to the more-strengths-than-weaknesses category. In contrast, student teachers performed weakly with regard to the last two behaviours ( $M_{\text{ADAPTING}} = 0.52, M_{\text{STRATEGIES}} = 0.59$ ). The standard deviations and differences between the minimum and maximum scores indicated that student teachers also varied in the extent to which they behaved effectively in their teaching.

The Pearson correlation coefficients that we derived from computing the inter-correlations of all nine variables (Table 5) indicated moderate correlations between development and reflective activities ( $r = 0.27$ ) and between collaborative and reflective activities ( $r = 0.30$ ). Development and collaborative activities correlated more strongly ( $r = 0.48$ ). Although we found some overlap among learning activities, the scales measured distinct aspects. The high inter-scale correlations also offered preliminary support for a one-dimensional construct of learning. The mean inter-scale correlations for effective teaching behaviours ranged from 0.44 (EFFICIENT–ADAPTING) to 0.85 (CLEAR–ACTIVATING). That is, the teaching components overlapped somewhat, but the scales measured distinct aspects of teaching

Table 3. Means for the three learning activities per cluster ( $N = 67$ ).

	Cluster 1 'High participation profile' ( $n = 43$ )	Cluster 2 'Low participation profile' ( $n = 24$ )
Developing knowledge and skills	.72	.56
Reflecting on experiences	.73	.68
Collaborating with colleagues	.70	.58

Table 4. Mean standardised scores and standard deviations for student teachers' effective teaching behaviours ( $N = 67$ ).

Scale	<i>M</i>	<i>SD</i>	Min.	Max.
Ensuring a safe and stimulating environment	.79	.14	.38	1
Efficient lesson organisation	.75	.18	.31	1
Clear and structured instruction	.72	.16	.36	1
Intensifying the lesson and activating students	.68	.17	.25	1
Adapting instruction to student differences	.52	.18	.25	1
Teaching students thinking and learning strategies	.59	.21	.25	1

Table 5. Intercorrelations among model variables (listwise,  $N = 67$ ).

	1	2	3	4	5	6	7	8	9
1. Developing knowledge and skills	1								
2. Reflection on experiences	.27*	1							
3. Collaboration with colleagues	.48**	.30*	1						
4. Ensuring a safe and stimulating environment	.13	.10	.29*	1					
5. Efficient lesson organisation	.34**	-.01	.36**	.69**	1				
6. Clear and structured instruction	.36**	.11	.34**	.71**	.82**	1			
7. Intensifying the lesson and activating students	.30*	.13	.25*	.67**	.75**	.85**	1		
8. Adapting instruction to student differences	.22	.09	.22	.53**	.44**	.59**	.67**	1	
9. Teaching students thinking and learning strategies	.19	.04	.06	.59**	.56**	.70**	.76**	.76**	1

\*Correlation is significant at the 0.05 level (two-tailed).

\*\*Correlation is significant at the 0.01 level (two-tailed).

behaviour. These high inter-scale correlations also suggested preliminary support for the one-dimensional construct of teaching behaviour. Furthermore, high correlations between components of learning and components of teaching behaviour provided strong preliminary support for a potential link between learning and effective teaching behaviour. Thus, it seemed reasonable to perform the next step: SEM analysis.

To assess the fit of our theoretical model with the empirical data, we first tested the factor structure as a whole (see Figure 1). The starting point for this analysis was a matrix of the intercorrelations across all model variables (Table 5). We set one of the loadings on the latent exogenous variable (student teachers' learning) and one of the loadings on the latent endogenous variable (student teachers' effective teaching behaviour) equal to 1.0 to establish a common metric (Long 1983). The statistical test showed a  $\chi^2$  value of 62.80, with 26 degrees of freedom, and a  $p$ -value of 0.00. The root-mean-square error of approximation (RMSEA) of 0.15, standardised root mean residual (SRMR) of 0.067 and confirmatory fit index (CFI) of 0.89 indicated the poor fit of the model to the data. The modification indices also

revealed strong covariance ( $\theta\text{-}\varepsilon = 18.56$ ) in the measurement error variables for ADAPTING and STRATEGIES; that is, the two most difficult teaching behaviours for teachers (Van de Grift, Van der Wal, and Toorenbeek 2011) were not explained well by the construct of effective teaching behaviour. A possible explanation for this finding is that these behaviours are beyond the reach of student teachers; the student teachers in this study scored more weakly on both of them ( $M_{\text{ADAPTING}} = 0.52$ ;  $M_{\text{STRATEGIES}} = 0.59$ ). Teacher development theories (Berliner 1994, 2001; Fuller and Bown 1975; Huberman 1989) similarly describe beginning teachers' focus on their own position, classroom management and subject matter content knowledge rather than on students' needs and learning processes. Therefore, we removed the observed endogenous variables ADAPTING and STRATEGIES from the model. In our reassessment of the fit of the model, the statistical test showed a  $\chi^2$  value of 14.61, with 13 degrees of freedom, and a  $p$ -value of 0.33. The RMSEA of 0.043, SRMR of 0.048 and CFI of 0.99 indicated good fit.

Next, we tested two measurement models pertaining to the relationships of the three learning activities (indicators) and the learning construct (latent exogenous variable) and of the four effective teaching behaviours (indicators) and the effective teaching behaviour construct (latent endogenous variable). The standardised factor loadings ( $\lambda$ ), standard errors and  $t$ -values of the different indicators of the two latent variables were our main focus (Tables 6 and 7). The  $t$ -values were all well above 1.96 (i.e. significant factor loadings), so we validly measured student teachers' participation in learning and effective teaching behaviours. For learning, the standardised factor loadings indicated that collaboration was the most important indicator (0.72), followed by developing knowledge and skills (0.69); reflection on experiences was the least important indicator (0.38). In contrast, the standardised factor loadings indicated that all four remaining teaching behaviours were important indicators.

As our final testing step, we considered the structural model with the relationship between learning (exogenous variable) and effective teaching behaviour (endogenous variable). We found a moderate-to-strong positive relationship, with a standardised path coefficient ( $\gamma$ ) of 0.49 ( $p < 0.005$ , standard error = 0.19,  $t = 2.85$ ). When student teachers participated more in learning, their teaching behaviours were more effective. In general, when student teachers are better professional learners, they also are more effective teachers. We present the results of the SEM analysis in Figure 2.

### ***Student teacher profiles and effective teaching behaviours***

Table 8 presents the scores of the four remaining teaching behaviours for each student teacher profile. The independent sample  $t$ -tests showed that three of them differed significantly across student teacher profiles: EFFICIENT ( $t(65) = 2.28$ ,  $p < 0.05$ ), CLEAR ( $t(65) = 2.47$ ,  $p < 0.05$ ) and ACTIVATING ( $t(65) = 2.41$ ,

Table 6. Standardised factor loadings ( $\lambda$ ), standard errors and  $t$ -values for learning.

	Standardised factor loadings	Standard errors	$t$ -values	Significance (two-tailed)
Developing knowledge and skills	.69	–	–	
Reflection on experiences	.38	.18	2.39	.02
Collaboration with colleagues	.72	.26	3.18	.002

Table 7. Standardised factor loadings ( $\lambda$ ), standard errors and  $t$ -values for effective teaching behaviour.

	Standardised factor loadings	Standard errors	$t$ -values	Significance (two-tailed)
Ensuring a safe and stimulating environment	.79	.09	8.32	.001
Efficient lesson organisation	.86	.08	11.31	.001
Clear and structured instruction	.95	—	—	—
Intensifying the lesson and activating students	.88	.08	11.92	.001

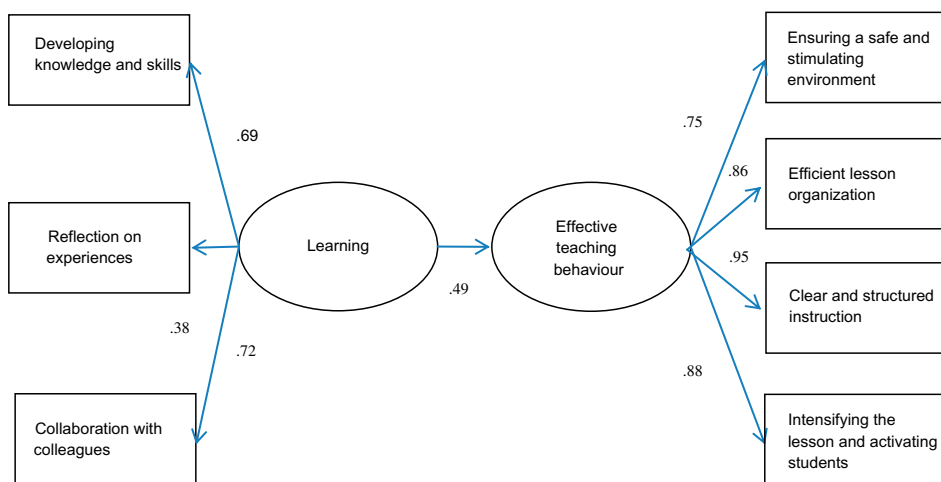


Figure 2. Standardised SEM solution.

Notes:  $\chi^2 = 14.61$ , d.f. = 13, RMSEA = 0.04, SRMR = 0.048, CFI = 0.99. All  $ps < 0.02$ .

Table 8. Means for four effective teaching behaviours per learning profile ( $N = 67$ ).

	Cluster 1 'High participation profile' ( $n = 43$ )	Cluster 2 'Low participation profile' ( $n = 24$ )
Ensuring a safe and stimulating environment	.80	.78 $ns$
Efficient lesson organisation	.78	.68
Clear and structured instruction	.76	.66
Intensifying the lesson and activating students	.71	.61

$p < 0.05$ ). Student teachers belonging to the HP profile are significantly more effective teachers with regard to these three effective teaching behaviours than student teachers belonging to the LP profile. These results confirmed and refined the result of our SEM analysis: when student teachers are better professional learners, their lesson organisation is more efficient, their instruction is clearer and more structured, their lessons are more intensive and they activate their students more. Finally, we note that with our cross-sectional study, we necessarily describe a correlational, rather than a causal, relationship.



## Conclusions and discussion

With this study, we have determined that, consistent with our expectation, student teachers vary in their participation in learning activities important for career-long learning. We have also identified a relationship between student teachers' participation in learning activities and their effective teaching behaviour. Career-long learning in this study requires active participation in the three learning activities of developing and updating knowledge and skills, reflecting on teaching experiences and collaborating with colleagues. The differences in participation in learning activities across student teachers were well reflected in the student teacher profiles we identified: the HP profile (64%), characterised by relatively high (close to regular) participation in career-long learning activities, and the LP profile (36%), characterised by relatively low (mainly close to rare) participation in the three learning activities. Although these learning activities are integrated into modern school-based teacher education programmes, not all student teachers use the opportunities and resources available in their learning and working environments to advance their professionalisation through active learning (Buitink and Beijaard 2007). This finding is consistent with the differences prior research has found in student teachers' learning orientations (Hagger et al. 2008; Oosterheert and Vermunt 2001) and self-regulation (Endedijk et al. 2012). In this first, crucial stage of the learning continuum, which is most influential for student teachers' professional development (Conway et al. 2009; Endedijk et al. 2012), 64% of student teachers engage regularly in learning activities and are likely to pursue these activities in the next stages of the learning-to-teach continuum; consequently, they are likely to become career-long learning teachers (Buitink and Beijaard 2007; Eraut 1994; Hammerness et al. 2005). More than one-third of student teachers participate significantly less often though – almost rarely engaging in development and collaborative activities and somewhat more often in reflective activities – and is it doubtful whether these student teachers will become career-long learning teachers.

Effective teaching behaviour in this study consists of six teaching behaviours that have been linked to students' academic achievement: SAFE, EFFICIENT, CLEAR, ACTIVATING, ADAPTING and STRATEGIES. As student teachers' participation in learning activities increases, the effectiveness of their teaching behaviours increases as well. Although student teachers' teaching behaviours are in an early stage of development, we demonstrate that differences in teaching behaviour are visible and observable. For the student teachers belonging to the HP profile (relatively HP in career-long learning activities), a significantly more effective teaching behaviour was observed for EFFICIENT, one of the two easy teaching behaviours, as well as for the CLEAR and ACTIVATING teaching behaviours, which reflect intermediate difficulty (Van de Grift, Van der Wal, and Torenbeek 2011). We removed from the model ADAPTING and STRATEGIES, the most difficult teaching behaviours to perform; the student teachers in this study scored relatively low on these teaching behaviours. Furthermore, ADAPTING and STRATEGIES were not explained well by the construct of effective teaching in the model, which could indicate that these two teaching behaviours are beyond the reach of student teachers. Regarding the teaching behaviour SAFE, the student teachers belonging to the HP and LP profiles (relatively LP in career-long learning activities) were able to perform this teaching behaviour satisfactorily. This finding could indicate that SAFE is the easiest teaching behaviour to perform. In conclusion, we can state that, just like

experienced teachers (Timperley et al. 2007; Van Veen et al. 2010), student teachers who engage in learning activities as career-long learners are more effective teachers of three observable behaviours EFFICIENT, CLEAR and ACTIVATING, which is an important finding. Even as early as during their teacher education programmes, their lesson organisation is more efficient, their instruction is clearer and more structured, their lessons are more intensive and they activate their students more. These HP-profile student teachers are significantly more effective teachers than those with the LP profile and, in all probability, will continue to improve and refine their teaching practices as career-long learning professionals. However, more than one-third of the student teachers belong to the LP profile and are significantly less effective teachers. It is doubtful whether they will become career-long learning teachers; consequently, they may not improve and refine their teaching practices over time, which is worrisome.

Although the three learning activities under study should be integral in any school-based teacher education (Bolhuis 2004; Buitink and Beijaard 2007; Feiman-Nemser 2001), we show that student teachers vary in their participation in these activities, with important consequences for teacher and teaching quality in the short and long runs. Therefore, more specific interventions need to be developed to improve the onset of career-long learning processes during these formative years (Endedijk 2010). Student teachers should explicitly learn, among other things, that learning itself is an integral part of teaching, and they must discover how to continue learning successfully in practice after they have completed their formal initial teacher education (Beijaard 2009; Bolhuis 2004; Feiman-Nemser 2001). Yet how can we ensure that student teachers use the opportunities and resources available in their learning and working environments to advance their professionalisation through active learning (Buitink and Beijaard 2007)? In accordance with research into ways to stimulate student teachers' learning activities in teacher education programmes (Bolhuis 2004; Bronkhorst et al. 2011; Buitink and Beijaard 2007; Darling-Hammond 2006; Dolan 2012; Feiman-Nemser 2001; Hagger et al. 2008; Korthagen 2012; Korthagen and Buitink 2010), we propose six key principles for school-based initial teacher education:

- (1) Student teachers should acknowledge that initial teacher education is just a first step in the perpetual continuum of professional teacher education.
- (2) Student teachers should receive an introduction to teacher education pedagogy and to theories of career-long learning.
- (3) Student teachers should be taught explicitly how to learn meaningful lessons through practice by linking their own beliefs, practices and theory, as well as how to learn from both challenges and successes.
- (4) Student teachers should learn with and from peers; cohort groups in teacher education could provide professional communities of teachers as learners.
- (5) Teacher educators should model best practices in career-long learning.
- (6) The work context at the practice school should model best practices in career-long learning. A promising example of a strategy to promote integration of the learning activities of student teachers in collaboration with experienced teachers in the school context is lesson study (Lewis, Perry, and Murata 2006).

Longitudinal studies will be required to determine whether interventions in the initial stage of teaching based on these principles enhance teachers' initial learning such that they continue to learn and develop and refine their teaching practices over time (Pianta and Hamre 2009). These studies would probably need to span 10 years or more (Berliner 1988).

### Further research

The results of this study enable us to describe the relationship between student teachers' participation in learning activities and their effective teaching behaviours but do not allow us to explain it. This approach is acceptable for our early, explorative study, but it limits the interpretability of the findings and their relevant implications for student teachers and teacher education. Ongoing research should address the complex web of factors, both contextual and personal, that may be involved in student teachers' learning and the connection to effective teaching behaviours.

To begin with, the contextual variables that are highly influential for the learning-to-teach processes include learning culture, the attitudes of the cooperating teachers and the role of mentors at the practice school (Kagan 1992; Kelchtermans et al. 2010). The culture at the practice school could be focused on teaching only, or it could be a learning environment for pupils as well as for teachers, with a shared vision of education, focus on learning and sufficient time and support (Little 2006; Richardson 1998; Wayne et al. 2008). Related to the learning culture is the attitude of the cooperating teachers. In this study, we found a learning pattern for student teachers in developmental and collaborative activities comparable to that of experienced teachers. It would be worthwhile to investigate whether the cooperating teachers – who, in the Netherlands, vary widely in the extent to which they participate in learning activities (Bakkenes, Vermunt, and Wubbels 2010; de Vries, Jansen, and Van de Grift 2013; Diepstraten et al. 2011; Vogels 2009) and therefore often reflect a rather 'restricted' (Hoyle 1980), autonomous, teaching-oriented professionalism implicitly or explicitly – are 'role models' for the student teachers entering the school and the profession. The role of the mentor also is important in creating a challenging environment for the student teacher with a focus on both practical support and personal growth (Geldens 2007; Giebelhaus and Bowman 2002). Good mentoring could also contribute to the development of teaching practices (Giebelhaus and Bowman 2002).

In addition to the contextual factors, there are also important personal factors, such as the student teacher's biography and past experiences (Kagan 1992). Student teachers have spent a 15,000-h apprenticeship watching others teach (Lortie 1975), which has a profound impact on how they understand and enact teaching and learning to teach. These educational experiences, often unconscious and affective in nature, form their attitudes and values about learning and teaching (Kagan 1992; Pajares 1993). For both experienced teachers and student teachers, research has found a link between their beliefs about learning and teaching and their participation in learning activities: the more student-oriented the beliefs are, the more the teachers participate in learning activities. However, no relationship appeared between subject matter-oriented beliefs and participation in learning activities (de Vries, Van de Grift, and Jansen 2013; de Vries et al. 2014). Further research should investigate the role of beliefs in relation to learning to teach for student teachers. Moreover, the role of student teachers' self-efficacy beliefs seems important, in that greater efficacy

increases effort, which improves teaching performance, whereas lower efficacy has the reverse effects (Tschannen-Moran, Hoy, and Hoy 1998). For experienced teachers, positive relationships have also been found between self-efficacy beliefs and teachers' in-service learning (Bandura 1993; Geijsel et al. 2009; Goddard, Hoy, and Hoy 2000; Runhaar, Sanders, and Yang 2010). In the light of this finding, further research should consider the connection we found between greater participation in learning activities (more effort) and better teaching behaviour.

We hope to include these contextual and personal factors, as well as students' learning outcomes, in future models, to investigate whether more effective student teachers produce better student outcomes. In addition, the learning activity of reflection requires further research. Compared with their more experienced colleagues, student teachers in the Netherlands exhibit average levels of participation in learning activities that are generally equivalent to the participation of experienced teachers in developing skills and collaborative activities (de Vries, Jansen, and Van de Grift 2013). However, unlike experienced teachers, who seem to engage relatively less in reflective activities (de Vries, Jansen, and Van de Grift 2013; Dijkstra 2009; Kwakman 2003; Van Eekelen 2005), student teachers engage more often in reflective activities than in other forms of learning. This finding might reflect the common focus on reflection in teacher education programmes (Loughran 2002), with student teachers performing many reflection assignments (e.g. portfolios; Mansvelder-Longayroux, Beijaard, and Verloop 2007). Although, compared with experienced teachers, student teachers engage more often in reflective activities than in other forms of learning, this learning activity emerged as the least important indicator (0.38) of the construct of student teachers' learning. In other words, better performing student teachers do not necessarily reflect more on their experiences. Student teachers' reflection, as a critical professional activity (Eraut 1994; Schön 1983), should help them 'see differently' and reframe situations (Schön 1983) such that they might gain insights into how to better understand and act on the situation (Korthagen, Loughran, and Russell 2006). Student teachers' reflection instead seems rather superficial, such that they reflect more on teaching practice issues ('What works?' and 'How can I?' questions) than on understanding underlying processes ('Why?' questions) (Mansvelder-Longayroux, Beijaard, and Verloop 2007; Korthagen and Buitink 2010). Student teachers seem more interested in short-term tips and tricks than in becoming aware of their beliefs and eventually changing them, to really understand the situation and act on it accordingly. Better performing student teachers probably experience fewer teaching problems, will not need the short-term solutions and may thus feel less need to reflect. Further research should consider more closely the relationship between reflection on experiences and learning.

Despite the limited scope of this exploratory study – three groups of observable learning activities in relation to six groups of observable teaching behaviours – it is the first to specify the student teacher learning practices important for career-long learning or these practices' association with outcomes relevant to their teaching practices. This study thereby contributes to extant literature. We consider a better understanding of student teachers' learning and its relation to effective teaching behaviours critically important, because it offers insights into this crucial initial teaching and learning stage, which paves the way for the active, career-long learning practices that will help teachers refine their teaching effectiveness over time (Endedijk et al. 2012; Eraut 1994; Hammerness et al. 2005).

### Disclosure statement

No potential conflict of interest was reported by the authors.

### Note

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