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Research paper

Teacher educators' task perception and its relationship to professional identity and teaching practice

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HIGHLIGHTS

- One of the first quantitative studies on teacher educators' professional identity.
- Valid and empirically reliable measurement of teacher educators' task perception.
- We distinguish between teacher educators as facilitators and transmitters.
- Facilitators demonstrate increased self-efficacy.
- Teacher educators' task perception is related to the quality of teacher training.

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ABSTRACT

We assessed teacher educators' task perception and investigated its relationship with components of their professional identity and their teaching practice. Using data from 145 teacher educators, two different task perceptions were found: transmitters and facilitators. Teacher educators who were categorized as facilitator tend to demonstrate higher levels of self-efficacy, job satisfaction, constructivist beliefs about teaching and learning and use more effective teaching strategies. The findings demonstrate that teaching practices of teacher educators are rooted in their professional identity.

1. Introduction

There is broad agreement in the scientific community that high-quality instruction is crucial for the overall quality of primary and secondary education (OECD, 2005). For teachers to be able to provide high-quality instruction, they need opportunities to continuously develop their professional competencies and to learn about recent developments in the subjects they teach as well as new didactic approaches. By providing in-service training and ongoing support to teachers over the course of their careers, teacher educators contribute significantly to the development of teachers' professional competencies (European Commission, 2013; Liston, Borko, & Whitcomb, 2008).

Previous research on teacher educators focused primarily on how they perceive themselves as professionals. A groundbreaking and widely cited self-study by Zeichner (2005) documented his transition from classroom teacher to university teacher educator. Subsequent studies investigated the professional roles of teacher educators, focusing on the expectations and demands placed on them in their job (Lunenberg, Dengerink, & Korthagen, 2014). Other studies examined components of teacher educators' professional identity, in particular, their personal views on their job and their self-image (Vanassche & Kelchtermans, 2014). These previous studies identified a number of different tasks of teacher educators, one of the most important of which is teaching pre-service and in-service teachers (Koster, Brekelmans, Korthagen, & Wubbels, 2005).

Previous research has collected primarily qualitative data on teacher educators' teaching practice and their relationship to their professional identity. Lunenberg et al. (2014) emphasize the need for more large-scale quantitative research on the instruction of

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teacher educators because it allows us to check whether the findings obtained in small-scale studies hold up in the population of teacher educators. Quantitative data make it possible to estimate the strength of the relationships between teacher educators' professional identity and their teaching practices. A valid and reliable measurement of teacher educators' identity serves also as a foundation for future research that focuses on other aspects (e.g., international comparisons) or used mixed-method approaches (Greene, Caracelli, & Graham, 1989). For example, our newly developed instrument can now be used for theoretical sampling of participants in qualitative studies on teacher educators where the sampling is based on their answers on the quantitative questionnaire regarding their professional identities.

The following study contributes to this gap in the research by using factor and correlation analyses. These allow us to estimate the structure of teacher educators' professional identity and its relationship to different aspects of their behavior. For this purpose, we draw on the concept of the professional identity as a theoretical framework to gain further insights into teacher educators' professional identity and instructional practices. In the following section, we begin by introducing the concept of professional identity developed by Kelchtermans (2009), present evidence on teacher educators' professional identity, and discuss how this may play out in teacher educators' teaching practices.

1.1. Professional identity

Professional identity is defined as the individual perception of oneself as a professional within a community of professionals (Ibarra, 1999). It includes a set of cognitions about one's profession and is based on attributes, beliefs, values, motives, and experiences (Beijaard, Meijer, & Verloop, 2004; Ibarra, 1999). In the context of teacher education, Kelchtermans (2009) describes the concept of professional identity as "a lens through which teachers (educators) look at their job, give meaning to it and act in it" (p. 260). Professional identity therefore builds a personal framework that guides one's perceptions, interpretations, and actions in job-embedded situations.

There is consensus in the research that professional identity is a multidimensional concept, but still no unanimous agreement on its central components (Canrinus, Helms-Lorenz, Beijaard, Buitink, & Hofman, 2012; Kelchtermans, 2009). We can, however, identify four components that have emerged from a variety of studies as manifestations of professional identity in teacher educators (see Fig. 1). The first of these is *task perception*, the individual understanding of the tasks for which a person feels responsible. The second is *self-efficacy*, the perception of one's ability to deal successfully with the specific requirements of one's profession (Canrinus et al., 2012; Kelchtermans, 2009). A third component highlighted by Canrinus et al. (2012) is the *perception of satisfaction* (or failure), since experiencing success in a job may lead to a feeling of satisfaction, whereas the experience of failure may result in a feeling of stress. A fourth component of teacher educators' professional identity is the personal system of *beliefs on teaching* and how to put them into practice (Kelchtermans, 2009).

The four aforementioned components of professional identity are important for teacher educators' actions and behavior in the workplace and may therefore influence their performance and the quality of their instruction. Although very few studies have investigated the relationship between teacher educators' professional identity and instructional quality, educational research has demonstrated that teachers' instructional practices are associated with how they make sense of their job (Day et al., 2006; Erickson & Pinnegar, 2017). Day et al. (2006) found that the sense of identity is an important contributing factor to teachers' commitment and resilience, and this in turn has proven to be crucial to teachers' abilities to remain effective in their work. Moreover, we also know from research on teacher competencies that the four aforementioned components of professional identity are positively associated with instructional quality and student achievement (Kunter et al., 2013). We would therefore expect to find these relationships also within the group of teacher educators.

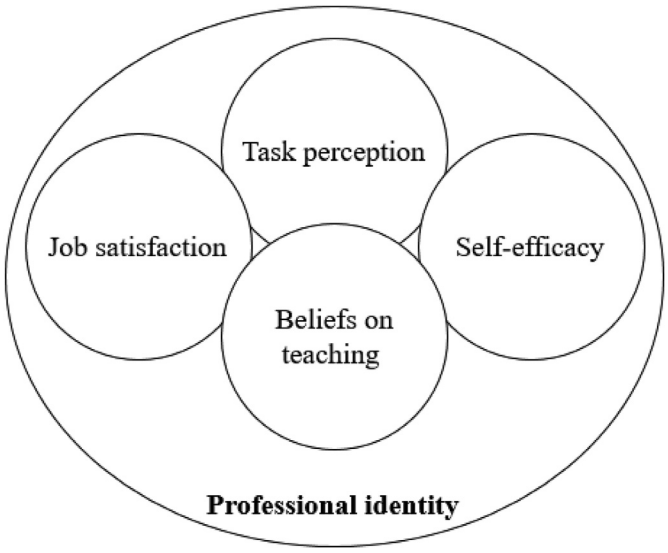


Fig. 1. Heuristic model of professional identity and its components based on Canrinus et al. (2012) and Kelchtermans (2009).

1.2. Thinking about oneself as a professional: teacher educators' professional identity

Teacher educators can be described in general terms as teachers of teachers (Bouckaert & Kools, 2018). They represent a mixed and diverse group of professionals who are responsible for a variety of different tasks and practices in pre-service and in-service teacher education (Koster et al., 2005; Loughran, 2014). In this broad sense, teacher educator is used as a generic and overarching term that encompasses all types of people who are involved in and responsible for pre-service and in-service teacher training (Kelchtermans, Smith, & Vanderlinde, 2018). This definition corresponds with the definition of the European Commission (2013), in which teacher educators are described as individuals "who actively facilitate the (formal) learning of student teachers and teachers" (p. 8). The group includes a large number of people in different institutional contexts. Some teacher educators work primarily in pre-service training at universities, and others work at schools or other practice-oriented institutions and focus primarily on the training of in-service teachers (Kelchtermans et al., 2018).

Given the heterogeneous working contexts of teacher educators (e.g., pre-service versus in-service teacher education; Kelchtermans et al., 2018), there is substantial research interest in how teacher educators perceive themselves as professionals. Studies in this vein have investigated the professional identity of teacher educators by examining their beliefs about themselves and their job responsibilities. A mixed-method study by Koster et al. (2005) reports that teacher educators consider the development of their own skills and the training of teachers to be very important, but other tasks such as participating in the development of teacher education or selecting future teachers to be less necessary (Koster et al., 2005). Lunenberg et al. (2014) drew similar conclusions from their review of the literature on this topic, showing that a key role of teacher

educators is to teach by promoting teacher learning. The studies mentioned above highlight that being a teacher of teachers is a central component of teacher educators' professional identity. However, the question of what it means to teacher educators to be teachers of teachers and how they interpret this role has not yet received substantial attention in the literature.

While quantitative studies (Koster et al., 2005); Lunenberg et al. (2014) have provided more generic insights into the professional identity of teacher educators, two recent qualitative studies from the Netherlands and Belgium have examined the role of teacher educators in more detail (Jonker, März, & Voogt, 2018; Vanassche & Kelchtermans, 2014). Both of these focused on university-based teacher educators and used the concept of professional identity as a conceptual framework to investigate how teachers perceive themselves as teachers of teachers. Although the two studies addressed different research questions, they both produced similar results.

Vanassche and Kelchtermans (2014) and Jonker et al. (2018) identified groups of teacher educators that share similar patterns of normative beliefs and perceived expectations, including assumptions about good teaching, the tasks of teacher education, and preferred forms of interaction with student teachers. Although the two studies used different samples and were conducted in different countries, both identified two groups of teacher educators. The first group takes a learner-centered position and includes individuals who see their task in terms of counselling and stimulating learning processes. They are not only concerned with transmitting subject matter knowledge or simple technical know-how for teaching, but also perceive their students as human beings who need to be supported in their full development and well-being (teacher educators as "pedagogues" and "reflective teachers", see Vanassche & Kelchtermans, 2014; teacher educators as "facilitators of student learning" and "communicators", see Jonker et al., 2018). The second group takes an instructor-centered position ("teacher educators of subject knowledge", see Vanassche & Kelchtermans, 2014; teacher educators as "transmitters of knowledge", Jonker et al., 2018). This second type of teacher educator aims to impart specific subject matter knowledge related to the curriculum and to train students in specific teaching methods, and to continuously update their knowledge of their subject matter.

1.3. From thinking to acting: teacher educators' teaching practices

Teaching pre-service and in-service teachers is one of the main tasks of teacher educators (Koster et al., 2005). A number of quantitative and qualitative studies have suggested that university-based teacher educators as a whole make use of constructivist teaching methods (Andrew, 2007; Goubeaud & Yan, 2004). According to Driscoll (2005), these are teaching methods that enable students to participate in actions and activities, promote student-student interaction, structure learning tasks in relevant and realistic environments, and provide different solutions and representations.

Nevertheless, we know very little about what affects the quality of their teaching. The lack of research attention to the teaching practices of teacher educators is remarkable, given their importance in ensuring the quality of teachers' professional development (Darling-Hammond, Hyler, & Gardner, 2017). This gap in the research can be addressed by using the concept of professional identity (Beijaard et al., 2004; Kelchtermans, 2009), which is based on the assumption that teacher educators' perceptions of their role and responsibilities affect the way they teach.

Some recent studies have empirically investigated how the professional identity of teacher educators relates to their teaching practices. A qualitative study from Hong Kong interviewed 19 university-based teacher educators and found that teacher educators held constructivist beliefs about teaching and that they used group projects and role plays in their classes (Hau-Fai Law, Joughin, Kennedy, Tse, & Ming Yu, 2015). Furthermore, Vanassche and Kelchtermans (2014) and Jonker et al. (2018) found evidence that different types of teacher educators differ in the ways they conduct their courses. They describe how learner-centered teacher educators acted as role models for their teacher students by using second-order teaching strategies, such as thinking aloud or stepping out. These teacher educators explained, for instance, why they chose certain courses of action in the teaching context to provide opportunities to explore decision making together with their students. Teacher educators who held an instructor-centered point of view, on the other hand, did not see the need for this kind of second-order teaching. They did not serve as models of exemplary teaching practice, but instead imparted expertise using elements of first-order teaching. This approach focuses on lecturing, explaining, and structuring. It manifests itself, among other things, in covering as much material as possible in a single lesson using traditional forms of teaching such as lecturing.

1.4. Current study

The aforementioned studies empirically showed that, within the theoretical framework of professional identity, teacher educators' teaching styles may be linked to their perceptions of themselves as teacher educators. The professional identity of teacher educators may therefore also be related to the general quality of teachers' continuing professional development. However, the existing studies have several shortcomings. To the best of our knowledge, no study examines how different personal interpretations of being a teacher of teachers relates to other components of teacher educators' professional identity, such as beliefs about teaching and learning, self-efficacy, or job satisfaction. Moreover, what we know about the relationship between professional identity and teaching practice is based largely on qualitative data covering only small numbers of teacher educators. The existing studies refer to university-based teacher educators only and do not cover educators of in-service teachers. The present study therefore aims to extend this strand of research by adding a quantitative perspective on the professional identity of educators of in-service teachers.

Taking into account the shortcomings of prior research on teacher educators' professional identity, the purpose of the present study is to enhance the empirical understanding of teacher educators' professional identity and its relation to their teaching practice in teacher training courses. The current study aims to achieve this goal by addressing three research questions:

Research question 1: *Can teacher educators' perception that their main task is to be a teacher of teachers be measured empirically?*

Teacher educators are teachers of teachers (Koster et al., 2005), but how they interpret this task varies widely. On the one hand, there are teacher educators with a more learner-centered perspective, while other teacher educators tend to take a more teacher-centered perspective. Qualitative studies have shown that each of these perspectives is associated with specific teaching methods (Jonker et al., 2018; Vanassche & Kelchtermans, 2014). Based on this evidence, we hypothesize that the two perspectives of teacher educators as teachers of teachers can be measured using standardized instruments.

Research question 2: *How are teacher educators' perceptions of their tasks as a teacher of teachers related to other components of*

their professional identity, such as beliefs about teaching and learning, self-efficacy, and job satisfaction?

Professional identity is a multidimensional concept (Canrinus et al., 2012; Kelchtermans, 2009). From a theoretical perspective, the way teacher educators interpret their role as teachers of teachers should be related to other components of their professional identity, such as beliefs, self-efficacy, and job satisfaction. None of the existing studies, however, has subjected this relationship to empirical investigation. To obtain a deeper understanding of professional identity, we carry out an explorative analysis to examine the relationship between the different components.

Research question 3: *How are teacher educators' perceptions of their tasks as a teacher of teachers related to their teaching practice?*

Qualitative research on the teaching practices of teacher educators has revealed that teacher educators differ in their teaching styles with regard to the way they perceive their tasks. While teacher educators with a more learner-centered perspective tend to make greater use of second-order teaching strategies, teacher educators with a more instructor-centered perspective appear to use elements of first-order teaching (Jonker et al., 2018; Vanassche & Kelchtermans, 2014). We expect to find similar relationships in the present study. Moreover, by extending previous work, we aim to quantify the strength of this relationship with our newly developed measures.

2. Methods

2.1. Study context

The present study was conducted in a large federal state in Germany, where the majority of in-service training is provided by experienced school teachers who are assigned to one of four school districts. Each school district acts as an institutional unit that provides the organizational framework for in-service teacher training. Within these districts, staff meetings are conducted regularly with all teacher educators to reflect on their teaching practice and discuss organizational issues. The teacher educators usually work only part-time as teacher educators in their school districts and spend the rest of their time as public school teachers. The number of hours spent working as teacher educators is individually regulated and therefore varies. In order to become a teacher educator in this federal state, a standardized training program must be completed that provides teachers with competencies in various areas such as communication and counselling.

2.2. Sample

The 304 teacher educators involved in in-service teacher education in this federal state were assessed as eligible for the study (Fig. 2). We asked them to complete a paper-and-pencil version of the survey at a mandatory staff meeting in their school district in spring of 2019. Mandatory attendance meant that the teacher educators were only allowed to miss the meeting for unavoidable reasons such as illness. In total, 145 of 304 teacher educators attended the staff meeting. All those present at the staff meeting took part in the survey as requested by the federal state's ministry of education. All data were suitable for use in the data analysis.

The majority of the teacher educators in the sample were female (68.3%) and had been working on average for 24.3 years as teachers ($SD = 10.9$) and for 10.1 years as teacher educators ($SD = 7.2$) at the time of the study. Because teacher educators in this federal state were simultaneously teacher educators and regular school teachers, we also asked participants about the type of schools where they taught. The participants in this study came from all types of regular schools in Germany. In general, we distinguished between primary and secondary schools. In secondary schools, there is a further distinction between academic and non-academic track schools. The academic track qualifies students for university entry, while the non-academic track qualifies students for vocational training (Cortina & Thames, 2013). There are also other types of schools, such as special needs or vocational schools. In this sample, 17.9% of the teacher educators spent part of their working time teaching at primary schools; 47.6% at academic-track schools; and 17.9% at non-academic-track schools. The remaining teacher educators (16.6%) taught at other school types. The participating teacher educators were granted a reduction in their school teaching load of about 9.9 h per week on average (SD = 3.2). Depending on the type of school, this corresponds to between 36.7% and 41.3% of their regular teaching load as school teachers.

2.3. Instruments

For our study, we used a paper-and-pencil questionnaire to assess background information on teacher educators, components of their professional identity, and aspects of their teaching practices. Since ours is one of the first studies to examine components of the professional identity and teaching practices of teacher educators in a quantitative investigation, we first had to develop new items and scales. We followed a multi-stage procedure that began with an intensive literature review of proven and frequently cited scales in order to connect our work with previous research and to build cumulative knowledge by using comparable measures. We found the scales developed as part of the research projects COACTIV and COACTIV-R (Kunter, Baumert et al., 2013) to be well established in the research through their use by diverse research groups. In a next step, we obtained feedback on the test instrument from various experts in the field of teacher education. We first discussed our instruments with representatives of the institution that offers the official standardized training program for teacher educators, then presented our revised instrument to the ministry of education of the federal state and finally to experienced teacher educators. During the various feedback loops, items were dropped and in some cases new items were developed by our team together with the expert groups. In the end, no problems were identified concerning the wording of instructions or items developed to study the professional identity and practices of teacher educators.

2.3.1. Background information on teacher educators

In order to describe the sample, we assessed gender (0 = male, 1 = female), and experience as a teacher educator (in years). Since teacher educators in this federal state work partly as regular school teachers, we also asked for information about their school tracks.

2.3.2. Components of professional identity

We used a paper-and-pencil questionnaire to assess the four components of teacher educators' professional identity. For *task perception of teacher educators,* we developed 12 new items, which were rated on a four-point response scale ranging from (1) strongly disagree to (4) strongly agree. The instrument includes various statements about tasks that teacher educators believe they have to perform, based on the results of previous qualitative research (Jonker et al., 2018; Vanassche & Kelchtermans, 2014). The analysis of the internal structure to identify possible sub-dimensions of *teacher educators' task perception* within this set of items is part of the first research question.

We assessed *constructivist-oriented beliefs about teaching* with a

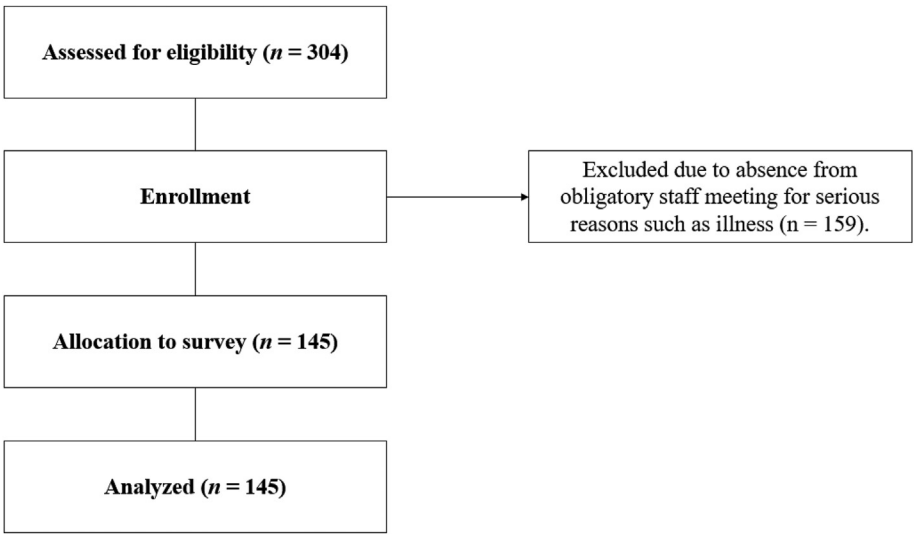


Fig. 2. Flow of participants through each stage of the study. This flowchart is an adaption of the flowchart offered by Appelbaum et al. (2018).

version of the Teacher Belief scale by Fennema, Carpenter, and Loef (1990) that was adapted to the German context and used previously by Staub and Stern (2002). The instrument measures the belief that student learning requires cognitively activating tasks and opportunities for students to converse about tasks and find alternative solutions. As the instrument was originally developed for mathematics teachers, we revised it to make it independent of the subject matter (i.e., "Students learn best by discovering ways to solve tasks themselves."). Our version uses six items, which were rated on a four-point response scale ranging from (1) strongly disagree to (4) strongly agree. Reliability as measured by the internal consistency yielded a Cronbach's $\alpha = 0.77$. At scale level, 22.8% of the participants had missing data. We assessed *transmissive-oriented beliefs about teaching* in the same way, using a version of the Teacher Belief scale by Fennema, Carpenter, and Loef (1990) that had been adapted to the German context. Again, we reworded the items to make them independent of the subject matter (i.e., "Students need detailed guidance on how to solve tasks."). Our version uses five items that also showed sufficient reliability for research purposes ($\alpha = 0.68$). At scale level, 28.3% of the participants had missing data.

We assessed *self-efficacy of teacher educators* with an adapted short version of the General Self-Efficacy scale by Schwarzer & Jerusalem (1995). The instrument measures the belief in one's ability to cope with a broad range of stressful or challenging demands. As the original scale was developed for teachers, we adapted it to make it more specific to teacher educators (i.e., "I know that I manage to get the message of my couses across to even the least interested teachers."). Our scale includes six items, which were rated on a four-point response scale ranging from (1) strongly disagree to (4) strongly agree. Reliability as measured by the internal consistency yielded a Cronbach's $\alpha = 0.68$. At scale level, 23.4% of the participants had missing data.

We assessed *job satisfaction of teacher educators* with a short German version of the Work Satisfaction scale of the Job Diagnostic Survey by Hackman and Oldham (1975) that was used by Merz (1979). This measure focuses on overall satisfaction with work and not on specific facets of work. Again, we adapted the item wording of the original scale to teacher educators (i.e., "For me, the advantages clearly outweigh the disadvantages in my work as a teacher educator."). Our version uses six items, which were rated on a four-point response scale ranging from (1) strongly disagree to (4) strongly agree. Reliability as measured by the internal consistency yielded a Cronbach's $\alpha = 0.84$. At scale level, 22.1% of the participants had missing data.

2.3.3. Aspects of teaching practices

We used a paper-and-pencil questionnaire to assess teaching practices of teacher educators. To the best of our knowledge, there was no scale for measuring aspects of teacher educators' teaching, so to be able to develop such an instrument, we first conducted an intensive review of the literature on what effective professional development of teachers should look like (Darling-Hammond et al., 2017). We identified three areas that represent high-quality in-service teacher education: *promotion of active and self-regulated learning*, *use of models and making modelling explicit*, and *focusing on student learning*.

Promotion of active and self-regulated learning means that teachers become actively involved in seminars through the use of different methods such as group discussions. This implies moving from traditional learning models, which are general and lecture-based, to a mode that involves teachers directly in the practices they are learning (i.e., "I make sure that the teachers can engage in an intensive exchange of information in groups.", Darling-Hammond et al., 2017).

Use of models and making modelling explicit refers to working with actual materials (e.g., student work) from real classrooms, but also to the analysis of real teaching cases by working with videos or peer observation. Curriculum models and the modelling of teaching help teachers to have a vision of practice on which they can base their own learning and growth (i.e., "I provide practical examples related to the training topic in the course.", Darling-Hammond et al., 2017).

Focusing on student learning contributes to professional learning by offering school teachers the opportunity to examine the learning processes of their students, to try out new curricula, and study a particular element of pedagogy or student learning in a specific content area (i.e., "I explicitly link the topic of the course to how the students are learning.", Darling-Hammond et al., 2017).

We developed new items for each of the three areas to measure the teaching practice of teacher educators. To ensure the content validity of the items, item wording was developed in collaboration with experts in the field of teacher education, such as researchers who conduct research in this field and experienced teacher educators. Reliability, as measured by internal consistency, yielded a

sufficient Cronbach's alpha (promotion of active and self-regulated learning: 6 items; $\alpha = 0.66$; 21.4% missing data; use of models and making modelling explicit: 4 item; $\alpha = 0.67$; 2.8% missing data; focusing on student learning: 6 items; $\alpha = 0.64$; 1.4% missing data). In the questionnaire, we asked the teacher educators how frequently they engage in certain activities during their lessons, ranging from (1) never to (4) in each class.

2.4. Data analysis

The first research question focuses on the valid and reliable measurement of different task perceptions of teacher educators as teachers of teachers. To answer this question, we conducted an exploratory factor analysis (EFA) using principal axis factoring with promax rotation, which allows factors to be correlated to best achieve a simple structure solution as recommended by Thompson (2008). Simple structure means that each factor is defined by a subset of items that have large loadings relative to the other items and in which each measured item loads highly on only a subset (ideally one) of the common factors (Fabrigar, Wegener, MacCallum, & Strahan, 1999). This analysis enabled us to identify different task perspectives and to probe the conceptual overlap with those dimensions that were identified in qualitative precursor studies (Jonker et al., 2018; Vanassche & Kelchtermans, 2014). According to Floyd and Widaman (1995) and Fabrigar et al. (1999), several criteria for determining the number of factors were considered: Cattell's scree test (Cattell, 1966), Horn's parallel analysis (PA) (Horn, 1965) and Velicer's minimum average partial (MAP) test (Velicer, 1976). Following a review of factor analysis recommendations by Carpenter (2018), all items with factor item loadings of 0.40 and less were excluded from further analysis. Items were also removed when the factor loadings differed by 0.20 or less on two factors. In addition, we have also deleted items that contain absolute loadings higher than 0.30 on two or more factors. Such items were considered to have cross-loadings (Worthington & Whittaker, 2006).

In order to investigate the second and third research questions, we computed bivariate correlations between task perception of teacher educators and components of their professional identity (beliefs about teaching and learning, self-efficacy, and job satisfaction) (research question 2) and between task perception of teacher educators and their teaching practice (promotion of active and self-regulated learning, use of models and making modelling explicit, and focusing on student learning) (research question 3). Following recommendations by Gignac and Szodorai (2016), we considered correlations of 0.10, 0.20, and 0.30 as relatively small, typical, and relatively large, respectively.

EFA and correlation analyses were conducted using M*plus* version 8 (Muthén & Muthén, 2011). Parameters were estimated by maximum likelihood estimation method (ML), and missing data were compensated by full information maximum likelihood method (FIML). FIML estimation methods produced unbiased estimates even in the presence of missing data if the missing process is considered missing at random.

3. Results

3.1. Research question 1: Can teacher educators' perception that their main task is to be a teacher of teachers be measured empirically?

An EFA was performed on the data to investigate the underlying structure of the eleven items in the scale we developed. Based on the initial analysis, four items were deleted following the recommendation of Carpenter (2018) and Worthington and Whittaker (2006). The second analysis was conducted on the remaining nine items using a promax rotation. The Kaiser-Meyer-Olkin (KMO) test still shows an acceptable value of 0.60, and Bartlett's test of sphericity is significant ($\chi^2 = 124.02$, $p < .01$), both indicating that our data are suitable or EFA (Carpenter, 2018). As advised by O'Connor (2000), varied standards were used to determine how many factors would be retained, with the scree test, parallel analysis (PA), and the minimum average partial test (MAP) unequivocally suggesting a two-factor solution (Fig. 3).

Table 1 presents the results of this factor analysis, in which nine items load on two factors that explain 56.6% of the total variance. The eigenvalues of the factors are 2.89 and 2.20. The first of the two factors can be termed "facilitator". This assesses the degree to which a teacher educator interprets his or her task as being primarily a supporter of teachers in their development and facilitating the teachers' reflection on their own teaching. The second factor can be termed "transmitter". This refers to the extent to which a teacher educator perceives his or her tasks as being primarily a transmitter of professional knowledge.

The bivariate correlation between the two scales is $r = -0.01$ ($p = .91$) indicating that there is no systematic relationship between "facilitator" and "transmitter". A somewhat simplified interpretation of this finding is that all four possible combinations of values on the factor "facilitator" (below/above average) and the factor "transmitter" (below/above average) can be found in approximately equal proportions in the present sample of teacher educators.

Means, standard deviations, and reliabilities of the two scales are also shown in Table 1. The reliability analysis of the two scales shows satisfactory internal consistency with a reliability of $\alpha = 0.78$ for the facilitator construct and $\alpha = 0.75$ for the transmitter construct. At scale levels, 1.4% of the participants had missing data on the scale facilitator and none had missing on the scale transmitter.

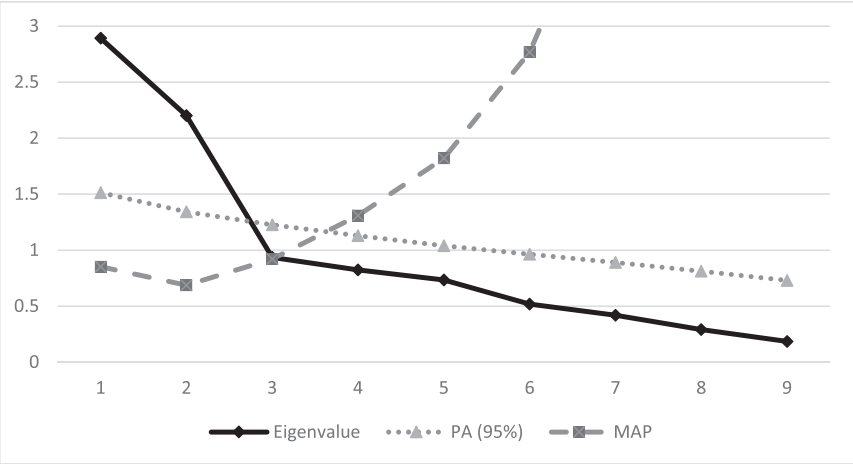
3.2. Research question 2: How are teacher educators' perceptions of their tasks as a teacher of teachers related to other components of their professional identity, such as beliefs about teaching and learning, self-efficacy, and job satisfaction?

In order to investigate the relationship between teacher educators' task perception and other components of their professional identity, we computed bivariate correlation analyses. As shown in Fig. 4, the bivariate correlations were relatively small to typical in size. The results reveal a significant positive correlation between "facilitator" and self-efficacy, constructivist-oriented beliefs, as well as job satisfaction and also a significant positive correlation between "transmitter" and transmissive-oriented beliefs.

The results suggest that teacher educators who perceive their task as supporting teachers in their development show higher ratings for self-efficacy and also higher satisfaction with their work as teacher educators. In addition, teacher educators who perceive their task as transmitting knowledge tend to show higher values for transmissive-oriented beliefs.

3.3. Research question 3: How are teacher educators' perceptions of their tasks as a teacher of teachers related to their teaching practice?

Analogously to the previous procedure, we also computed bivariate correlation analyses. As shown in Fig. 4, the bivariate correlations were typical to relatively large in size. The results reveal a significant positive correlation between "facilitator" and promotion of active and self-regulated learning, use of models and making modelling explicit, and focusing on student learning. We



Note: Eigenvalue = empirically observed eigenvalues; PA = parallel analysis; triangles indicating results for eigenvalues obtained from simulated data; MAP = minimum average partial test, squares represent average partial correlation for each factor; for a better representation, the coefficient was multiplied by the factor 10; results for factor 7-9 are larger than 3 and are not shown for reasons of better presentation.

Fig. 3. Results of scree test, Parallel Analysis, and Minimum Average Partial test for determining number of factors in the exploratory factor analysis.

Table 1
Results of the exploratory factor analysis (EFA) and resulting scale sum scores.

	Item	Factor 1 "facilitator"	Factor 2 "transmitter"
1	My primary task is to lay the foundation for the independent development of the participants after the training.	**.56**	-.05
2	My central task is to support the self-reflection of the participants.	**.73**	-.06
3	I see myself mainly as a moderator of the development process of my participants.	**.45**	.23
4	My tasks also include supporting the participants after the end of a course.	**.56**	-.07
5	One of my core tasks is to build a trusting relationship with the participants.	**.59**	.02
6	The heart of my work is the transfer of professional knowledge to the participants.	.10	**.43**
7	I see myself primarily as an expert in my field.	-.07	**.69**
8	I see myself first and foremost as a professional contact person.	.09	**.79**
9	One of my tasks is to provide the participants with detailed subject knowledge.	-.16	**.74**
Descriptives for Scale Scores[a]			
	Number of items	5	4
	M	3.16	3.11
	SD	.51	.57
	Cronbach's alpha	.78	.75

Note: The numbers in bold represent the maximum loading of a certain item (e.g., items 1 to 5 load higher on Factor 1 than on Factor 2).
[a] The scale score was computed as the mean across item scores obtained from a four-point Likert scale ranging from (1) strongly disagree to (4) strongly agree.

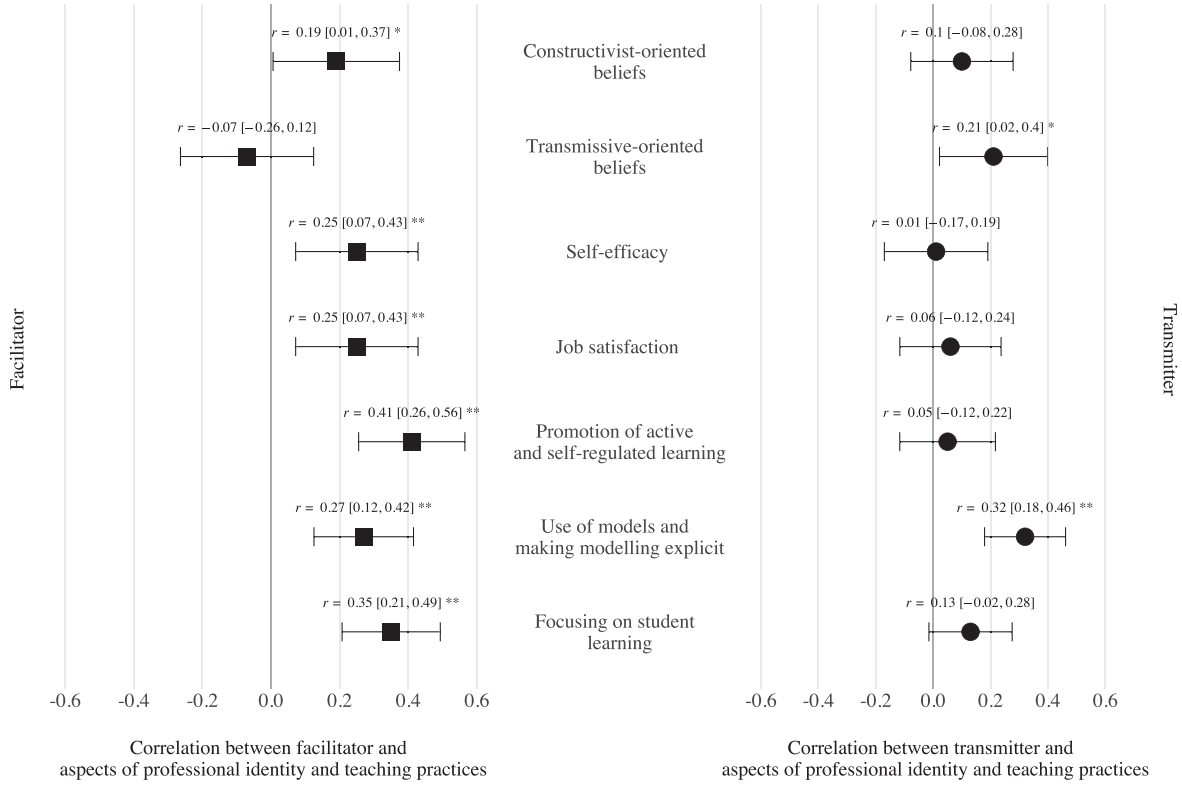
also found a significant positive correlation between "transmitter" and use of models and making modelling explicit.

The results suggest that teacher educators who interpret their task as supporting teachers in their development are positively associated with the teaching practices described in the research literature about effective teacher professional development.

4. Discussion

Teacher educators contribute significantly to the development of in-service teachers' professional competencies and instructional quality through their training of in-service teachers (European Commission, 2013; Liston et al., 2008). However, there has been little research on this group of educators in general (Lunenberg et al., 2014) and little research of a quantitative nature in particular. In this quantitative study, we addressed this research gap by examining aspects of the professional identity of teacher educators and the relationship between professional identity and teaching practices. Using a newly developed instrument to measure the task perceptions of teacher educators, this study found that teacher educators' perceptions of their main task fall into two categories: "facilitator" and "transmitter" (research question 1). In our analysis, we illustrated how these perceptions are related to other components of professional identity (research question 2). We showed specifically that teacher educators who perceive their tasks more from a learner-centered perspective show higher levels of constructivist-oriented beliefs, self-efficacy, and job satisfaction, whereas teacher educators who perceive their tasks more from an instructor-centered point of view show higher levels of transmissive-oriented beliefs. We also examined relationships between the task perceptions of teacher educators and the ways they teach in-service teachers (research question 3). Individuals who considered their main task to be supporting the professional development of teachers in general more often reported integrating aspects of high-quality professional development into their courses, such as the promotion of active and self-regulated learning (see Darling-Hammond et al., 2017).

Our study builds on previous qualitative research and integrates these findings to arrive at new insights and in-depth knowledge on teacher educators. First, we have contributed an innovative approach to this field of research. Our study connects to previous qualitative research in identifying relevant target constructs. It



Note: Whiskers in this plot represent the 95% confidence interval. *p<.05. *p<.001.

Fig. 4. Bivariate correlation of teacher educators' task perception (left: facilitator, right: transmitter) with components of professional identity and teaching practices.

extends the existing research by using a quantitative, large-scale approach to investigating teacher educators. This is urgently necessary; as Lunenberg et al. (2014) noted in their review study, "solid quantitative studies are almost completely absent in the literature" (p. 72). To fill this gap, we have developed a new instrument to capture different task perceptions of teacher educators and presented first evidence of its validity and reliability. In line with qualitative studies on teacher educators as teachers of teachers (Jonker et al., 2018; Vanassche & Kelchtermans, 2014), we have differentiated various perspectives on this specific task. The new measure of this perception can be used as a basis for monitoring the task performance of different groups of teacher educators (university-based, school-based) and for intercultural comparisons. It provides the basis for further studies, which could go beyond our study, to investigate how task performance is related to other criteria of professional success of teacher educators (e.g. effects on teacher learning). Furthermore, it could be a powerful assessment tool for use in the context of self-study, evaluations, or coaching during in-service teachers' professional development (Ping, Schellings, & Beijaard, 2018).

Second, this study indicates that it might be worthwhile to explore the individual components of professional identity to better understand how educators use teaching strategies in teacher training. In line with Jonker et al. (2018) and Vanassche and Kelchtermans (2014), we have demonstrated that specific task perceptions of teacher educators are related to specific teaching strategies. Due to our cross-sectional research design, we were not able to identify what was first: task perception or teaching strategy. However, similar results from teacher research have shown that teachers' beliefs and assumptions can predict their behavior in the classroom. (e.g., Kistner, Rakoczy, Otto, Klieme, & Büttner, 2015; Steinbach & Stoeger, 2016). Our study enhances the existing knowledge by using standardized measurement instruments and a representative sample to illustrate how strongly task perception of teacher educators is related to the characteristics of teacher professional development courses, which are considered in research to be important for teacher learning, but also subsequently for student achievement. If we accept, nevertheless, that being a "facilitator" is associated with a higher level of course quality (as defined by Darling-Hammond et al., 2017), then it would be necessary to strengthen this task perception in the training programs for teacher educators and over the course of their careers through better opportunities for professional development.

Apart from several strengths, our study also has some limitations. We focused specifically on concepts of professional identity, as many other studies in this field of research have done (e.g., Jonker et al., 2018), taking into account that other theoretical approaches might also be suitable to examine professional behavior of teacher educators. To better understand what is enabling teacher educators to teach effectively, future research could draw on theoretical approaches from past research on the effectiveness and quality of teachers and use these in attempting to predict teacher educators' practices. One promising approach is the model of teachers' professional competence introduced by Baumert and Kunter (2013). In contrast to the framework used in this study, the Baumert and Kunter (2013) model focuses on the cognitive and motivational prerequisites that the individual brings to teaching. In this context, professional knowledge plays an important role in predicting the quality of teachers, something that has not been considered in previous research on teacher educators so far. A

second limitation of our study is that it was conducted in just one federal state in Germany. National and international replications of this study are necessary to test the generalizability of our conclusions. To further corroborate the evidence that we present in this study, future research could also include a mixed-methods and multi-perspective approach, using not only self-reports but also external evaluations of the teaching practice of teacher educators, for instance, by asking participating teachers about courses they have attended.

In addition to potential directions for future research, the findings of this study also imply recommendations for practice. Since our results reveal the importance of components of professional identity, teacher educators need training programs that not only prepare them for their tasks but also help them to actively and reflectively build a professional identity. In addition, building a professional identity could be seen as a permanent task of teacher educators. To carry out this task successfully, teacher educators need the resources and support to be able to deal with the question of what it means to be a teacher of teachers in a sustainable way.

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Declaration of competing interest

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