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Professional identity of pre-service teachers: actual and designated identity profiles and their relationship to teacher education programs

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In this study, we investigated the professional identities of 490 pre-service teachers (PSTs) at the University of Hamburg, Germany. By distributing 100 percentage points, the PSTs assessed the relevance of the roles of subject specialist (SS), didactician (DD), and pedagogue (PD) for themselves currently (actual identity) and for an ideal teacher in different school types (designated identity). A theory-based non-hierarchical cluster analysis distinguished seven profiles: three main role profiles, three dual role profiles, and one balanced profile. The distribution of the PSTs' actual identities across these seven profiles showed expectedly large interindividual diversity. The most frequent actual identity profiles were those for which the DD and PD roles were particularly relevant (dual role PD/DD profile and balanced profile). The distribution of PSTs across profiles supported the hypothesis that actual identity is related to the type of teacher education program being followed: upper secondary education PSTs were more strongly characterized by profiles that emphasized the SS role (main role SS and dual role SS/DD profiles) than the other PSTs, and special education PSTs were more strongly characterized by profiles that emphasized the PD role (main role PD profile, dual role PD/DD, and PD/SS profiles) than the other PSTs. The designated identities, on the other hand, showed greater consensus among the PSTs. The profiles that best characterized PSTs were the dual role PD/DD profile and the balanced profile. In contrast, the two main role SS and DD profiles and the dual role PD/SS profile were irrelevant as designated identities. A comparison of PSTs' actual identities with their designated identities showed that a third of the PSTs had the same profile. The diversity of professional identities and the factors in teacher training that influence them should be investigated more closely.

KEYWORDS

professional identity, teacher identify, professional role, pre-service teachers, teacher education

1. Introduction

Teachers' professional identity has become of increasing relevance in educational research in recent decades, as it is considered to play a central role in teachers' professional performance (Philipp, 2007). Sachs (2005) refers to teacher identity as the core of the teaching profession, as it enables teachers to "construct their own ideas about "how to be," "how to act," and "how to understand" their work and place in society" (Sachs, 2005, p. 15). According to Beijaard et al. (2004), teacher identity is believed to significantly influence the choices teachers make regarding their teaching methods, the subjects they teach or their interactions with student. Hammerness et al. (2005) argue that teacher identity can influence whether and how teachers pursue professional development opportunities. A professional identity is a dynamic construct that defines professional beliefs about the characteristics of one's professional role (Reusser and Pauli, 2014; Fischer and Ehmke, 2019) and develops in the tension between personal attitudes and professional demands and expectations (Beauchamp and Thomas, 2009). This development is often described as a learning process that closes the gap between the current perception of one's professional identity and a perceived ideal professional identity (Sfard and Prusak, 2005). Since some of this teaching and learning occurs in university education, an in-depth examination of both current and ideal professional identities appears to be of importance (MacLure, 1993). Beijaard et al. (2004) and Izadinia (2013) show in review papers that professional identity has been studied mainly from a theory-based perspective, using different theoretical frameworks and focusing on different aspects. For example, few quantitative studies have focused on the relationships between institutional contextual factors and the development of pre-service teachers' professional identities (e.g., Lamote and Engels, 2010; Brovelli et al., 2011). In particular, few studies have investigated the relationships between current and ideal professional identities (e.g., Heyd-Metzuyanim, 2019; Molfino and Ochoviet, 2019; Meyer et al., 2021). In the study described in the paper, we focus on these questions and examine whether previous findings on in-service teachers are transferable to pre-service teachers. The research goal is to determine whether there are commonalities or differences between the current and ideal identities of pre-service teachers from different teaching education programs. The findings can support the development and implementation of university programs that help pre-service teachers to engage in a productive process of constructing their professional identity.

2. Theoretical framework and central conceptualizations

Along with subject-specific pre-requisites, professional beliefs are described as an important facet of teachers' professional competence (Hoy et al., 2006; Kunter et al., 2011; Blömeke, 2012). In particular, there is evidence that teachers' beliefs can impact instructional quality and, thus, students' learning (for mathematics, see Dubberke et al., 2008; Blömeke et al., 2017; Yang et al., 2020; for an overview see Depaepe and König, 2018). Reusser and Pauli (2014) systematized different areas of professional beliefs and distinguished (1) epistemological beliefs about learning content and processes, (2) person-related beliefs about teachers and students, and (3) context-related beliefs about schools and society. The second subject area was central to the present study, and Fischer and Ehmke (2019), in their theoretical model of teachers' professional beliefs, specifically included beliefs relating to "one's own understanding of the teacher role or teacher identity and self-perception" (Fischer and Ehmke, 2019, p. 415). There is a consensus that professional identity is a dynamic construct formed through, among other things, active engagement with professional experiences (Beijaard et al., 2000) and the development of professional knowledge (Antonek et al., 1997; Beijaard et al., 2004). Nowadays, identity formation is conceived as an ongoing process that involves the interpretation and reinterpretation of experiences as one lives through them (Kerby, 1991), and Beijaard et al. (2004) described identity formation as a complex equilibrium between personal self-image and professional roles. Sfard and Prusak (2005) proposed the terms *actual identity* and *designated identity*: "actual identity, consisting of stories about the actual state of affairs, and designated identity, composed of narratives presenting a state of affairs which, for one reason or another, is expected to be the case, if not now, then in the future" (p. 16). Designated identities are usually the product of collective storytelling, to which institutional narratives contribute, as do one's own experiences as a learner in school (Beauchamp and Thomas, 2009), which is why designated identities are considered more inert and context-independent than actual identities (Sfard and Prusak, 2005), but not immutable. Because designated identities "give direction to one's actions and influence one's deeds to a great extent" (Sfard and Prusak, 2005, p. 17), and because learning processes close the gap between actual identity and designated identity (Sfard and Prusak, 2005), teacher education is increasingly emphasizing the formation of professional identity (Sachs, 2005; Hoban, 2007; Beauchamp and Thomas, 2009). Various sub-identities can be identified, which, according to Mishler (1999), can both conflict and harmonize. Research studies that have adopted this approach have described, for example, the role of a teacher as an instructor versus an educator (Müller et al., 2008) or have modeled the teachers' professional identities as mathematicians, educators, and professional experts (Bromme and Strässer, 1991). Current approaches (e.g., Brovelli, 2014) draw on Shulman (1987) three domains of professional knowledge to describe professional roles and distinguish between (1) subject specialists (SSs), (2) didacticians (DDs), and (3) pedagogues (PDs). Subject specialists are teachers who perceive the implementation of their profession mainly from a subject-specific perspective. Didacticians are teachers who perceive the implementation of their profession mainly under the aspects of planning, implementation, and reflection of teaching and learning processes in the respective subject. Pedagogues are teachers who perceive the implementation of their profession mainly in terms of supporting the individual, social, emotional, and moral development of learners. These different pedagogical approaches guided the operationalization of professional identity in the present study since it is closely linked to the curricula and organization of teacher education programs.

3. State of research

In recent years, two major reviews of the research have summarized the state of research.

Beijaard et al. (2004) reported the results of 22 studies on teachers' professional identity and identified 9 studies that examined the formation of professional identity from a theoretical perspective or using qualitative methods, mainly focusing on in-service teachers. Beijaard et al. (2004) made the case that (1) the development of professional identity is shaped by various influences (e.g., knowledge, biographical experiences, self-perceptions, self-location in the professional community, and teaching experiences), as well as how these influences are dealt with, and (2) the formation of professional identity can be described as the integration of different, sometimes conflicting, roles. However, they also pointed to the lack of a unified conceptualization of professional identity and an insufficient empirical basis.

In her review paper, Izadinia (2013) identified 29 empirical studies on the professional identity of pre-service teachers and addressed the studies' research questions, methods, and key findings. Eight of these studies examined the contextual factors that influence the formation of professional identity, making them particularly relevant to this study. The qualitative studies primarily examined the tension between actual identity and designated identity (Samuel and Stephens, 2000; Legard Larson and Kalmbach Phillips, 2005) that influences the formation of professional identity. Schepens et al. (2009), in a quantitative study of early career teachers, identified a significant influence of school type (pre-school, primary school, and lower secondary school) on professional identity, operationalized by the three subdomains of teaching efficacy, professional orientation, and teaching commitment, but with small effect sizes. Lamote and Engels (2010) reported on a survey of three cohorts of pre-service teachers for lower secondary education in which they operationalized professional identity using four self-assessment scales (professional orientation, task orientation, teachers' self-efficacy, and commitment to teaching). They found a significant effect of study time on task orientation, such that pre-service teachers with more study experience developed a more student-centered perspective. In summary, Izadinia (2013) identified four research-dominant factors influencing the development of pre-service teachers' professional identities: reflective activities, learning communities, (prior) experiences, and context, although university contextual factors have rarely been studied. Furthermore, Izadinia (2013) noted that previous research has mainly used sociological theoretical frameworks, which appear to be limited in their potential to incorporate influencing factors at a broader level. In the following section, we report the results of the detailed studies.

3.1. Profiles and development of professional identity

In a study of 80 experienced secondary school teachers, Beijaard et al. (2000) reported that many in-service teachers undergo a shift from subject specialists to didacticians and pedagogues during their professional careers. Of the in-service teachers interviewed, 69% showed significant differences between the retrospective (t1) and the current (t2) self-perceptions of their professional identities, which were operationalized by assigning 100 percentage points to the three subject specialist, didactician, and pedagogue roles. Five groups of teachers could be distinguished: subject-matter, didactical, and pedagogical experts, a balanced group, and a group with two strongly pronounced roles (which pre-dominantly emphasized either the subject specialist or the didactician role). The proportion of subject-matter experts decreased from 59 (t1) to 35% (t2), the proportion of didactical experts increased from 7 (t1) to 12% (t2), and the proportion of pedagogical experts increased from 3 to 4%. The proportion of the balanced group doubled from 15 (t1) to 30% (t2), and the proportion of the group with two strong roles increased from 16 (t1) to 19% (t2). Meyer et al. (2021), using the same instrument on a sample of 454 pre-service teachers, reported that pre-service teachers at bachelor level rated the relevance of the subject specialist role (M = 37.0%) higher and the relevance of the didactician role (M = 29.5%) lower than pre-service teachers at master level (M_{SS} = 27.5%, M_{DD} = 34.5%). Further studies on the professional beliefs of in-service teachers have suggested that changes in knowledge can lead to changes in beliefs (Hachfeld et al., 2012; Hartwig et al., 2017).

3.2. Connections between the teaching education program or the type of school and professional identity

Brovelli et al. (2011) examined 404 pre-service teachers for secondary education from different universities regarding their professional identities, which were assessed with three self-evaluation scales on the relevance of the subject specialist, didactician, and pedagogue roles using a five-point Likert scale (1 = low, 5 = high). The reported mean values were high overall (M_{SS} = 3.9, M_{DD} = 4.1, M_{PD} = 4.4), and a significant relationship was found between the education program (integrated program versus separate-discipline program) and professional identity. Pre-service teachers studying science as an interdisciplinary subject felt more like subject specialists and less like didacticians or pedagogues compared to pre-service studying separate subjects. Meyer et al. (2021) examined the professional identities of 454 pre-service teachers from different teacher education programs with different subject combinations, asking them to assign 100 percentage points to the three professional subject specialist, didactician, and pedagogue roles. They reported significant relationships of small effect size such that the relevance of the subject specialist role was rated higher by pre-service teachers for upper secondary education (M = 36.7%) than for pre-service teachers for primary and lower secondary education (M = 28.5%).

3.3. Designated identities of teachers

So far, only a few studies have examined the role expectations and designated identities of teachers or whether actual identity develops toward the individual designated identity as a teacher. Meyer et al. (2021), in a study of 454 pre-service teachers (who distributed 100 percentage points to the subject specialist,

didactician, and pedagogue roles), reported that the designated identity of pre-service teachers for primary level education differed greatly from that of pre-service teachers for upper secondary education: for the latter, the subject specialist role was dominant (M_{SS} = 40.6%, M_{DD} = 33.4%, M_{PD} = 26.1%) and for the first, the pedagogue role was dominant (M_{SS} = 18.5%, M_{DD} = 32.6%, M_{PD} = 48.9%). The ratings largely revealed consensus (i.e., pre-service teachers with different teaching education programs, subject combinations, or study phases had pre-dominantly the same designated identities for the two school types they were studying for). Furthermore, it was apparent that pre-service teachers at master level deviated less from their stated school-specific designated identities than pre-service teachers at bachelor level; to summarize, a development in the direction of the individual designated identity could be identified. Heyd-Metzuyanim (2019) and Molfino and Ochoviet (2019) reported partial proximity processes based on case studies involving one experienced mathematics teacher and four pre-service mathematics teachers, respectively, and emphasized that mentor teachers or teacher educators play a key role in the transition process of pre-service teachers from an actual identity to a designated identity.

4. Research questions and hypotheses

Based on the current state of the research, we formulate two research goals and associated research questions (RQs) and hypotheses (Hs).

The first research goal aims to replicate the professional identity profiles of in-service teachers identified by Beijaard et al. (2000) among pre-service teachers. The first RQ is therefore as follows: Is it possible to replicate the seven different professional identity profiles and how can these profiles be characterized? We assume that pre-service teachers, who are just beginning to develop their professional identities, will display more diverse actual identity profiles than in-service teachers, so that all seven theoretically possible profiles (i.e., three main role profiles: subject specialist, didactician, pedagogue, three dual role profiles: subject specialist/didactician, pedagogue/subject specialist, pedagogue/didactician, and one balanced profile) will be found in relevant sample size (at least 5% of the sample; H1a). We assume a structural similarity of the three main role profiles, each with one strong role and two weak roles (H1b). We also assume that, in each of the three dual role profiles, the two roles will be similarly pronounced (H1c). In the balanced profile, we expect all three roles to be equally distributed (H1d).

The second research goal aims to identify relationships between actual and designated professional identity profiles and the teacher education program. The second RQ is therefore: To what extent is the teaching education program related to the professional identity profile typical of a pre-service teachers' actual identity? The aforementioned studies (Schepens et al., 2009; Brovelli et al., 2011; Meyer et al., 2021) point to possible relationships. Furthermore, following the studies by Antonek et al. (1997) and Beijaard et al. (2004), we expect relationships between teacher education programs and actual identities. In Germany, where we conducted the present study, pre-service teachers achieve their credentials through different education programs. Those preparing to become upper secondary school teachers (who typically teach in grades 5 through 13) tend to attend more subject-specific courses than those preparing to become primary and lower secondary school teachers (who typically teach in grades 1 to 10) and tend to attend relatively more didactical and pedagogical courses. Those preparing to become teachers for special education attend the most pedagogical courses and the fewest subject-specific and didactical courses. Since the three teacher education programs are so different, we expect that more pre-service teachers for upper secondary education will have profiles that emphasize the subject specialist role (main role subject specialist profile or dual role subject specialist/didactician profile) than students on the other education programs (H2a). In addition, we expect that more pre-service teachers for special education will have profiles that emphasize the pedagogue role (main role pedagogue profile, dual role pedagogue/subject specialist or pedagogue/didactician profiles) than pre-service teachers of the other education programs (H2b). We cannot formulate equivalent hypotheses for pre-service teachers for primary and lower secondary schools as the subject-specific, didactical and pedagogical courses are similar in their quantity and therefore do not suggest a particular focus for this teacher education program.

The third RQ targets the relationship between PSTs' pre-service teachers' actual and designated professional identities: To what extent do the distributions of pre-service teacher's professional role profiles differ in terms of actual identity and designated identity? According to Sfard and Prusak (2005), a teacher's actual identity develops toward the designated identity over the course of professional development, and this change in identity is primarily fostered by practice experiences (Richardson, 2003; Leko et al., 2015). Given that teacher traineeships, which follows university graduation in Germany, provide the most extensive practical experiences in teacher education and that pre-service teachers at the beginning of the second semester are preparing for their first school internships, we assume that the evaluated pre-service teachers would still be at an early stage of developing their actual identities and would not yet have developed their designated identities. Based on the findings of, among others, Beijaard et al. (2000) and Meyer et al. (2021), who reported the development of actual identity from subject specialists to didacticians and pedagogues, we hypothesize, on the one hand, that more pre-service teachers show an actual identity profile that strongly emphasize the subject specialist role (main role subject specialist profile) than such a designated identity (H3a). On the other hand, we hypothesize that more pre-service teachers have an actual identity profile that strongly emphasize the pedagogue and didactician roles (dual role pedagogue/didactician or balanced profiles) than such a designated identity (H3b). In addition, the sub-question will be explored as to how many pre-service teachers have an actual identity and a designated identity with the same profile and how strongly that depends on the teacher education program or the type of school the pre-service teachers are aiming for.

5. Materials and methods

5.1. Data collection and sample

As part of the project "Professional teachers' actions to promote subject-based learning under changing social conditions" (ProfaLe),[1] we collected pre-service teachers' self-evaluations of their actual and school-specific designated identities at the University of Hamburg, Germany. A total of 490 pre-service teachers (of 533, 91.9%) participated in the online survey in 2022 at the beginning of the summer semester, which was a mandatory component of seminars at the beginning of the school internships. All participants were in their second study semester at master level. The Distribution across the three teacher education programs was as follows: upper secondary education (N = 213, 43.5%), primary and lower secondary education (N = 174, 35.5%), and special education (N = 103, 21.0%). The median age of the participants was 25 years, and the majority (N = 369, 75.3%) were female. **Table 1** presents the key sociodemographic and study-related characteristics of the sample, grouped by teacher education program.

5.2. Instrument

The instrument was developed by Bromme and Strässer (1991) and used among others by Beijaard et al. (2000), Brovelli et al. (2011), and Meyer et al. (2021). The participants of the study received information in advance about the three professional roles, as follows (cf. Brovelli, 2014):

"In this question, the teaching profession is divided into the roles of subject specialist, didactician, and pedagogue. By this, we mean the following:

- Subject specialists: Teachers who perceive the exercise of their profession mainly from a subject-specific perspective.
- Didacticians: Teachers who perceive the exercise of their profession mainly under the aspects of planning, implementation, and reflection of teaching and learning processes in the respective subject.
- Pedagogues: Teachers who perceive the exercise of their profession mainly in terms of supporting the individual, social, emotional, and moral development of learners."

Subsequently, the following instructions were given:

"Now please assign a total of 100 points to the three roles mentioned. The higher the score, the more pronounced the respective roles are compared to the other roles.

1. This is how pronounced the roles of the teaching profession are for me right now . . ."

The instructions were delivered digitally by assigning three sliders to the roles, each of which had a range of values from zero to 100 points. The three sliders had to add up to 100.

After we received the self-evaluations of actual identity, we collected evaluations of school-specific designated identities on a subsequent page with the following instructions:

- "This is how pronounced the roles of the teaching profession should ideally be for a teacher who works in the following type of school . . ."

The shown school types were based on the previously indicated teaching levels, namely, pre-service teachers for primary and lower secondary education assigned their evaluations for a teacher at an elementary school, pre-service teachers for upper secondary education gave them for a teacher at an upper secondary school, and pre-service teacher for special education assigned them for a teacher working with special education students. Subsequent changes in the actual identities were technically prevented to exclude any influence of the assessments of the actual identity by the assessment of school-specific designated identities.

5.3. Analysis and evaluation of the data

To examine the self-evaluations of actual and designated identity together in a cluster analysis, we added the designated identity information to the dataset of actual identity information as virtual cases, resulting in a dataset with 980 (2 × 490) cases.

To analyze the data, we conducted a non-hierarchical cluster analysis, assuming seven clusters based on the existing research findings (Beijaard et al., 2000). Specifically, we conducted a K-means cluster analysis (Bortz and Schuster, 2010) and, based on the theoretical assumptions (Beijaard et al., 2000), we chose the following initial configurations: main role profiles (80, 10, 10), (10, 80, 10), (10, 10, 80), dual role profiles (40, 40, 20), (40, 20, 40), (20, 40, 40), and balanced profile (33, 33, 34).[2] The cluster analysis converged in seven steps.

We performed Chi-squared tests to detect overall frequency differences. To test the null hypotheses for independence, we analyzed the condensed contingency tables corresponding to the hypotheses (Bortz et al., 2008). Because of the directed hypotheses, the significance tests were one-sided. The significance level was set at $p < 0.05$ for all the analyses. For calculating the effect sizes, we used the following conventions for Cramer's V: > 0.1 = small effect, > 0.3 = medium effect, > 0.5 = large effect (Cohen, 2013) and for Cohen's d: > 0.2 = small effect, > 0.5 = medium effect, > 0.8 = large effect (Cohen, 1988). Due to the size of the sample, we interpreted only significant results that had at least a

1 The project "Professionelles Lehrerhandeln zur Förderung fachlichen Lernens unter sich verändernden gesellschaftlichen Bedingungen" [Professional teachers' actions to promote subject-based learning under changing social conditions (ProfaLe)] at the University of Hamburg is funded as part of the joint "Qualitätsoffensive Lehrerbildung" (Teacher education quality campaign) run by the German federal government and the German states using funds from the German Federal Ministry of Education and Research (BMBF).

2 To check the stability of the cluster solution, we performed several K-means cluster analyses with deviating initial values. The cluster centroids of the respective final solutions differed only slightly from the presented solution, with deviations in a range of 0–5. The mean matches of the cluster assignments for the individuals ranged from 95 to 100%.

small effect size. We performed all calculations using IBM® SPSS® Statistics version 28 software.

6. Results

6.1. Results for RQ1 on the quantities and qualities of professional identity profiles

Table 2 shows the absolute and relative frequencies of pre-service teachers in the clusters in relation to their actual and designated identities. In terms of actual identity, slightly less than half of all pre-service teachers fell into the balanced (N = 124, 25%) and pedagogue/didactician (N = 113, 23%) clusters. Fewer pre-service teachers fell into the other two dual role clusters (subject specialist/didactician, N = 66, 14%; pedagogue/subject specialist, N = 54, 11%). In each case, 9–10% of the pre-service teachers fell into the three main role clusters: subject specialist (N = 43, 9%), didactician (N = 42, 9%), and pedagogue (N = 48, 10%). The relative frequencies of pre-service teachers in each actual identity cluster differed significantly[3] from 5%, supporting H1a, which states that the professional identity of pre-service teachers at master level is not clearly pronounced, but rather quite diverse.

For the designated identity, the two clusters with the most pre-service teachers were again the balanced (N = 169, 31%) and pedagogue/didactician (N = 152, 31%) clusters. In contrast to actual identity, the next two most frequent clusters were the subject specialist/didactician (N = 61, 12%) and pedagogue (N = 64, 13%) clusters. In each case, only a maximum of 4% of all pre-service teachers fell into the remaining two main role clusters (subject specialist, N = 10, 2%; didactician, N = 13, 3%) and the pedagogue/subject specialist cluster (N = 21, 4%).

Figure 1 presents the means and standard errors for the distributions of the three roles for each of the seven clusters. The results are presented in detail below. The subject specialist cluster had a high mean for the subject specialist role (M = 67.8, SE = 1.34) and low means for the didactician (M = 18.9, SE = 0.97) and pedagogue (M = 13.3, SE = 1.00) roles. The pedagogue cluster was nearly a mirror image of the subject specialist cluster and had a high mean for the pedagogue role (M = 67.0, SE = 0.86) and a low mean for the didactician (M = 19.8, SD = 0.64) and subject specialist (M = 13.2, SE = 0.57) roles. The didactician cluster, on the other hand, had a lower mean value for the name-giving didactician role (M = 51.2, SE = 0.86) than the other main role clusters, and the mean values for the subject specialist (M = 23.2, SE = 0.95) and pedagogue (M = 25.62, SE = 0.97) roles were similarly high and higher than for the other main role clusters. Overall, the values for the dominant roles of the main role clusters were not as high as expected or as specified by the initial configuration of the cluster analysis, but they are in line with H1b, being significantly[4] higher than for the other roles.

In the subject specialist/didactician cluster, the subject specialist role had the highest mean value (M = 46.3, SE = 0.46), and the mean values for the didactician (M = 32.3, SE = 0.57) and pedagogue (M = 21.3, SE = 0.50) roles were lower in descending order. The pedagogue/subject specialist cluster had the highest mean for the pedagogue role (M = 46.2, SE = 0.74), the second highest for the subject specialist role (M = 35.0, SE = 0.77), and the lowest for the didactician role (M = 18.9, SE = 0.57). For the pedagogue/didactician cluster, the mean value for the pedagogue role (M = 47.9, SE = 0.33) was the highest, and the mean values for the didactician (M = 34.1, SE = 0.36) and subject specialist (M = 18.0, SE = 0.33) roles were lower in descending order. For all dual role clusters, we observed a "staircase" arrangement of the mean values; no two roles were similarly pronounced, as we had assumed, but the mean values for the two dominant roles differed significantly[5] in each cluster. Therefore, we can state that H1c was not supported by the data.

The mean values for the balanced cluster corresponded most clearly to the initial values of the cluster analysis. All mean values were very similar (M_{SS} = 32.8, SE_{SS} = 0.25; M_{DD} = 33.1, SE_{DD} = 0.20; M_{PD} = 34.1, SE_{PD} = 0.21). The differences between the means for the three roles were partially significant,[6] but with effect sizes that had no practical relevance, so H1d was supported.

3 We performed seven one-tailed t-tests with test value.05. All the results were significant, t = (2.82; 10.33), $p < 0.002$, d = (0.13; 0.47).

4 We performed two one-tailed t-tests for each main role cluster. All the results were significant, t = (16.39; 41.03), $p < 0.001$, Cohen's d = (2.21; 3.88).

5 We performed a two-tailed t-test for each dual role cluster. All the results were significant, t = (8.04; 22.45), $p < 0.001$, Cohen's d = (0.93; 3.38).

6 We performed three two-tailed t-tests. Two test results were significant: (SS vs. PD), t (292) = 3.23, p = 0.001, Cohen's d = 0.19 and (DD vs. PD), t(292) = 3.09, p = 0.002, Cohen's d = 0.18.

TABLE 1 Sociodemographic and study-related characteristics of pre-service teachers who participated in the online survey in 2022.

Variable	Upper secondary education	Primary and lower secondary education	Special education	Total
N	213	174	103	490
Gender				
Female	144 (67.6%)	143 (82.2%)	82 (79.6%)	369 (75.3%)
Male	69 (32.4%)	29 (16.7%)	20 (19.4%)	118 (24.1%)
Divers, N/A	0	2 (1.2%)	1 (1.0%)	3 (0.6%)
Age (median)	25	26	25	25
Age (min-max)	21–47	22–44	22–47	21–47

Missing values caused smaller values than the total N or 100% in the summation.

TABLE 2 Absolute and relative frequencies of pre-service teachers in the clusters related to actual identity and designated identity (N = 980).

Identity type	Cluster							
	Main role SS	Main role DD	Main role PD	Dual role SS/DD	Dual role PD/SS	Dual role PD/DD	Balanced	Total
Act. ID	43 (9%)	42 (9%)	48 (10%)	66 (14%)	54 (11%)	113 (23%)	124 (25%)	490 (100%)
Des. ID	10 (2%)	13 (3%)	64 (13%)	61 (12%)	21 (4%)	152 (31%)	169 (31%)	490 (100%)

Act. ID, actual identity; Des. ID, designated identity; SS, subject specialist; DD, didactician; PD, pedagogue. Rounding was the reason for the relative numbers not adding up to 100%.

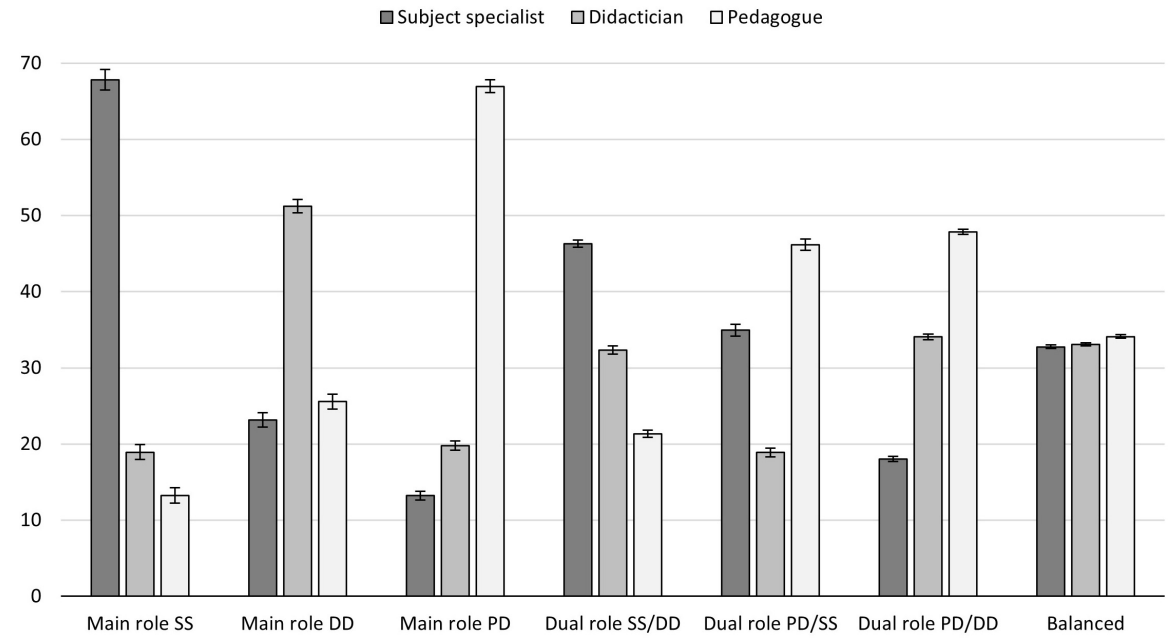

FIGURE 1
Means and standard errors for the three roles within each cluster (N = 980).

6.2. Results for RQ2 on the relationship between actual identity and the teacher education program

The second RQ focused on the relationship between actual identity and the teacher education program. Table 3 shows the absolute and relative frequencies of pre-service teachers in the actual identity clusters, grouped by teacher education program.

To test H2a, which stated that more pre-service teachers for upper secondary education would have a profile that emphasizes the subject specialist role (subject specialist or subject specialist/didactician) than pre-service teachers in the other programs, we conducted a Chi-squared test on the actual identity subject specialist and subject specialist/didactician clusters (=1) versus the rest (=2) and the teacher education program. We identified a statistically significant relationship with a small effect size, $\chi^2(2) = 14.04$, $p < 0.001$, Cramer's V = 0.17. Of the 213 pre-service teachers for upper secondary education, 29.6% (63 participants) were in clusters that emphasized the subject specialist role (subject specialist and subject specialist/didactician). This proportion was significantly higher than for pre-service teachers for primary and lower secondary education [19.5%, 34 out of 174 participants, $\chi^2(1) = 5.58$, $p = 0.009$, Cramer's V = 0.11] and also significantly higher than for pre-service teachers for special education [11.7%, 12 of 103 participants, $\chi^2(1) = 12.90$, $p < 0.001$, Cramer's V = 0.16]. Thus, H2a was supported by the data with small effect sizes in each case.

To test H2b, which stated that more pre-service teachers for special education would have profiles that emphasized the pedagogue role (pedagogue, pedagogue/subject specialist, or pedagogue/didactician) than pre-service teachers in the other education programs, we conducted a Chi-squared test analogously between the actual identity pedagogue, pedagogue/subject specialist, and pedagogue/didactician clusters (=1) vs. rest (=2) and the teacher education program. We observed a statistically significant relationship with a small effect size, $\chi^2(2) = 37.70$, $p < 0.001$, Cramer's V = 0.27. Of the 103 pre-service teachers for special education, 68.9% (71 students) were in a cluster that emphasized the pedagogue role (pedagogue, pedagogue/subject specialist, or pedagogue/didactician). This proportion was significantly higher than for pre-service teachers for upper secondary education (32.4%, 69 of 213 participants; $\chi^2(1) = 37.64$, $p < 0.001$, Cramer's V = 0.28) and also significantly higher than for pre-service teachers for primary and lower secondary education [43.1%, 75 of 174 students; $\chi^2(1) = 17.53$, $p < 0.001$, Cramer's V = 0.19]. Thus, H2a was also supported by the data with small effect sizes in each case.

TABLE 3 Absolute and percentage frequencies of pre-service teachers in the actual identity clusters grouped by teacher education program (N = 490).

Act. ID cluster	Upper secondary education	Primary and lower secondary education	Special education	Hypothesis
Main role SS	24 (11%)	15 (9%)	4 (4%)	H2a
Main role DD	21 (10%)	16 (9%)	5 (5%)	
Main role PD	6 (3%)	15 (9%)	27 (26%)	H2b
Dual role SS/DD	39 (18%)	19 (11%)	8 (8%)	H2a
Dual role PD/SS	25 (12%)	16 (9%)	13 (13%)	H2b
Dual role PD/DD	38 (18%)	44 (25%)	31 (30%)	H2b
Balanced	60 (28%)	49 (28%)	15 (15%)	
Total	213 (100%)	174 (100%)	103 (101%)	

Act. ID, actual identity; SS, subject specialist; DD, didactician; PD, pedagogue. Relative figures not adding up to 100% due to rounding.

TABLE 4 Absolute and relative frequencies of pre-service teachers in the clusters, grouped by actual identity and designated identity, and by teacher education program/school type (N = 980).

Cluster	Upper secondary schools		Primary and lower secondary schools		Special schools		Hypothesis
	Act. ID	Des. ID	Act. ID	Des. ID	Act. ID	Des. ID	
Main role SS	24 (11%)	8 (4%)	15 (9%)	2 (1%)	4 (4%)	0 (0%)	H3a
Main role DD	21 (10%)	9 (4%)	16 (9%)	0 (0%)	5 (5%)	4 (4%)	
Main role PD	6 (3%)	3 (1%)	15 (9%)	29 (17%)	27 (26%)	32 (31%)	
Dual role SS/DD	39 (18%)	58 (27%)	19 (11%)	2 (1%)	8 (8%)	1 (1%)	
Dual role PD/SS	25 (12%)	7 (3%)	16 (9%)	8 (5%)	13 (13%)	6 (6%)	
Dual role PD/DD	38 (18%)	22 (10%)	44 (25%)	87 (50%)	31 (30%)	43 (42%)	H3b
Balanced	60 (28%)	106 (50%)	49 (28%)	46 (26%)	15 (15%)	17 (17%)	H3b
Total	213 (100%)	213 (100%)	174 (100%)	174 (100%)	103 (100%)	103 (100%)	

Act. ID, actual identity; Des. ID, designated identity; SS, subject specialist; DD, didactician; PD, pedagogue. Rounding was the reason for the relative figures not adding up to 100%.

6.3. Results for RQ3 on the relationships between the actual identity and the designated identity

The third RQ addressed the extent to which the distribution of pre-service teachers differed between the actual and designated identity profiles. Table 4 shows the absolute and relative frequencies of pre-service teachers in the clusters for actual identity and designated identity, grouped by teacher education program and studied school type, respectively.

In H3a it was assumed that, regardless of the teacher education program, more pre-service teachers would have the subject specialist profile for actual identity than for designated identity. To test the hypotheses, we conducted a Chi-squared test on the subject specialist cluster (=1) vs. the rest (=2) and the type of identity (actual identity vs. designated identity) for each teacher education program. Of the 213 pre-service teachers at upper secondary education, 11.3% (24 participants) fell into the subject specialist cluster for their actual identity; however, only 3.8% (8 participants) fell into such a cluster for their designated identity. This difference was significant, $\chi^2(1) = 8.65$, $p = 0.003$, Cramer's V = 0.14. Of the 174 pre-service teachers for primary and lower secondary education, 8.6% (15 participants) fell into the subject specialist cluster for their actual identity compared to 1.1% (2 participants) for their designated identity. This difference was also significant, $\chi^2(1) = 10.45$, $p < 0.001$, Cramer's V = 0.17. Of the 103 pre-service teachers for special education, 3.9% (4 students) fell into the subject specialist cluster for their actual identity, but none for their designated identity; this difference was not significant, $\chi^2(1) = 4.08$, $p = 0.061$. Thus, H3a was partially supported.

In the hypothesis H3b it was assumed that regardless of the teacher education program, more pre-service teachers would have profiles that emphasized the pedagogue and didactician roles (pedagogue/didactician and balanced profiles) for their designated identity than for their actual identity. We performed a Chi-squared test on the pedagogue/didactician and balanced clusters (=1) vs. the rest (=2) and the type of identity (actual identity vs. designated identity) for each teacher education program. Of the 213 pre-service teachers for upper secondary education, a combined sample of 46.0% (98 participants) fell into the pedagogue/didactician and the balanced cluster for their actual identity, whereas a combined sample of 60.1% (128 participants) fell into these clusters for their designated identity. This difference was significant, $\chi^2(1) = 8.48$, $p = 0.002$, Cramer's V = 0.14. Of the 174 pre-service teachers for primary and lower secondary education, 53.4% (93 participants) fell into a pedagogue/didactician or balanced cluster for their actual identity compared to 76.4% (133 participants) for their designated identity. This difference was also significant, $\chi^2(1) = 20.19$, $p < 0.001$, Cramer's V = 0.24.

Similarly, of the 103 pre-service teachers for special education, significantly fewer participants possessed an actual identity that fell into the pedagogue/didactician and balanced clusters (44.7%, 46 participants) than a designated identity [58.3%, 60 participants; $\chi^2(1) = 3.81$, $p = 0.035$, Cramer's V = 0.14]. Thus, H3b was supported by the data.

To examine the exploratory sub-question of how many students had an actual and designated identity with the same profile, we generated a cross table of cluster memberships for each teacher education program and read out the absolute frequencies for the main diagonal. For pre-service teachers at upper secondary education, 81 out of 213 participants (38.0%) fell into the same cluster for their actual and designated identities. The balanced cluster (17.8%) and the subject specialist/didactician cluster (8.5%) had the highest correspondence. Among pre-service teachers for primary and lower secondary education, 65 out of 174 students (37.4%) fell into the same cluster for their actual and designated identities (highest correspondences: balanced cluster, 13.2% and pedagogue/didactician cluster, 17.8%). For pre-service teachers for special education, 44 of 103 participants (42.7%) showed a match. The highest matches were found for the pedagogue/didactician (17.5%) and pedagogue (14.6%) clusters.

7. Discussion and conclusion

Based on a cluster analysis, we evaluated in our study the professional identity profiles of pre-service teachers in terms of their current actual identities and the school-specific designated identities of teachers for upper secondary schools, primary and lower secondary schools, and special education schools. In addition, we studied the relationships between actual identity and teacher education programs and examined the relationships between actual identity and school-specific designated identities.

All the theoretically assumed professional identity profiles were empirically validated (H1a). In the case of the main role profiles the respective professional role was dominant (H1b). However, for the dual role profiles the roles were not weighted equally (one of the roles tended to be emphasized), contrary to H1c. The dual roles profiles thus represent weak main role profiles, with the three professional roles moving toward a more balanced profile, according to the study by Beijaard et al. (2000). The fact that the didactician role was not dominant in any of the profiles could be due to the relatively low importance of didactic courses in teacher education programs. As expected, the balanced profile strongly corresponded to the cluster analysis specifications, with equal importance for each role (H1d). The relative frequencies of pre-service teachers in the actual identity profiles indicated the high importance of the balanced profile (124 participants, 25%) for pre-service teachers in general and for pre-service teacher for upper secondary education (60 participants, 28%) in particular, which aligns with Beijaard et al.'s (2000) findings. In contrast to the study by Beijaard et al. (2000), we identified high numbers of pre-service teachers with pedagogue/didactician (113 participants, 23%) and pedagogue/subject scientist (51 participants, 11%) profiles. For the main role profiles, the relative frequencies of pre-service teachers for upper secondary education were congruent with Beijaard et al.'s (2000) findings, with a comparatively high proportion of pre-service teachers having the subject specialist profile (24 participants, 11.3%). Overall, the results indicate that (1) there is great diversity in professional identity profiles among pre-service teachers at the master level, and (2) this diversity seems to be greater than among in-service teachers. This result can be explained by the fact that pre-service teachers may come from a wider range of backgrounds and have different prior experiences that contribute to their diverse professional identity profiles. This suggests that teacher educators should pay close attention to the unique needs and experiences of individual pre-service teachers and provide opportunities for them to explore and develop their professional identities.

H2, regarding the importance of the teaching education program, was supported by the data. In accordance with H2a, more pre-service teachers for upper secondary education (29.6%) had an actual identity profile that emphasized the subject specialist role (subject specialist and subject specialist/didactician) than pre-service teachers for primary and lower secondary education (19.5%) and pre-service teachers for special education (11.7%) (H2a). In addition, consistent with H2b, more pre-service teachers for special education (68.9%) had an actual identity profile emphasizing the pedagogue role (pedagogue, pedagogue/subject specialist, or pedagogue/didactician) than pre-service teachers for secondary education (32.4%) and pre-service teachers for primary and lower secondary education (43.1%). These results confirm Antonek et al.'s (1997), Beijaard et al.'s (2004), and Meyer et al.'s (2021) findings, according to which, on the one hand, professional identity is formed by the influence of knowledge gained during educational or professional studies and, on the other hand, the influence of different expectations regarding the central tasks of the teaching profession on the choice of teacher education program. This implicates that teacher educators need to be aware of the importance of knowledge gained in university courses in the formation of professional identity and teacher education programs should provide opportunities for pre-service teachers to engage in reflective practice, which can help them to integrate the knowledge into their professional identities (Korthagen and Vasalos, 2005). Furthermore, the influence of different expectations regarding the central tasks of the teaching profession on the choice of teacher education program suggests that teacher education programs should provide clear and accurate information about what is expected of teachers in different contexts. This can help prospective teachers to make informed choices about their career paths and the type of teacher education program that best aligns with their professional goals (Darling-Hammond and Hammerness, 2005).

The third RQ dealt with the relationship between actual identity and designated school-specific identities. The results showed that a profile strongly emphasizing the subject specialist role (main role subject specialist) was more frequently found as an actual identity than as a designated identity for pre-service teachers for upper secondary education and pre-service teachers for primary and lower secondary education, in accordance with H3a, but not for pre-service teachers for special education, contrary to H3a. The fact that the latter difference was not significant can be explained by the fact that only 4% (4 participants) of pre-service teachers had a subject specialist profile as an actual identity, which can also be attributed to the very low importance of subject-matter courses

for this education program. However, overall, only a few pre-service teachers across all teacher education programs considered the subject specialist profile ideal, with a maximum of 4% of designated identities falling into this profile, which shows that for the pre-service teachers, being a teacher means more than just transmitting knowledge. The professional identity profiles in which the pedagogue and didactician roles (pedagogue/didactician and balanced profiles) were heavily weighted were the most frequently designated identities: 76.4% of the pre-service teachers for primary and lower secondary education, 60.1% of the pre-service teachers for upper secondary education students, and 58.3% of the pre-service teachers for special education perceived one of these professional identity profiles as ideal, and the differences in the frequencies of the corresponding actual identity profiles were significant. This result supported H3b and thus, together with the previous result, connects with Beijaard et al. (2000) findings, according to which teachers develop their identity from the subject specialist role toward the pedagogue and didactician roles. Furthermore, we found that between 37.4 and 42.7% of pre-service teachers reported an actual identity that matched their designated identity. This result reinforces the previously reported findings revealing that most pre-service teachers at the master's level did not have the chance for extensive practical experiences, which according to the studies by Leko et al. (2015) and Richardson (2003) promoted a development from the actual identity toward the designated identity (Sfard and Prusak, 2005). These results lead to the conclusion that teacher education programs should address this issue by providing more opportunities for pre-service teachers to gain practical teaching experience. In line with Coldron and Smith's (1999) idea of exposing pre-service teachers to a wide range of situations for interacting, developing, and becoming aware of their professional identities, teacher education programs can achieve this by incorporating early or additional internships and classroom observations. This can help pre-service teachers to identify their strengths and weaknesses and to develop a clearer understanding of their professional goals and values.

Finally, some limitations of the present study should be discussed: (1) The instrument used is restricted due to the assignment of 100 percentage points to the three professional roles, the individual self-evaluations are interdependent. However, direct comparison or conflicts between the individual occupational roles (Mishler, 1999) assessed in this way should counteract the consistently high weighting of all three professional roles that occurs when judgments are made based on rating scales (Brovelli et al., 2011). (2) We discussed the self-evaluations of actual identity and school-specific designated identities intensively during the assessment phase to counteract direct mutual influence. The pre-service teachers evaluated their actual identities without knowing that they would subsequently be asked to assess school-specific designated identities. However, due to the chosen sequence, we cannot exclude that the pre-service teachers' evaluations of their actual identities affected their evaluations of school-specific designated identities. (3) Although the presented solution of the K-means cluster analysis proved to be stable, we cannot firmly conclude that other specifications would not have led to different empirical results.

The results presented in this paper indicate the highly diverse professional identity profiles of pre-service teachers at master level. To address these results, teacher education programs should provide pre-service teachers with opportunities for critical reflection on their professional identities. This can help them to develop a deeper understanding of themselves as professionals and to recognize the potential impact of their professional identities on their teaching practices. Reflections on professional identities can also help pre-service teachers to organize their own learning and development processes (MacLure, 1993) and enable educators to affect influencing factors (Olsen, 2008). Since pre-service teachers designated identities can greatly influence their (future) actions and are shaped primarily through teaching and learning processes influenced by their mentors or professional teacher educators (Sfard and Prusak, 2005), university education should aim to clearly support favorable developmental transformation processes.

Data availability statement

The raw data supporting the conclusions of this article will be made available on demand by the authors.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

DM: analysis of the data, participation in data sampling, and development of the first draft of the manuscript. JD: overseeing and organization of the data sampling, support of the data analysis, and support in the development of the manuscript. GK: support of the data sampling process and support in the development of the manuscript. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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