Research Article

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Pedagogy, Didactics, or Subject Matter? Exploring Pre-service Teachers' Interest Profiles

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Abstract: Interest has been considered an important determinant of teacher quality. However, research into teacher interest, and more specifically, pre-service teachers' interest is limited. Hence, the current study tackled the current gaps in pre-service teachers' interest and aimed to explore pre-service teachers' interest profiles based on the multidimensional framework of teacher interest. A total of 225 pre-service teachers, enrolled in various initial teacher education programs of two universities in Germany, participated voluntarily in the study. The results revealed two distinct pre-service teachers' profiles based on the three teacher interest factors. Interestingly, the two profiles did not significantly differ in their subject interest levels, but did vary in their didactic and educational interest. In addition, the findings also revealed gender and school track differences in pre-service teachers' interests and profiles. Consequences for future research and teacher education are discussed in detail.

Keywords: teacher motivation; teacher interest, pre-service teachers, teacher education

1 Introduction

Numerous pressing challenges such as teacher quality, teacher shortages and attrition, as well as teacher education dropout rates have demanded the need for educational research to focus, among other variables, on

the topic of teacher motivation (Eren, 2012; Høgheim & Federici, 2020; Wyatt & Richardson, 2008). With this urgent call for research, authors and educational scientists have revised established motivational theories and adapted them into the context of the teaching profession (Schiefele et al., 2013). Most recent research on teacher motivation has focused mainly on goal orientations (Butler, 2012), expectancies and values (Reeve & Su, 2014), self-efficacy (Tschannen Moran et al., 1998), enthusiasm (Kunter et al., 2011), self-determination (Eyal & Roth, 2011), amongst others. Such scientific literature and research have identified teachers' motivation as a key element of teachers' professional competence (Lauerman, 2017), and further reported its influence on important outcomes such as teachers' instructional practices, teacher quality and psychological well-being (Richardson et al., 2014; Zee & Koomen, 2016). Additionally, teacher motivation is also assumed to influence students' motivation and achievement (Klassen & Tze, 2014; Kunter et al., 2013).

Another important motivational construct that stems from previously established motivational theoretical frameworks is teacher interest (Daumiller, 2018; Reichhart, 2018). When compared to other teacher motivation constructs, research into teacher interest is limited (Daumiller, 2018). However, there are several recent studies that have shown positive effects of teacher interest on both teacher and student outcomes. For instance, evidence has revealed important associations between in-service teachers' interests, their teaching behaviours (Reichhart, 2018), their choice to teach (Watt et al., 2012), and their engagement in professional development training (Rzejak & Lipowsky, 2016). Moreover, a study by Riconscente (2014) reported positive effects of teachers' level of interest on students' interest in mathematics.

Given the potential of interest for teacher and student outcomes, it is vital to also pay attention to pre-service teachers' interest. Additionally, pre-service teachers' interest is an important aspect of their professional competence (Praetorius et al., 2017; Rösler et al., 2018). Nevertheless, research into pre-service teachers' interest in teaching is scarce (Glutsch & König, 2019; Høgheim

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& Federici, 2020), and thus required to enhance our theoretical understanding on the topic. Furthermore, given that Germany implements a formalised tracking school system (in which students are assigned at an early age to a secondary school based on academic ability), future pre-service teachers must enrol in different general education programmes. Hence, each teacher education program has particular features that relates to the specific school track profile (Cortina & Thames, 2013; Kunter & Voss, 2011), which might influence the development of pre-service teachers' interest.

Against this background, the present study aims to explore teacher interest in a sample of German pre-service teachers enrolled in diverse teacher education programmes. For the purpose of this study, pre-service teachers' interest will be investigated based on the multidimensional framework by Schiefele et al. (2013). The next section will present the theoretical background guiding this paper and will be followed by a brief description of the legislation and structure of the German teacher education system, as well as empirical research regarding school track differences in respect to teachers' interest.

2 Teacher interest

The construct of interest has been widely acknowledged as one of the most important constructs within motivation theories (Hidi, 2006; Linnenbrink-Garcia et al., 2016; Schiefele, 2009). Interest, as a motivational variable, has been described as the psychological predisposition to reengage with specific types of objects, events, ideas or content (Durik & Harackiewicz, 2007; Hidi & Renninger, 2002). In this sense, interest is considered to be object-specific containing both affective and cognitive components that involve personal relevance and value, (Ryan & Deci, 2000), and foster positive emotional experiences (Krapp, 2002; Krapp & Prenzel, 2011). Within the literature, two main conceptualizations have been suggested: (a) individual interest, and (b) situational interest. Individual interest refers to a relatively stable affective-evaluative pre-existing disposition to reengage with a particular topic or domain (Hidi, Renninger, & Krapp, 2004), and commonly involves focused attention, persistence, and effort, as well as value-related attributes (Ainley, Hidi & Berndorff, 2002; Schiefele, 2009). In contrast, situational interest is a momentary emotional state generated from the interaction with certain conditions or stimuli from the environment (Schiefele, 2009). This assumes that interest is within the individual,

however, the content or situational factors define its direction and contribute to its development. Situational interest has been shown to positively influence an individual's cognitive performance, focused attention, facilitate the integration of new knowledge, as well as, enhance the levels of learning (Hidi & Renninger, 2006; Durik & Harackiewicz, 2007).

Hidi and Renninger (2006) established their model of development of interest, in which they describe how interest is influenced by the experience of positive affect in relation to an activity by perceived value. According to the authors, interest develops in four phases:

- a) Phase 1. Triggered situation interest: momentary interest is triggered/activated by some external cue such as surprising information, task features, or personal relevance. Most commonly, situational interest is externally supported, meaning that certain aspects of the environment are needed in order to catch an individual's attention.
- b) Phase 2. Maintained situational interest: situational interest is maintained when the individual finds a task meaningful and relevant, as well as has the desire to continue pursuing the activity. As with triggered situational interest, maintained situational interest can be typically externally supported.
- c) Phase 3. Emerging individual interest: if situation interest is sustained over time, and an individual continues to engage in such activity, then individual interest may begin to develop.
- d) Phase 4. Developed individual interest: continuous reengagement with the task over a period of time, along with increased knowledge and positive affect. Such variables can create an enduring interest in the activity.

The model describes situational interest in terms of affective and cognitive processes, as well as the basis for the development of individual interest (Renninger & Hidi, 2002). In addition, according to research (Renninger & Hidi, 2002; Hulleman et al., 2010) interest is reciprocally related to other variables such as effort, self-efficacy, goal setting, and self-regulated behavior. More importantly, such variables can change as interest develops or decreases.

Given the potential of interest for learning, extensive research has focused primarily in exploring the role of interest from the student perspective (Daumiller 2018; Schiefele et al., 2013), revealing it to have the potential to promote important educational outcomes (Durik & Harackiewicz, 2007). In contrast, literature and research on the role of interest from the educator perspective, and

its relation to school characteristics, or teacher and student outcomes, is still limited (Reichhart 2018, Schiefele et al., 2013). Against this background, Schiefele et al. (2013) established the construct of teacher interest based on the concept of individual interest that is grounded in the person-object theory of interest (Frenzel et al., 2010; Hidi et al., 2004). In this line, teacher interest is conceptualized as a multidimensional construct divided into three domains: subject, didactic and educational interest. Teachers' subject interest refers to interest in a specific subject-domain or content, which bears similarities to the concept of subject-specific academic interests (Eren, 2012; Høgheim & Federici, 2020). By didactic interest, Schiefele et al. (2013) refer to teachers' interest in instructional methods or strategies, stemming from a strong value placed on effective teaching methods (Høgheim & Federici, 2020). Finally, teachers' educational interest is related to the interest in the pedagogical aspects of teaching that cover for example the development of students, classroom management, or effective support of students with special education needs (Schiefele, 2017; Schiefele et al., 2013). This multidimensional breakdown is similar to the components of professional knowledge as distinguished in Schulman's (1986) model. For instance, Schiefele et al. (2013) discuss that there is a close correspondence between educational interest and Schulman's (1986) components of general pedagogical knowledge and knowledge of educational ends purposes, and values as "these components address issues of educating students" (Schiefele et al., 2013, p. 12). Lastly, a teachers' professional competence depends on the interplay of knowledge, skills, attitudes, and motivational variables (Kunter et al., 2013). Consequently, teacher interests are conceptualized as a component of professional competence as they function as a driver of effective and innovative teaching behaviors (Kunter & Holzberger, 2014; Praetorius et al., 2017).

The available research has revealed the positive relationship between the three dimensions of teacher interest and occupational well-being, and enjoyment (Schiefele 2017; Schiefele and Schaffner 2015; Schiefele et al., 2013). In particular, subject interest was found to be a significant positive predictor of flow (Schiefele et al., 2013). Additionally, teacher interest has been found to have significant associations with teachers' instructional practice. For instance, Schiefele and Schaffner (2015) found that teacher educational and didactic interest predicted their use of mastery-oriented practices and cognitive stimulation. Moreover, Schiefele et al. (2013) reported that didactic interest was found to be a significant predictor of differentiated instruction. Lastly, it has also been suggested that teacher interest could support the

acquisition of professional knowledge that fosters a more effective teaching practice (Schiefele et al., 2013).

To the best of our knowledge, there is a very limited number of studies that have examined pre-service teachers' interests. All of these studies have a focus on interest with very different research goals in relation to diverse outcomes. First, two of these studies were focused mainly on pre-service teachers' interest and their relation to occupational choice and dropout. For example, Eren (2012) investigated the relationships among Turkish teacher candidates' interest in teaching, professional engagement, career development and career choice satisfaction. Findings indicated the positive influence of interest on pre-service teachers' persistence and effort in their teacher training. Moreover, a recent study by Høgheim and Federici (2020) revealed that didactic interest had a significant influence on pre-service teachers' ambitions to teach, and further discussed that both educational and didactic interest had a positive relation to their own self-evaluated teaching skills.

Second, other studies focused mainly on subject-domain interests. Rösler et al. (2018) investigated the relations between achievements and pre-service teachers' interests. The authors found that achievements were positively related to interests in the same domain. On the other hand, Liebendörfer and Schukajlow (2020) explored how pre-service teachers' subject-specific interest (in mathematics) could be increased through a designed-based intervention, revealing that utility-value interventions appear to be beneficial to foster interest. A recent study by Glutsch and König (2019) explores the effects of subject interest on pre-service teachers' motivation to choose the teaching profession. Latent path analyses revealed that teacher candidates with high subject interest showed higher intrinsic, social-altruistic and pedagogical motivations.

Lastly, one study conducted by Ekstam et al. (2017) examined the relationship between interest and self-efficacy. The results indicated that individual interest of pre-service teachers had a significant effect on their self-efficacy beliefs. This result was also found in a study by Schwab, Hellmich and Gorell (2017). Although their main focus of the study was not centred on interest, it was used as a control variable. Their findings indicated that interest was correlated with pre-service teachers' self-efficacy for inclusion.

Taken together, these findings might suggest that interest could be important to pre-service teachers' motivations, teacher training, development, competence, and future instructional behavior. Hence, examining pre-service teachers interests in teacher education,

especially in the first phase, are of great importance (Rösler et al., 2018). Important to note is that, initial teacher training certification programmes in Germany are implemented significantly differently across the country (Liebner & Schmaltz, 2021; Walm & Wittek, 2014). Bearing in mind such important variations (please refer to the next section), Scheifele et al. (2013) assumed that in-service teachers working in the different German school tracks would report diverse levels of subject, didactic and educational interest. This hypothesis was indeed found in the authors' prominent study. In detail, upper secondary school teachers showed higher levels of subject interest, whereas lower secondary school teachers reported a stronger educational interest. Therefore, it seems reasonable to expect variations among pre-service teachers' subject, didactic and educational interest levels that could be related to the teacher certification program they are enrolled in.

3 Teacher education in Germany

The following section introduces a brief description on the legislation and the structure of the German teacher education system. Full information can be obtained from the Standing Conference of the Ministers of Education and Culture (Ständige Kultusministerkonferenz, KMK) or please refer to Terhart (2019). Given that the federal states (*Länder*) are primarily responsible for both teacher education and the education system itself, there are large differences across states and universities (Cortina & Thames, 2013). As a result, Walm and Wittek (2014) conclude that there are significant variations regarding the certification, duration and content of the study programme. However, Germany implements a formalized tracking system (in which students are assigned at an early age to a secondary school based on academic ability), to which teacher education is inherently structured accordingly to such school types (Terhart, 2019). Consequently, future pre-service teachers must enroll in different general education certifications (KMK, 2019; Terhart, 2019):

- Elementary schools (*Grundschule*) (grades 1-4)
- Lower secondary schools (*Hauptschule*, *Realschule*, *Schule mit mehreren Bildungsgängen*, *Gesamtschule*) (grades 5-10)
- Upper secondary school (*Gymnasium*) (grades 5-13)
- Vocational schools (*Berufsschule*) (grades 11-13)
- Special education schools (*Förderschule*) (grades 1-13; variations can occur as a result of inclusive schooling)

Teacher training is divided into two stages: a theory-based stage at universities or colleges of education that leads into the “First State Examination” (*Erstes Staatsexamen*), and which is organized in a bachelor's-master's program (Terhart, 2019). During this phase, uppersecondary teacher candidates choose two teaching school subjects (Cortina & Thames, 2013), whereas primary teacher candidates are obliged to study two core subjects such as German language or mathematics, with the addition of a third subject (e.g. science) (Terhart, 2019). Although pre-service teachers must take the same subject-specific courses as university students with other professional studies, they must also take part in pedagogical content knowledge, educational theory, general pedagogical knowledge, and psychology courses. In contrast, lower secondary teacher candidates have fewer course requirement courses, but have a higher number of pedagogical content knowledge seminars and certain specialized classes (Cortina & Thames, 2013).

The second phase of initial teacher education is a preparatory phase that is practice-oriented at ministry-run training institutes and supervised by teacher trainers. This phase ends with the achievement of a “Second State Examination” (*Zweites Staatsexamen*). After this second examination, teachers are fully certified, and allowed to start teaching in schools.

4 Purpose and research questions

In light of the aforementioned theoretical background and outcomes of previous studies, it seems meaningful to explore pre-service teachers' interest profiles, which to the best of our knowledge, have not yet been examined. Exploring pre-service teachers' interest in teaching could shed light into the differential learning developments of pre-service teachers during their teacher training (König, 2017), or identify content in teacher education that is necessary to the development of their professional knowledge (Høgheim & Federici (2020). This is of particular importance for the first phase of the German teacher education (Rösler et al., 2018). Consequently, exploratory analyses are therefore required to provide insight into the current research gap in terms of pre-service teachers' interest. Accordingly, the study sought to investigate differences in profiles in regard to pre-service teachers based on the different teacher interest domains (Schiefele et al., 2013). Furthermore, since data are collected in different initial teacher education certification programs (i.e. lower secondary schools, upper secondary schools,

or special education schools), this study attempts to explore whether there are variations within the profiles as a result from the different teacher education certification programs. With this background, the research question guiding this study was: what are the profiles of German pre-service teachers' interest?

Based on the few available studies, it is reasonable to expect that the prospective teachers' profiles obtained will not differ in terms of didactic interest (Schiefele et al., 2013). However, differences are assumed between subject and educational interest. Consequently, it is expected that a larger number of upper secondary school pre-service teachers will be represented by a stronger subject interest, whereas lower secondary and special education pre-service teachers will be represented by a stronger educational interest.

5 Method

5.1 Sampling and sample

Participants in this study were pre-service teachers enrolled at two universities offering initial teacher education programs in Germany. Following convenient sampling (Creswell, 2012), a total of 225 pre-service teachers (46% female) responded voluntarily in an online survey conducted. All teacher candidates were taking part in a master program and had a mean of 25.94 (SD = 3.08) years. The sample was stratified according to the different initial teacher education programs (KMK, 2019; Terhart, 2019): upper secondary school pre-service teachers ($N = 157$), lower secondary school pre-service teachers ($N = 35$), special education school pre-service teachers ($N = 32$) and missing ($N = 1$).

5.2 Instrument: Teacher interest

Teachers' interest was measured using the Teacher Interest Scale from Schiefele et al. (2013). The scale is composed of three sub-scales underlying the following constructs: Subject interest (5 items, i.e. "I chose my subject because I find it interesting") ($\alpha = .93$), Didactic interest (4 items, i.e. "I place a strong personal value on thinking about teaching methods") ($\alpha = .82$), and Educational interest (4 items, i.e. "The most interesting aspect of my work is helping students develop") ($\alpha = .85$). All sub-scales are based on a 4-point Likert scale ranging from 1 = *not at all true* to 4 = *very true*.

The teacher interest scale used in this study was originally developed, confirmed and validated, by means of structural equation analyses, in a sample of in-service teachers in upper and lower secondary school tracks (Schiefele et al., 2013). Given that the current sample consisted of pre-service teachers, the instrument's three-factor model was tested via confirmatory analysis (CFA). In the present study, results of the CFA showed that the three-factor teacher interest model with 15 items had an acceptable fit to the data ($\chi^2(62) = 225.24$; CFI = 0.92; TLI = 0.90; RMSEA = 0.10; SRMR = 0.09). Although common *cutoff* criteria for RMSEA ($< .06$) and SRMR ($< .08$) (Tabachnick & Fidell, 2014) is exceeded in this data, it was still decided to follow with further data analysis base on Hu and Bentler's (1999) combinational rule of RMSEA and SRMR. The authors discussed that using a combinational rule, for instance of RMSEA $> .06$ and SRMR $> .09$ (or $.10$), provides still acceptable fit for evaluation of the model and has the least sum of Type I and Type II error rates. Additionally, this instrument has been previously used and tested successfully in other pre-service teacher samples (Eren, 2012; Høgheim & Federici, 2020).

5.3 Data analyses

Statistical analyses were conducted in IBM SPSS Statistics 27. To explore our data, descriptive analyses and t -tests were performed. Subsequently, a two-step cluster analysis was conducted in order to ensure the reliability of the clusters. A cluster analysis is a statistical method used to identify and group participants who have similar scores (Field, 2013). As a first step, a hierarchical cluster analysis using Ward's method and squared Euclidean distance was performed to identify the number of possible profiles of pre-service teachers (Hair et al., 1998; Yim & Ramdeen, 2015). The clustering variables were the three teacher interest scales: subject, didactical, and educational interest. The second step consisted of a k-means procedure to assign pre-service teachers to their profile and was followed up by an additional discriminant analysis in order to validate the number of clusters.

6 Results

6.1 Descriptive Analyses

Before searching for pre-service teachers' interest profiles, descriptive analyses of the three interest domains

were undertaken by analyzing the mean and standard deviation of each scale. Subject interest was the domain with the highest score ($M = 3.40$; $SD = .50$), followed by educational interest ($M = 3.03$; $SD = .68$), whereas didactic interest had the lowest score ($M = 2.89$; $SD = .58$). A t -test for dependent samples revealed that pre-service teachers' ratings of their subject, ($t(221) = 27.17$, $p < .001$), didactic, ($t(221) = 10.09$, $p < .001$), and educational interest, ($t(221) = 11.55$, $p < .001$), were significantly higher than the theoretical mean of the scale (2.5). Such results imply that pre-service teachers' hold high levels of interest. Lastly, independent samples t -tests were performed to explore gender differences between the three teacher interest scales. Significant differences were found only for the teacher interest domain of subject interest, where male teacher candidates ($M = 3.47$; $SD = .39$) scored higher than female teacher candidates ($M = 3.31$; $SD = .59$), ($t(165.04) = 2.29$, $p < .05$).

6.2 Pre-service teacher interest profiles: cluster analysis

A two-step procedure was used for the cluster analysis. First, a hierarchical cluster analysis was conducted to distinguish clusters between pre-service teachers based on the three domains of teacher interest. Results from the hierarchical cluster analysis indicated that there were several options for 2- or 3- clusters. Based on these two possible solutions, a first k-means cluster analysis was conducted based on the 3-cluster solution. However, results revealed that one cluster had only two cases. Therefore, a second k-means cluster analysis was conducted based on a 2-cluster solution to assign the teachers into their interest profile. As a final step, a discriminant analysis was performed where one discriminant function was identified. This function showed a canonical correlation of $R = .80$ (eigenvalue = 1.83; Wilks Lambda = .35; $p < .001$; explained variation 100%). In total, 98.6% of the cases were correctly classified. Accordingly, 1.4% were reassigned which corresponds to 3 persons.

As shown in Table 1, one-way ANOVA with post-hoc analyses indicated that, with the exception of subject interest, didactical interest, and educational interest significantly varied between clusters.

Figure 1 visually presents the profiles as well as a comparison of the means scores of all the scales within each cluster:

- (1) The first profile was pre-service teachers (55% of the respondents) with a comparable high interest in educational aspects of teaching, subject-matter, and

Table 1: One-way ANOVA of the teacher interest domains between profiles.

Domain	Cluster 1		Cluster 2		$F(1,221)$	η^2
	M	SD	M	SD		
Subject interest	3.45	.49	3.33	.48	2.93	-
Didactical Interest	3.19	.46	2.53	.49	108.56**	.33
Educational interest	3.50	.42	2.47	.50	282.34**	.56

** $p < .01$

didactic interest. This cluster of participants was labelled as 'highly combined interest'.

- (2) The second profile was pre-service teachers (45% of the respondents) with a predominantly high interest in the subject matter to be taught. These pre-service teachers scored significantly lower in both didactical and educational interest, and thus labelled as 'predominantly specialist interest'.

Subsequently, a multivariate analysis of variance (MANOVA) was conducted to explore whether the scores of the separate variables in each of the profiles differed across the clusters. MANOVA has been selected instead of running multiple ANOVAS in order to prevent the risk of making a Type I error and maintain the relationship between the variables (Field, 2013). The Wilks' lambda was revealed to be significant highlighting the differences between the clusters, [$F(3,218) = 132.92$, $p < .001$, $\eta^2 = .65$]. Finally, chi-square tests of association were used to examine whether there was a relationship between the profiles and the demographic variables. These showed no significant relations between the pre-service teachers' profile and age and gender. However, it revealed significant results for the association between profile and school track, $\chi^2(2) = 6.59$, $p < .04$. When looking at the distribution of pre-service teachers in the three profiles (figure 2), it is possible to observe that lower secondary and special education pre-service teachers are mainly represented in the first profile compared to the second profile. On the other hand, compared to profile 1, more upper secondary pre-service teachers are represented in the profile 2, the subject-specifically interested.

7 Discussion

Interest is a key motivational construct in teacher education as there are crucial to pre-service teachers' development of professional competence (Eren, 2012;

Figure 1: Interest profiles of pre-service teachers.

Figure 2: Distribution of pre-service teachers over the different interest profiles.

Høgheim & Federici, 2020; Kunter et al., 2013; Liebendörfer & Schukajlow, 2020). However, research into teacher interest, and more specifically, pre-service teachers' interest is scarce (Daumiller, 2018; Høgheim & Federici, 2020; Rösler et al., 2018). Hence, the current study tackles the current gaps in pre-service teacher interest and seeks to further contribute with new insights from exploratory analyses. In this context, the present study aimed to explore pre-service teachers' interest profiles based on Schiefele et al.'s (2013) multidimensional framework of teacher interest domains in order to identify the areas of development in teacher education that is necessary for the development of their professional knowledge and competence.

Descriptive results revealed that overall pre-service teachers are highly interested in all three interest domains, with a particular higher rating on subject interest. Nonetheless, it is important to highlight that the sample consisted of pre-service teachers in a master's program. Hence, these results might imply that given that their interest has been already triggered, maintained and developed throughout their teacher education program. Conducting longitudinal research throughout teacher training programs (from beginning to end) could shed important information into the development of pre-service teachers' interest. However, the fact that subject interest was quite highly rated can be associated with findings from two studies in different countries, those in Germany by Glutsch and König (2019) and in Australia by Watt et al. (2017).

For gender, findings indicated significant gender differences in pre-service teacher interest, in which male students reported higher levels of subject interest compared to females. Previous research has demonstrated considerable interest differences between the genders, providing evidence for example, that males are more interested in realistic academic fields such as mathematics (Frenzel et al., 2010; Hansen et al., 1993). A study by Eren (2012), also with a pre-service teacher sample, reported no significant gender differences between the three interest dimensions. Likewise, Schiefele et al., (2013) found no significant gender differences in an in-service teacher sample. Thus, the available empirical research on teacher's and pre-service teachers' interest has yielded mixed evidence. Against this backdrop, it is important to mention that there have been only a few studies on students' teachers' motivation (Fray & Gore, 2018). Nonetheless, given that gender was not the main focus of this study, deeper analyses to investigate associations between male and female pre-service teachers subjects of study were not conducted in this study. This step is

planned for a future study that would allow to provide more understanding into such result. It is necessary to highlight though, that these results are in contrast to those from Høgheim and Federici (2020), who found significant gender differences, however, only for the domains of didactic and educational interest. The authors indicated that female pre-service teachers reported higher levels of didactic and educational interests compared to male pre-service teachers. Consequently, this study calls for further empirical research that could develop a more fine-grained analysis of gender differences in terms of pre-service teachers' interest.

Two profiles of pre-service teachers were found. Interestingly, there were no significant differences with regards to subject interest in both of the profiles. Previous research has shown that subject interest is related to the experience of flow and enjoyment (Schiefele et al., 2013), as well as the attributed motives in the teaching profession such as intrinsic and social motivations (Glutsch & König, 2019). Consequently, it is plausible that regardless of the profile, pre-service teachers are more intrinsically motivated, and thus, are placing strong value and meaning to the subject matter they have chosen to learn and eventually teach (Frenzel et al., 2010). This finding seems to also go in line with results from studies exploring pre-service teachers' motivations for choosing teaching as a career. According to Rothland (2014) and Pohlmann and Möller (2010), pre-service teachers' subject-specific interest in using their subject matter knowledge and expertise are the highest rated motivations for becoming a teacher (Paulick, Retelsdorf, & Möller, 2013).

The first profile, 'highly combined interest', was represented by pre-service teachers scoring higher in all three teacher interest domains. Based on the theoretical assumptions and research on teacher interest (Schiefele et al., 2013), it can be assumed that these pre-service teachers place a strong value on learning about teaching methods, classroom management, and/or student development. More importantly, given that participants within this profile also score high in subject interest, it can be expected that such pre-service teachers are not only enjoying learning about teaching and effective instructional strategies amongst other, but they also attain a more positive learning experience and are engaged in practical experiences of teaching, such as internships. In contrast, the second profile, 'predominantly specialist interest', was mainly represented by teachers scoring high in subject interest and significantly lower in didactic and educational interest. Based on the empirical evidence from Schiefele et al., (2013), it can be assumed that such teachers have a strong preference on learning about and

teaching their chosen subject. However, they place far less value and personal significance on learning about effective instruction methods. This is a critical finding since interest is a powerful motivational variable that can guide an individual's behavior and choices (Frenzel et al., 2010; Glutsch & König, 2019; Rösler et al., 2018). This has been shown in previous studies, where didactic interest has been revealed to be a significant predictor of cognitive stimulation and differentiated instruction (Schiefele et al., 2013). Therefore, the lack of didactic and educational interest could result in a major problem for pre-service teachers' development of professional knowledge, teacher quality and competence. In this context, if pre-service teachers are not placing value and interest in learning about matters of differentiation and effective teaching strategies to support students, this will inherently limit their ability to provide appropriate and meaningful education for all. Taken together, this finding is of utmost importance for teacher education as interest has been considered to be "an amendable motivational concept" (Høgheim & Federici, 2020, p. 5). Consequently, it is possible to foster the development of individual interest by triggering and maintaining situational interest in learning (Schiefele, 2009). Therefore, the findings from this paper call for teacher education programs to invest efforts in targeted interest-enhancing interventions where, for instance, pre-service teachers are given the opportunities to see the benefits on students' outcomes when using effective teaching strategies, differentiated instruction, etc.

In addition, the analyses conducted showed that there are significant differences between the distribution of pre-service teachers between the two interest profiles. Upper secondary school pre-service teachers were significantly more represented in the 'predominantly specialist interest' profile, whereas the 'highly combined interest' profile had a higher number of lower secondary and special education school teachers (compared to profile 2). These findings bear similarities with previous studies that have repeatedly proven that lower secondary school pre-service teachers are more inclined to the didactical and pedagogical aspect of teaching (Glutsch & König, 2019; König et al., 2008), whereas upper secondary school tend to put more focus on the subject matter (Schiefele et al., 2013). Two possible explanations can be identified for these results. A first explanation could be derived from the fact that in Germany, subject-specific interest is one of the highest motivational factors for choosing teaching as a career among prospective secondary school teachers (Ulich, 2004). On the other hand, a second possible explanation for these differences could plausibly be found

in the structural differences between the initial teacher certification programs that perhaps fosters a teacher interest domain more than the others. As discussed in the theoretical background, upper secondary school teacher education programs are more focused on the development of the subject-specific content and have a lower number of pedagogical courses compared to lower secondary and special education programs (Cortina & Thames, 2013; Terhart, 2019). As a result, lower secondary teachers have a more extensive educational knowledge and thus develop a stronger interest in such aspects of teaching, whereas upper secondary school teachers are seen as subject-specific experts triggered by their deeper and more comprehensive training in content knowledge and pedagogical content knowledge (Blömeke et al., 2008a; Blömeke et al., 2008b; Cortina & Thames, 2013). Consequently, it appears that teachers have different 'professional ethos', in which for example, upper secondary school teachers see themselves as the technical experts and not specifically as great educators (Gawlitza & Perels, 2013). Thus, in light of the present study's findings, it is plausible to assume that this professional ethos has developed right from the initial teacher training. This inherently has critical implications for teacher training, precisely because, given that the teaching labor is in a state of constant flux between demand and supply (Terhart, 2019), upper secondary school teachers are allowed to teach at lower secondary schools to cover teacher shortages in such schools. Hence, such teachers would require not only technical expertise but also educational interest and knowledge. Likewise, with policies that demand the inclusion of student with special needs education in regular schools, upper secondary school teachers with didactic and educational expertise are also required (Terhart, 2019).

The present study has two main contributions. First, the findings from this work contribute empirical evidence to the current state of research on pre-service teachers' interest in teaching. Second, and most importantly, by examining the interest profile of pre-service teachers it was possible to identify areas of needs and further improvement crucial for pre-service teachers to develop during their initial teacher education. In this context, the present study wishes to encourage educational researchers to further explore the construct of interest in pre-service teachers in order to have a better understanding of the differential learning developments of teacher candidates during their teacher training.

8 Limitations and further research

It is important to acknowledge several limitations. Although convenient sampling (as used in this study) is a common research strategy that possesses great advantages (e.g., least time-intensive and simple to conduct), it also carries important disadvantages. One of these is that the results obtained from such samples have generality only to the sample under study (Bornstein et al., 2013). Additionally, despite the fact that data was collected from pre-service teachers across different school tracks, the sample is predominantly based on upper secondary teacher candidates, and thus may cause limitations regarding the representativeness of the sample to the population. Consequently, the findings from this study must be considered with caution. In this sense, future research should not only include a larger sample but aim for a balance between school track pre-service teacher samples in order to improve the generality and transferability of the findings. A second limitation is that the present study uses pre-service teachers' self-reports. Hence, such responses can inherently be sensitive to overestimation, underestimation, or socially desired answers. Future research is advised to be carried out in combination with other methods (e.g., observations and/or interviews). Additionally, although this instrument has been previously used in other research using pre-service teacher participants (see Eren, 2012; Høgheim & Federici, 2020), the teacher interest instrument has not been in this study (or in previous studies) formally validated. Thus, this study calls for future research to explore, confirm, and validate the instrument within pre-service teacher samples.

A third limitation is that this study holds a cross-sectional design. Thus, further longitudinal studies must be designed to identify how pre-service teachers' interest evolves during their initial teacher training and which factors and/or interventions influence their subject, didactic and educational interest. This is in particular important to understand the differences between initial teacher education programs (i.e. differences between primary, lower and upper secondary, etc.), as well as the educational stage of study, and gender differences. Such research will help obtain a more in-depth understanding of pre-service teachers' interest in teaching. Finally, given that different methods of clustering analysis could yield different results (Field, 2013), it would be important for further research to test such structure in other German pre-service teachers as well as conduct qualitative interviews with participants to confirm the link between the respondents and the cluster they were ascribed to (Vanslambrouck et al., 2018).

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