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# The role of beliefs in teacher professionalisation for multilingual classroom settings

<https://doi.org/10.1515/eujal-2019-0040>

**Abstract:** This paper describes and discusses findings gained in a teacher training reform project at the University of Hamburg in Germany. In a newly implemented structure, pre-service teachers partake in an integrated model of courses that prepare them to deal with multilingualism in the subject classroom. For the first four semesters of the new model, a complex evaluation tool was employed in a pre-post design to better understand student competence development, curricular components of the teaching degree and student beliefs about multilingualism. This paper sheds light on the professional beliefs that pre-service teachers have about linguistic diversity and multilingual learners. The overall results show generally positive beliefs about multilingual learners, multilingualism in schools, and language support for multilingual learners. Moreover, the data show that multilingual pre-service teachers have more positive beliefs, female participants have more positive beliefs, and that there is a significant interdependence between beliefs and relevant opportunities to learn. Comparing the pre-test and the post-test data using explorative factor analysis, it can be shown that students' beliefs are far more structured and follow a clear five-dimensional pattern in the post test, whereas the pre-test data can be described as diffuse and unstructured.

**Keywords:** teacher beliefs, teacher training, multilingualism, linguistic diversity

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# 1 Introduction

Contrary to historical ideas about monolingual nation states, multilingualism<sup>1</sup> has long been a prevalent reality for many societies and their educational institutions across Europe (Gogolin 1994; Lo Bianco 2005; Lundberg 2019a). In Germany, this has been particularly the case since the end of the Second World War, when large amounts of guest workers from Turkey and various parts of Southern Europe arrived to work in Germany's coal mines, steel production and other parts of industry. These societal processes quickly had effects on educational structures in general, and on primary as well as secondary schools in particular. Experts have called for a need to prepare teachers for multilingual learners since the 1970s in Germany (Baumann 2017), yet there was only little systematic activity until what became to be known as Germany's PISA shock. The first results of the Programme for International Student Assessment (PISA) released in 2001 showed (amongst numerous other problematic issues) a substantial educational achievement gap between learners who have a migrant background and their peers without a migrant background (OECD 2019). Following this, increased activity to better prepare teachers to support multilingual learners can be observed (Baumann and Becker-Mrotzek 2014; Baumann 2017). Given the large authority over educational policy by the 16 individual federal states in Germany and authority over study programme design by German universities, the initiatives to better equip pre-service teachers with relevant skills to cater for multilingual learners differ extensively between the approximately 70 teacher education institutions across Germany. Relevant components in the teacher education programmes differ in terms of quantity, structure and study phase in which they are part of the curriculum, institutional responsibility, level of compulsion, type of teacher degree programme and possibly in further aspects (Ehmke and Lemmrich 2018). The University of Hamburg, where the research for this paper was conducted, has made extensive efforts to establish numerous modules and courses that prepare pre-service teachers for multilingual classroom settings. A majority of these courses are, however, elective components of the teacher degree programme, and therefore, the extent to which students engage with relevant content during their teacher degrees largely depends on students' individual preference structures. In the entire teacher training curriculum, which consists of a BA degree and a Masters of Education (M.Ed.) degree, there is only one component at the equivalent of one

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<sup>1</sup> The term multilingualism or multilingual is used in this paper in an inclusive sense. This means that linguistic diversity, linguistic heterogeneity and other related concepts are contained. (For further elaboration on multilingualism as an inclusive concept, see: Schroedler 2020).

credit point (CP), for which all pre-service teachers have to study the basics of multilingualism and issues related to German as a second language (GSL) speakers. In order to make the best use of this one CP and to provide all future teachers with effective opportunities to learn (OTL) relevant topics around multilingualism and GSL, a reform initiative led by researchers from the University's German Linguistics and Intercultural Education departments developed a new integrated model, which is further explained in Section 2. In the context of teacher professionalisation, it was important to evaluate the new course design. In order to obtain a better understanding of the new model, the DaZKom-Test (hereinafter: GSL competency test) was employed in a pre-post design. Alongside the pure competency testing, further data on students' biographies, their educational experiences, their perceived relevant OTL in the area of multilingualism, their beliefs about multilingualism as well as other further background data was collected (further details in Section 3). Many aspects of the competence development, the relevance of OTL and the effectiveness of the new course design have now been better understood (Bührig et al. 2020; Stangen et al. 2020; Schroedler and Stangen 2019; Schroedler and Lengyel 2018; Schroedler and Grommes 2019), which will briefly be summarised in Section 3. What has not been analysed so far is the extensive data collection on the participants' professional beliefs about multilingualism, multilingual learners and language support in the subject classroom. Associated with the GSL competency project, numerous items on how to gather data on pre-service teachers' professional beliefs were piloted, tested and validated in various constellations (Fischer 2018; Fischer et al. 2018; Hammer et al. 2016; Fischer and Ehmke 2019; Fischer [forthcoming]). Grounded in some of these studies, a collection of 42 items were used in the testing procedures at the University of Hamburg. The underlying theory on professional beliefs about multilingualism as well as the study design are explained in Section 4. Section 5 presents the methodology that was employed in this study. The three most central research questions in this paper are: 1. How can the professional beliefs of pre-service teachers about multilingualism be described in general?, 2. Do professional beliefs change between the pre-test and the post-test?, and 3. What are the interdependencies between professional beliefs and other relevant background data? The analytical procedures that were undertaken to respond to these three research questions are explained in Section 6. Section 7 then discusses and summarises the findings.

## 2 The research environment: A new course model

Teacher education programmes and curriculum models of teacher degrees differ widely on a global level, and even within Germany, the roughly 70 institutions

that educate pre-service teachers operate quite differently (for overview information on teacher education in Germany, see for example: Cortina and Thames 2013). In simplified terms, pre-service teachers complete an undergraduate (Bachelor of Arts) and a graduate degree (Master of Education), in which they receive academic training to teach two different school subjects, and complete components of educational studies as well as subject specific pedagogy.

As indicated further above, a need to better prepare future teachers for multilingual classroom realities has been perceived for quite some time. Methods and manners in which pre-service teachers are equipped with necessary skills in the area of multilingual learners differ substantially between Germany's federal states and between the universities within them (Otto et al. 2020 [forthcoming]; Schroedler and Lengyel 2018; Baumann and Becker-Mrotzek 2014; Baumann 2017). While some federal states and universities operate larger modules or prominent courses on GSL and multilingualism in education that are obligatory for all pre-service teachers, the University of Hamburg treats the issue as a so-called priority topic. Since 2006, the education policy of the federal state of Hamburg includes three of these priority topics (1. dealing with cultural and social heterogeneity, 2. new media and 3. school development), which should be integrated throughout teacher education (Otto et al. 2020 [forthcoming]). Under the umbrella of social and cultural heterogeneity, pre-service teachers have a wide range of elective courses on multilingualism in education that are offered throughout the University of Hamburg's teacher degree. The only compulsory component, for which all pre-service teachers have to study basic contents of dealing with GSL learners and multilingualism in education is one CP, which itself is part of a larger module on teaching practice during the M.Ed. phase of their studies. The operationalisation of this component used to be a one-off lecture followed by unguided and unassessed self-study. In order to use this small component more effectively, researchers from the German Linguistics and Intercultural Education Department began developing and testing a new course model in 2015. This work was carried out as one of several project branches within a large teacher education reform project entitled "Professional Teachers' Actions to Promote Subject-based Learning under Changing Societal Conditions / *Professionelles Lehrerhandeln zur Förderung fachlichen Lernens unter sich verändernden gesellschaftlichen Bedingungen*" (University of Hamburg 2019). For the small element (equivalent to 25–30 hours of overall workload of a student) on GSL and multilingualism, pre-service teachers now take a course called 'Foundations of Multilingualism and Language Development in Subject Teaching'. The course is offered in a blended-learning format, with four lectures and five to six online learning elements. "A broad structure of four topic areas was chosen to effectively convey relevant knowledge and skills on how to deal with multilingual classroom settings: 1) The

Multilingual Reality, 2) Peculiarities and Important Features of the German Language, 3) Language Registers: The Way from Everyday Language to Academic Language Use, and 4) Practical Strategies and their Application.” (Schroedler and Grommes 2019: 231). For each of the four blocks, there is one lecture session, which is either prepared by an online task or entails a follow-up online task (or both).

The fact that the course described above is part of a larger module on teaching practice allowed for cooperation with other lecturers in the subject-specific didactics departments of the participating pre-service teachers, who teach the central didactics seminars of said module. Through this integrated model, pre-service teachers learned certain general basics of multilingualism/language in education in the foundations course. In the subject didactics seminars, lecturers were then able to draw on these contents and broach the issue of the role of language in the respective subject-specific teaching practice in more detail (Schroedler and Lengyel 2018). To allow for a better understanding of the intended competence development, to gather data on relevant OTL and to see what the pre-service teachers’ beliefs about multilingualism are, the course was evaluated using a competence test including a questionnaire on further background data in a pre-post design. The tool and the data collection are described in the following section.

### 3 Data collection and complementary findings

In the context of introducing the integrated model for pre-service teacher professionalisation for dealing with multilingualism in the classroom, described above, there was a strong interest to evaluate the new course design. It is important to point out that the study presented here is not an intervention study in a conventional sense as no control group was surveyed. The following results and the descriptions of pre-post developments are therefore only to be interpreted as developments within one paired sample. For the future it would be desirable to compare the following results with other studies using the same instruments, in order to identify best practices or tendencies between different models that have been evaluated using the GSL competency test.

As introduced further above, the evaluation study consisted of a competence test, which was accompanied by an extensive questionnaire on biographical data, OTL and beliefs. The competence test was developed in the DaZKom project and measures pre-service teachers’ competences for dealing with multilingualism and GSL-learners’ difficulties in subject teaching (Hammer et al. 2015; Köker et al. 2015; various chapter in Ehmke et al. 2018). The test uses Item Response Theory

based analyses and has been thoroughly piloted and validated. The competence model that is measured is divided into three dimensions (with further sub-categories), namely language registers, multilingualism, and didactics (Hammer et al. 2015; Köker et al. 2015; Gültekin-Karakoç et al. 2016). The weighted likelihood estimates results of the test's Item Response Theory based measure are standardised and translated into three stages of skill acquisition. These three stages, 'lower minimum standard', 'minimum standard', and 'regular standard' represent the three bottom categories of Dreyfus and Dreyfus' (1986) five stage model of skill acquisition (Ohm 2018). For further information on the test design, its validation, theory on its competence measurement and the development of the three result categories, see various chapters in Ehmke et al. (2018). The first results of the Hamburg study, which included 296 students, who were all tested in the very beginning of their semester taking the aforementioned foundations course and then again six months later after the semester (which includes a school internship during term break) are published in Stangen et al. (2020) and Schroedler and Stangen (2019). The results in Stangen et al. (2020) which are only based on the first two of four cohorts (n=143) reveal two central findings. First of all, the overall competence development is positive insofar as the post test results are significantly better than the pre-test results. At the same time, it needs to be pointed out that in the post-test, still roughly two thirds of the participants are in the lowest competence category, the aforementioned lower minimum standard, and only 10 % reach the regular standard. To put this into perspective, it shall be pointed out that these results still show a higher average competence than the initial standard setting study validating the test result standards (Gültekin-Karakoç et al. 2016). The second important finding concerns the measurement of relevant OTL. Students were asked how often they have heard about and studied contents related to language, multilingualism, diversity, etc. during their academic studies. Regression analyses revealed that the amount of relevant OTL are (besides the pre-test result) the most impactful predictor for good post-test performance. Moreover, most of the single items on OTL measurement correlate significantly with the post-test result. This last finding was successfully replicated for the full cohort of participants (n=296) in Schroedler and Stangen (2019).

Besides the actual competence measurement, the participation in the testing procedure involved the completion of a questionnaire including several separate parts. The first extensive questionnaire part was designed to collect socio-demographic/biographical data of all participants. The items included age, gender, subjects of study, language repertoire, social background, educational background, and more. The second part was concerned with a data collection of relevant OTL of the participants as indicated above. What so far has not been analysed in the Hamburg study, and what will hereinafter be the focus of this paper,

is the third larger part of the questionnaire, in which all participating pre-service teachers were asked about their professional beliefs about multilingualism and multilingual learners. The following section outlines the theoretical groundwork on professional beliefs, before the data is presented and analysed.

## 4 Theoretical approaches to conceptualising Beliefs

The section above has demonstrated that large parts of the evaluation data of the Hamburg study on GSL competence development have been analysed to better understand teacher professionalisation for dealing with multilingualism in the classroom setting. At the same time, one important aspect that is likely to have an influence on good teaching practice, so far, has been left out: the professional beliefs of pre-service teachers about multilingualism and the role of language in subject teaching. Most models of professional competence of teachers (i.e. Krauss et al. 2004; Kaiser and König 2019) include a prominent component of affective-motivational predispositions within the construct of professional competence of teachers (Kaiser and König 2019, referring back to multidimensional approaches to capturing relevant dispositions to professional behaviour by Shulman 1987). This particular aspect in teachers' professional competences has gained increasing attention over the last years. It has been established that teacher knowledge and teacher beliefs are intertwined (Borg 2003; Pajares 1992). It is therefore useful to consider beliefs as a dimension of professional competence (Lundberg 2019a).

To elaborate on the conceptualisation, to introduce clarity regarding terminology, and to introduce clear ideas for the later discussion in this paper, a short introduction into the concept of *belief* is in order. Both in English and in German literature, one sometimes finds alternating terminology, when research focuses on orientations, attitudes, opinions, values or related concepts (Trautmann 2005). While for the German discourse, the term *Überzeugung* (contextless translation: conviction) appears to be most dominant in recent studies, a review of international literature (publications written in English) exhibits a clear tendency for the term beliefs (Fischer 2018). Both concepts appear to describe the same (or a very similar) concept and are oftentimes used synonymously (Fischer 2018; Ricart Brede 2019). For the purposes of the work presented here, the term belief is used in a clearly defined yet inclusive understanding, which draws on clarifications by Borg (2001), who points out four common features defining beliefs. Beliefs firstly describe a mental state of propositions that are accepted as true by individuals. Secondly, beliefs guide people's thinking and action. Thirdly, they can be con-

scious or unconscious, and fourthly beliefs are often understood as value commitments (Borg 2001: 186). Ricard Brede (2019) drawing on Buehl and Beck (2014) explains that beliefs are situated within every person's complex and multi-dimensional cognitive system, and that within this system, beliefs can be closer to the core or more peripheral (Ricard Brede 2019: 31). The idea that beliefs differ in strength gains essential importance when asking the question whether beliefs can be changed. A useful conceptualisation of this issue is portrayed in Wischmeier (2012), who describes that the beliefs of an individual are arranged concentrically as clusters with stronger and weaker meaning (Wischmeier 2012: 171). Wischmeier here bases her ideas on the concept of psychological strength of a belief (Green 1971) and explains that strong or primary beliefs are more resistant to change than the more peripheral beliefs.

The overall question whether professional beliefs can change or not remains complex, and probably cannot be answered conclusively. Kirsch and Aleksić (2018) point to four educationalists' studies that demonstrated a positive effect of professional development measures on beliefs (Egert et al. 2018; Hamre et al. 2012; Ottley et al. 2015; Sachse et al. 2016). Lundberg (2019b) explains that changing teachers' beliefs takes time and can only happen when, in the view of teachers, sensible pedagogical modifications are concerned (Lundberg 2019b; Haukås 2016). In other relevant literature, mostly rooted in educational psychology, scholars argue that beliefs are difficult or impossible to change. Nespor (1987) writes that beliefs systems are less flexible and less dynamic than knowledge systems, and that "beliefs are basically unchanging" (Nespor 1987: 321). Roehler et al. (1988) also argue that beliefs "remain unchanged in a teacher's mind regardless of the situation" (Pajares 1992: 312, referring to Roehler et al. 1988: 164). For the purposes of the analyses presented here, we therefore mostly refer back to the idea of concentric clusters of beliefs that differ in strength as presented above.

A closer look at literature on teachers' beliefs on multilingualism reveals both a certain popularity of the topic in recent years, but also very diverse approaches and findings. Some of the most recent examples include the work of Portolés and Martí (2018) who surveyed both pre-primary and primary pre-service teachers in Spain in a pre-post design. Conclusions include a persistent monolingual idea about education in general, but differences between participants when looking at individual linguistic backgrounds. Kirsch and Aleksić (2018) examined the changes of beliefs on multilingual early childhood education among early career professionals before and after a professional development measure in Luxembourg. Here, the findings clearly demonstrate positive changes in the participants' beliefs structure. In a study employing Q-methodology (Lundberg 2019b), Lundberg (2019a) finds a mixed picture concerning the beliefs about multilingual learners of Swedish primary school teachers. On the one hand, teachers exhibit rela-

tively positive views about multilingualism in general. On the other hand, however, the author also describes substantial scepticism, mostly based on monolingual ideas, amongst the participants.

Theoretical groundwork for the data analyses presented further below includes the understanding of dimensionality when measuring teachers' beliefs concerning multilingualism in education. Fischer (2018) examined an exceptionally wide range of literature on teachers' beliefs and identified seven dimensions into which beliefs can be categorised. These categories were epistemological beliefs (i.e. in Calderhead 1996), beliefs about teaching (i.e. in Woolfolk Hoy et al. 2006), beliefs about the teacher's role (i.e. in Kunter and Pohlmann 2009), beliefs about the learners (i.e. in Calderhead 1996), beliefs about school in general (i.e. in Woolfolk Hoy et al. 2006), beliefs about teacher training (i.e. in Reusser et al. 2011), and beliefs from a social perspective (i.e. in Kunter and Pohlmann 2009). Out of these seven dimensions, three were empirically tested and validated in Fischer and Ehmke (2019). These three dimensions contained first the epistemological dimension, meaning beliefs about language practices of multilingual learners, which in their study was operationalised using a 5-item scale on the use of family languages other than German. The second dimension concerned the beliefs about teaching (and learning), and was operationalised using a 7-item scale on the role of languages other than German or multilingualism in the classroom setting. The third tested dimension was on the beliefs about the teacher's role, which was implemented into the questionnaire using items on the responsibility for language support in the classroom setting. To test and validate these dimensions, items and scales on teachers' beliefs about multilingualism were developed (grounded in a broad theoretical construct), piloted and used in questionnaires amongst pre-service teachers. Using Item Response Theory-based scaling, the results show that the three dimensions that were tested, can be confirmed and fit the hypothesised model. Moreover, the study shows that OTL are significantly interrelated with the measured beliefs (Fischer and Ehmke 2019: 427). While the methodologically complex study confirmed and validated item sets and scales, it also identified some unanswered questions, which can be considered a useful point of reference for the data analysis that follows below in this paper. Fischer and Ehmke (2019: 428) point to the fact that while the three dimensions analysed fit well in their study design, a differentiation into further sub-dimensions would be desirable. Furthermore, results regarding the interdependence between certain socio-demographic variables, for example gender, and the beliefs construct indicate contrary effects to previous studies. In Hammer et al. (2016) no significant interdependence between the gender of the participants and the measured beliefs was found, in Fischer and Ehmke's (2019) study, female participants had significantly more welcoming beliefs about multilingualism and multilingual learners. Among the numerous future research desiderata

identified in Fischer and Ehmke's study, a look into pre-post developments of beliefs before and after an intervention is also featured.

Based on the description of the Hamburg study on competence development in the first sections, and on the state of research presented in this section, three core research questions emerge. First of all, it is of natural interest to gain a descriptive overview of how positive/negative the beliefs of the participants are. Secondly, the question regarding possible dimensions of beliefs and pre-post developments will be answered. Thirdly, the data analysis will provide insights into the interdependencies between beliefs on the one hand and OTL as well as selected socio-demographic variables on the other.

## 5 Methodology

This section provides insights into the data collection procedure, including a description of the items that were employed, and into the methodological and analytical procedures that were used to gain the findings presented further below. The questionnaire featuring the items presented below was administered in a pre-post design with four cohorts (in four semesters) in the newly developed foundations course described in Section 2. The participants were 296 pre-service teachers in the process of completing their M.Ed. to become either primary or secondary school teachers. All participants were pre-service teachers of mathematics or a science subject.

The 42 items asking for the participants' beliefs in the Hamburg survey have been developed and tested as part of the design of the survey "Beliefs about Linguistic and Cultural Heterogeneity in School and Teaching" (Fischer 2020; Fischer 2018; Fischer and Ehmke 2019) and partly rely on previous studies (Hammer et al. 2016; Fischer et al. 2018). None of these surveys, however, used this particular, more extensive, composition of items (as presented here), and also the wording in some items has been altered to fit the research context of the study presented here. There were several reasons for employing this extensive set of items. 24 items were used as part of a larger instrument validation study, which is presented in Fischer (2018) and Fischer and Ehmke (2019). The remaining items originate from Fischer et al. (2018) and Hammer et al. (2016). These items were rephrased to suit the context of the study at hand. Thus, for the purposes of the survey presented here, the 42 items were used both as part of an instrument validation, and to explore the participants' beliefs. This naturally poses a methodological problem, namely the fact that the collection of items used here, had (in this form) not been tested for its psychometric quality and had not been validated as a connected instrument. This implies that the analyses presented below can only be

understood as an exploration of the data that was gathered in the Hamburg study on pre-service teachers' professionalisation for multilingual classroom realities.

Participants were asked to rate all statements (items) on a four-point Likert scale indicating their agreement or disagreement: (1) strongly disagree, (2) rather disagree, (3) rather agree and (4) strongly agree. The 42 items on pre-service teachers' beliefs about multilingualism and multilingual learners were grouped into seven sets of items.

- 1: The first set included ten items that evolved around the general relationship between learning (education) and language. One example item of this set, as published in Hammer et al. (2016: 162) reads: “Content learning is always connected to language learning. Therefore, language teaching has to be a part of content classes.” [translations here, always authors' own].
- 2: The second set included eight statements on language support in the subject classroom. One example reads: “Every content class needs to be planned linguistically responsive” (theoretically based on Leisen 2011, item published in Fischer and Ehmke 2019).
- 3 & 4: The third and fourth item sets are preceded by a stimulus that describes a fictional online forum, in which a teacher asks for help on how to include children who speak virtually no German. The nine items that follow then consist of imagined responses in the online forum and include statements such as “Language facilitation is exclusively the task of language remediation lessons” (theoretically grounded in Michalak 2008, item published in Fischer and Ehmke 2019).
- 5 & 6: The fifth and sixth sets are preceded by short descriptions of cases, in which learners who speak a home language other than German are briefly described. The statements then concern the role of languages other than German in the home (with its assumed implications for the child's language development) and the role of other languages in the classroom. Examples include: “GSL-learners should have the opportunity to speak their home language in the classroom to one another from time to time” (item published in Maak and Ricart Brede 2019: 316) or “It is better when (non-German) parents speak German to their children and not their family language” (originating from Hammer et al. 2016, item published in Fischer and Ehmke 2019).
- 7: The last item set follows, similar to sets three and four, an entry into a fictional online forum, where a teacher describes her (positive) experiences with helping newly arrived pupils with their German language acquisition. Towards the end of the entry, the teacher voices criticism that schools do not provide resources to help committed teachers. The four statements that follow evolve around ideas and criticism regarding support structures in comparable contexts.

As indicated further above, about half of the items employed in this survey were also used to validate a shorter instrument. The items of the final version containing 21 items of this instrument, called “Beliefs about Linguistic and Cultural Heterogeneity in School and Teaching” (Fischer 2018; Fischer and Ehmke 2019), can soon be found on the research data platform *Forschungsdatenzentrum Bildung* (<https://www.fdz-bildung.de/>) in their original (Fischer 2020).

Out of the 42 items used in the survey presented here, 19 were negatively worded (indicating a negative view towards multilingualism and its related issues). These items were recoded, so that for the data analysis below a higher score of agreement on the 1–4 scale described above equates a more positive view towards multilingualism across all items. After the descriptive analyses, the average means for each item set were calculated, and t-tests for paired samples were used to test the changes for the pre- and post-test data for significance. In order to find out more about the dimensionality of the pre-service teachers’ beliefs clusters, explorative factor analysis was used to identify commonalities between items and the measured constructs. As described further above, the compilation of the items used on the seven item sets in this study has not been employed elsewhere in other studies. We hence employed explorative factor analyses to identify commonalities. Given that little was known about the instrument (regarding scaling and structure of the items) and taking into consideration that the item grouping into seven sets (not scales) did not follow a psychometrically tested structure, confirmative factor analyses had, for the purposes of the data exploration presented here, not been feasible.

For further clarification, correlations between the average mean values of the beliefs sets and selected socio-demographic data were calculated. IBM SPSS 24 (IBM 2016) was used for the data input and all analytical procedures.

## 6 Data analysis

In response to the three central research questions addressed in this paper, this section presents and discusses the analytical steps outlined in the section above. To answer the first research question (How can the professional beliefs of pre-service teachers about multilingualism be described in general?), first of all, the seven item sets described in the previous section were analysed individually. Table 1 presents the average mean values for each item set for the pre- and for the post-test. The fifth line shows the change in the mean values (as delta  $\Delta$ ) between the pre-test and the post-test. The sixth line indicates whether the change is significant, based on t-tests (\*\* being defined as  $\leq .01$ ). The bottom line shows the results of the effect size based on Cohen’s d.

**Table 1:** Overview of Beliefs Data (n=296)

	Set 1	Set 2	Set 3	Set 4	Set 5	Set 6	Set 7	All
(M) pre	3.38	3.33	3.52	3.52	3.14	2.81	3.01	3.26
SD	.41	.28	.65	.65	.61	.66	.42	.50
(M) post	3.39	3.39	3.52	3.54	3.30	3.00	3.10	3.32
SD	.43	.36	.65	.61	.59	.62	.43	.51
$\Delta$	+ .01	+ .06	—	+ .02	+ .16	+ .19	+ .09	+ .06
t-test	n.s.	n.s.	n.s.	n.s.	**	**	**	n.s.
Cohen's d	—	—	—	—	.33	.39	.22	—

Taking into consideration that the four-point scales to indicate agreement for the participants ranged from 1 (=strongly disagree) to 4 (=strongly agree), the averages across all items of 3.26 in the pre-test and 3.32 in the post-test demonstrate that the participants' beliefs about multilingualism can be described as rather (or even very) positive. While there is no clear frame of reference, the data show that (with all negatively worded items having been recoded), the pre-service teachers surveyed in this study regard language as important for subject education and have positive ideas about multilingualism as well as multilingual learners.

What can further be seen from the table with regard to research question two (Do the professional beliefs change between the pre-test and the post-test?) are mild changes between the pre-test and the post-test. For four out of the seven item sets as well as for the overall average, these changes are insignificant. For the item sets 5, 6 and 7, a significantly higher mean value in the post-test compared to the pre-test can be observed. Following Cohen (1988), the d-values indicated in Table 1 are considered observable effect sizes, yet fall into the category 'small effects'. Following Hattie's (2009) interpretation of effect sizes, the effects here would be categorised as *teacher effects*, with Set 6 almost showing in the *zone of desired effects*.

In further exploration of the second research question and in order to better understand the measured construct, the dimensionality and the clusters of beliefs, an explorative factor analysis (EFA) was conducted both for the pre-test data and the post-test data separately. The results of the EFA for the pre-test data paint an unclear, or scattered, picture. Employing the Kaiser-criterion of including all components with eigenvalues  $\geq 1$ , the analysis suggested an 11-factor-solution. Using scree plot interpretation, a 2-factor solution would have been suggested. This indicates rather scattered or unclear beliefs constructs amongst the participants in the pre-test. The EFA that was conducted on the post-test data produced very different results. The analysis, after varimax rotation, suggested a 5-factorial solution. As suggested by Bortz (1999: 534, in reference to Guadagnoli and Velicer

1988), items with factor loads  $< .4$  were excluded. This meant that 5 items were no longer considered for the following analysis. After tests for internal reliability and item-total correlations, five scales were comprised. Table 2 provides an overview of the scales' characteristics.

**Table 2:** Scale descriptions EFA post-test

	Scale 1	Scale 2	Scale 3	Scale 4	Scale 5
Number of Items	13	10	5 (6)	5	3
Cronbach's $\alpha$	.86	.81	.78	.83	.63
Corrected item-total correlation	.41-.71	.50-.74	.41-.89	.64-.76	.53-.61
Item exclusion	—	—	1	—	—

The results of the EFA on the post-test data presented in Table 2 can be described as acceptable in statistical terms. Scale 5, which only contains three items and (partly as a result of this low number of items) shows a Cronbach's alpha of lower .7, might be considered rather weak. When looking into the item contents, however, a relatively convincing picture emerges. Scale 1 contains all items that address the responsibility of the teacher to take care of multilingual learners and to cater for language support in the subject classroom. On Scale 2, most items are about the importance of language for subject learning and the importance to cater for multilingual learners in the subject classroom. Scale 3 contains items with statements on the role of home languages (languages other than German that are spoken in pupils' homes). On Scale 4, items are gathered which address the role of using languages other than German in the school and in subject teaching. On Scale 3, three items are grouped that were heavily negatively worded and therefore confronted the questionnaire participants with very negative views on language support in the subject classroom.

This EFA mirrors Fischer and Ehmke's (2019) findings on the three dimensions tested in their study described in Section 4 (1. Language Use at Home, 2. Multilingualism in Content Teaching and 3. Responsibility for Language Facilitation), in which 21 items were used to test these dimensions of the beliefs construct. These three dimensions can here be found in Scale 3 (beliefs about multilingualism/using languages other than German in the home of pupils [related to dimension 1]), Scale 4 (beliefs about the role of multilingualism/using languages other than German in subject teaching, [related to dimension 2]), and Scale 1 in the data presented here (beliefs about the teacher responsibility when it comes to supporting GSL learners in their language development [related to dimension 3]).

When comparing the unsuccessful attempt to identifying commonalities and building meaningful scales with the pre-test data on the one hand, and the well-sorted explorative factor analysis of the post-test data, one can infer further findings regarding the question of whether beliefs change. While we see a scattered picture in the pre-test data regarding the beliefs about multilingualism amongst the pre-service teachers surveyed here, in the post-test the beliefs seem far more structured and meaningfully clustered. It has been pointed to the fact that the beliefs of our participants do not change greatly in terms of becoming more positive (or negative) further above. The differences between the factor analyses discussed here though imply a substantial change in terms of the participants' cognitive structure and systematisation of beliefs. An additional approach to interpreting the changes between the factor analyses of the pre-test and the post-test data can be linked to comprehension of the contents learned during the course. If we consider that certain items carry complex concepts (for example 'linguistically responsive teaching'), it could be argued that the differences in the participants' responses in the post-test are linked to an improved understanding of such concepts.

In response to research question 3 (What are the interdependencies between professional beliefs and other relevant background data?), and as a last component of the data exploration presented here, Table 3 presents correlations between the overall mean value of all beliefs items and some selected socio-demographic variables as well as with the measured OTL. As indicated in Section 4, previous studies showed contrary results regarding the interdependency between beliefs and gender (Hammer et al. 2016; Fischer and Ehmke 2019). What has consistently been shown is a strong relationship between beliefs and OTL. Further interest in the context of the study presented here, lies on the question of whether participants who grew up speaking another language than German themselves hold more positive beliefs, and naturally, in how far the measured competence is linked to (positive) beliefs. For a better understanding of the correlation, the right column indicates whether or not the correlations are significant and at what level.

**Table 3:** Relationship between beliefs and other variables

	Beliefs (average mean across all items, post-test)	
	r	Significance (* $\leq$ .05; ** $\leq$ .01)
Competence Level (post-test)	.16	*
Opportunities to Learn (post-test)	.22	**
Gender	.23	**
Multilingual Participant	.17	*

Unlike in other studies on the role of beliefs about multilingualism amongst pre-service teachers, the participants in the survey presented here were a comparably homogenous group. All participants were M.Ed. students (and hence had approximately the same amount of semesters of preparation), all participants were preparing to become teachers either for mathematics or for a science subject, they were enrolled at the same university, and the data was collected by the same research group administering the same course during which the survey was conducted. What furthermore has to be pointed out is that, while being administered in the same survey, the competence test, the OTL survey and the beliefs questionnaire were separate instruments. Whilst taking all this into consideration, Table 3 reveals a few interesting correlations. The data show that there are significant interdependencies between the competence level of the participants and the measured beliefs, between the (amount of) OTL and the beliefs, between the participants' gender and the beliefs as well as between whether or not a participant speaks a home language other than German and the beliefs. While the correlation coefficients for the competence level and the multilingual participants are relatively low and the significance level is on the weaker end, there still seem to be noteworthy relationships, namely that multilingual participants show more welcoming beliefs about multilingualism, and that positive beliefs are interconnected with good test performance in the GSL competency test. In line with the findings in Fischer and Ehmke (2019) is the strong and solidly significant relationship between the amount of OTL that participants had had during their studies and the positivity in their beliefs. The highest coefficient (which, of course is still not high in statistical terms) comes out of the correlation between gender and beliefs, which thus confirms Fischer and Ehmke's (2019) findings that female participants have more welcoming views towards multilingualism and multilingual learners.

The following section reflects on these findings and provides a conclusive discussion of the data analysis in relation to the three research questions laid out further above.

## 7 Discussion and Conclusion

In response to the research questions outlined above, this section conclusively discusses the data analyses' findings. With regard to the general overview of the participants' responses to the 42 items used in this survey, we observe rather positive (or welcoming) views towards multilingualism, multilingual learners and teachers' responsibility for language support in the subject classroom. With an overall average of 3.26 in the pre-test and 3.32 in the post test on a response scale ranging from 1 (=strongly disagree) to 4 (=strongly agree), it can be attested that the participants in

the study presented here tend to believe in multilingualism being a resource and in the importance of supporting multilingual learners. It is naturally difficult to put these findings into perspective for two reasons. First of all, as Fischer and Ehmke (2019) point out, it is difficult to assess social acceptability or the perceived expectations regarding response patterns amongst the participants in surveys like the one presented here (Fischer and Ehmke 2019: 430; Ponterotto et al. 1998; Hachfeld et al. 2012; Riebling 2013). Secondly, there is no real frame of reference given as no study results in which the same items were used are available. The only possibly comparable study by Fischer et al. (2018), in which 27 similar (yet by no means identical) items were used with 626 participants, reveals a mean average of 3.17 across all items. While this is slightly below the mean averages presented here, it cannot be inferred that the beliefs of the pre-service teachers observed here are outstandingly more positive. Perhaps both results simply show that pre-service teachers in the current student generation have generally rather positive beliefs regarding multilingualism and multilingual learners. What should also be highlighted in this context is the gap between beliefs and competence. As explored in Section 3, the students surveyed in this study had rather low competences measured by the GSL competence test, yet they hold very positive beliefs about multilingualism and the importance to support multilingual learners. Of the 296 participants in this study, only a little under 10 % reached the pre-defined regular standard in the GSL competency test, and over two thirds of the participants remained in the lowest standard category in the post-test. This shows that, while there are significant competence improvements between the pre-test and the post-test, students are overall not very well prepared to cater for multilingual learners in their future career as teachers of sciences and mathematics. At the same time, through the analysis of the beliefs structures presented here, we observe that the participants are very aware of the necessity and the importance to support multilingual learners. Based on this, one may argue that the data show a theoretical nature of beliefs about multilingualism, but a lack of tools, techniques and knowledge about pedagogical actions to handle multilingualism. From this, it can be concluded that pre-service teachers want to be well prepared for multilingual classroom realities, but their preparation in the teacher degree might be insufficient.

When looking at the data analysis presented above in relation to the second research question (whether beliefs change between pre-test and post-test), a more multifaceted response is in order. Fischer and Ehmke (2019) describe a need for pre-post measurements of beliefs. Strictly speaking, the data discussion here cannot respond to this, as it does not emerge from a conventional intervention study including a control group. Nevertheless, a look into the plain descriptive data of the average means between pre-test and post-test reveals mild improvements in a sense that the beliefs are slightly more positive in the post-test. The averages of

three out of seven item sets are even significantly higher in the post-test and show small effect sizes. Of course, no direct link to the new course model described in Section 2 can be made given the lack of a control group sample. Also, the overall average mean across all 42 items does not change significantly, which somehow confirms both the educational (as set out by Kirsch and Aleksić 2018 explained in Section 4) as well as the psychological view (in reference to Pajares 1992) on whether beliefs can be changed. Seeing that changes do occur yet no drastic improvements can be observed, confirms that beliefs are difficult to change. To put this into perspective, it should, however, also be mentioned again that the participants attended only one small course of an overall workload of 25–30 hours. Comparable evaluations of bigger measures would possibly lead other results.

What emerges from the explorative factor analyses presented in Section 6, however, is noteworthy regarding the changes of belief patterns. Relating to the concepts of beliefs in concentric clusters including deeper (primary) beliefs and more peripheral beliefs (forwarded by Wischmeier 2012, and Ricart Brede 2019), a few assumptions can be deduced. The changes regarding the commonalities between the items revealed by the EFA show that the survey's participants had very unstructured belief patterns regarding their views on multilingualism and multilingual learners at the beginning of the semester. This changed considerably in the post-test, when clear structures emerged that allowed to comprise the vast majority of items on five scales, which relate well to previous findings. This shows that, the positivity towards the measured construct does not change greatly, which would arguably be rather surprising given the already quite positive beliefs in the pre-test. However, an interesting systematisation of beliefs patterns took place over the course of the semester. To conclude, these findings show that beliefs in this area are difficult, yet not impossible, to change in their overall quality. Patterns or clusters, however, can certainly change, which in the data exploration presented here can be deduced from the fact that explorative factor analyses in the pre-test showed a diffuse and unstructured pattern of our participants' beliefs, which then changed considerably in the post-test data. An alternative avenue to explaining this phenomenon may be grounded in an improved comprehension of concepts. As hinted at in Section 6, some of the items that were used in this survey included complex concepts, which participants may better understand after the course, which then enables them to provide more informed responses to the beliefs items.

For the third research question on interdependencies between beliefs and selected background variables, some interesting findings were revealed by the data analysis. Correlations show significant interdependencies between a) the participants' competence level and their beliefs, b) the participants' amount of exercised OTL and their beliefs, c) the participants' gender and their beliefs, and d) the participants' own multilingualism and their beliefs. Those correlations are to be un-

derstood as follows. First, we see that the higher the measured competence the better the beliefs are and vice versa. Secondly, the data show that the more OTL that a participant had the better the beliefs are and vice versa. Thirdly, it can be attested that female participants have more positive beliefs, male participants' beliefs are less positive, and fourthly, participants who grew up speaking a language other than German in the home have more positive beliefs than participants who grew up as monolingual German speakers. Especially, the two more solid correlations between the measured beliefs and gender and OTL are noteworthy. Regarding the question of gender, previous studies using similar instruments provided contrary findings (Hammer et al. 2016 found no effect between the two variables, Fischer and Ehmke 2019 found that female participants hold more positive beliefs). The data presented here is therefore in line with the latter study, which also found strong relationships between beliefs and OTL. When thinking about the underlying realities, meaning that pre-service teachers who have learnt more about language, multilingualism, multilingual learners, GSL, etc. hold more positive beliefs about those issues, this correlation is not overly surprising. Neither is the fact that OTL and competence development are very closely linked as explained in Section 3 (Stangen et al. 2020; Schroedler and Stangen 2019). What is noteworthy in this context though, is the extent of the proximity between the two constructs. When trying to predict the participant's competence using regression analysis and controlling for several relevant background variables, OTL have the most solid predictive value in the model published in Stangen et al. (2020). Adding beliefs into this model shows very little impact, insofar as when both constructs are included, beliefs have no significant predictive value and OTL lose a substantial share of its impact power. This can be understood as a further indication of the close relatedness between beliefs and OTL.

All in all, it has to be stressed that the analyses presented in this paper remain limited to an exploration of the data. More advanced methodology such as Rasch modelling (as used in Fischer and Ehmke 2019), the use of multilevel analyses or further exploration of interaction terms in multiple regression analyses would help to even better understand the data. Moreover, a more advanced look at the psychometric quality of the item collection used in this study would be helpful both in general terms, but also to put the findings from the two explorative factor analyses into coherent perspective. To counter the aforementioned methodological challenge of social expectedness/acceptability when collecting such data as presented here, two avenues can be identified. Ponterotto et al. (1998) used a social desirability assessment as a control measure in a study teachers' multicultural attitudes. Lundberg (2019a) makes use of Q-methodology, where respondents have to rank statements, which means respondents are 'pushed' to also indicate disagreement or indicate personal views of lower importance of certain state-

ments. Moreover, mixed-methods approaches to better understand pre-service teachers' beliefs about multilingualism could potentially shed light on issues that remain unclear from the data presented here. These and more methodological advancements both for collecting and for analysing data in (pre-service) teachers' beliefs are desirable for future studies.

This paper has shown that pre-service teachers, who were surveyed in a pre-post design to evaluate a new course structure, have welcoming beliefs about multilingualism and multilingual learners. The data presented here has shown that those beliefs do not change substantially over the course of one semester in their overall positivity towards multilingualism, but that some sort of mental systematisation took place amongst the participants between the pre-test and the post-test. Moreover, the study reveals that pre-service teachers' beliefs are interconnected with their competence, the amount of exercised OTL during their teacher training, their gender and with the question whether or not the participants grew up speaking another language than German. Referring back to the discrepancy between beliefs and competence, it can be argued that (while the new course model presented further above leads to increased OTL and shows positive competence development) a broader structure, possibly including a larger compulsory part of teacher preparation for multilingual classroom realities than one CP, is needed to equip all pre-service teachers with adequate competencies that appropriately mirror their positive beliefs. Beyond this, studies on practising teachers, especially early in their career, would help to find out whether the largely positive beliefs of pre-service teachers (as described here and elsewhere) are maintained when teachers enter the educational institutions as professionals.

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