Höltge, Lea; Ehm, Jan-Henning; Hartmann, Ulrike; Hasselhorn, Marcus

Teachers' self-efficacy beliefs regarding assessment and promotion of school-relevant skills of preschool children

Mitglied der
Leibniz-Gemeinschaft

Teachers´ Self-efficacy Beliefs Regarding Assessment and Promotion of School-relevant Skills of Preschool Children

Lea Höltge, Jan-Henning Ehm, Ulrike Hartmann[1], and Marcus Hasselhorn

Department of Education and Human Development, German Institute for International Educational Research, and Center for Individual Development and Adaptive Education of Children at Risk (IDeA), Frankfurt am Main, Germany.

[1]Ulrike Hartmann works now at the Institute for Educational Research, School of Education, at the University of Wuppertal, Germany

Correspondence concerning this article should be addressed to Lea Höltge, Department of Education and Human Development, German Institute for International Educational Research, Schlossstr. 29, D-60486 Frankfurt am Main, Germany. Email: hoeltge@dipf.de

Biographical notes:

Lea Höltge (M.Sc) is a research assistant and doctoral candidate in the Department of Education and Human Development at the German Institute for International Educational Research (DIPF) and the Center for Individual Development and Adaptive Education of Children at Risk (IDeA), Frankfurt am Main, Germany.

Jan-Henning Ehm (PhD) is a researcher in the Department of Education and Human Development at the DIPF and IDeA Center.

Ulrike Hartmann (PhD) is a researcher at the Institute for Educational Research, School of Education, at the University of Wuppertal, Germany, and the IDeA Center.

Marcus Hasselhorn (PhD) is professor of psychology at the Goethe-University Frankfurt am Main, Germany, Executive Director of the DIPF, head of the DIPF-Department of Education and Human Development, and scientific coordinator of the IDeA Center.

Teachers´ Self-efficacy Beliefs Regarding Assessment and Promotion of School-relevant Skills of Preschool Children

Abstract: This study addresses preschool teachers´ self-efficacy beliefs in assessment and promotion of children´s early language, social-emotional, and mathematical skills. The aim of the study was to find out to what extent preschool teachers believe to be able to assess and promote those skills, respectively. In a sample of 368 German preschool teachers, average scores in all scales were quite homogenously high. However, average scores of self-efficacy beliefs between the domains differed, with self-efficacy beliefs regarding language skills being the strongest. Self-efficacy beliefs regarding assessment were stronger than in promotion in the social-emotional and the mathematical domain, but not in language. Yet, confirmatory factor analyses indicate that self-efficacy beliefs regarding assessment were highly correlated with self-efficacy beliefs regarding promotion of skills in all three domains. Possible explanations for these results and ideas for further research are discussed.

Keywords: early childhood; compensatory education; self-efficacy, measurement

Preschool teachers play an important role in children´s educational development. Even though preschool teachers report positive attitudes towards promotion of skills in different domains, research has also shown that beliefs and practices are not always consistent (Fives & Buehl, 2012; Hegde & Cassidy, 2009; Sandvik, van Daal, & Adèr, 2014; Wen, Elicker, & McMullen, 2011). Predictors for teachers´ behaviour are not only their educational beliefs, pedagogical knowledge, and skills, but also their beliefs in their own capabilities (Bandura, 1997; Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998). In accordance with Bandura´s definition of self-efficacy and in correspondence with the model of teacher efficacy by Tschannen-Moran et al. (1998), we define preschool teachers´ self-efficacy beliefs as their self-perception of competencies to perform certain educational tasks. More specifically, the tasks we refer to in this study are those of assessing and promoting school-relevant skills in young children. As self-

efficacy beliefs can be seen as a motivational resource (Bandura, 1997; Zimmerman, 2000) that plays a role in the implementation of evidence-based practices (Durlak & DuPre, 2008), innovations or reforms (Ghaith & Yaghi, 1997; Gorozidis & Papaioannou, 2011), preschool teachers´ self-efficacy beliefs may affect the quality of early education and thus children´s development (cf. Kluczniok & Roßbach, 2014). Hence, high self-efficacy beliefs can help teachers satisfy the demands made on them.

Teachers´ and Educators´ Efficacy Beliefs

Research about task specific efficacy beliefs of preschool teachers is rare, but studies addressing school teachers´ efficacy beliefs have indicated that they are indeed related to their practices (Allinder, 1994; Fackler & Malmberg, 2016; Gorozidis & Papaioannou, 2011; Sandholtz & Ringstaff, 2014). One reason for this relationship might be that self-efficacy has a positive impact on teachers´ motivation to learn, on their long and short-term goals as well as their openness to use new classroom practices (Ciyer, Nagasawa, Swadener, & Patet, 2010). In accordance with frameworks of educational quality (Kluczniok & Roßbach, 2014), relationships between teachers´ efficacy beliefs and their students' outcomes, like achievement, have also been found (Fackler & Malmberg, 2016; Guo, Piasta, Justice, & Kaderavek, 2010; Moolenaar, Sleegers, & Daly, 2012; Tschannen-Moran et al., 1998; Varghese, Garwood, Bratsch-Hines, & Vernon-Feagans, 2016).

A lot of these studies on teachers´ efficacy beliefs use scales that assess teachers´ self-efficacy in classroom management, student engagement and instruction (based on Tschannen-Moran & Woolfolk Hoy, 2001; e.g. E. Brown, 2005; Bullock, Coplan, & Bosacki, 2015; Garvis & Pendergast, 2011; Varghese et al., 2016) or that, similarly to the Gibson and Dembo scale (1984), assess the two dimensions *personal teaching efficacy* and *general teaching efficacy* or *outcome expectancy* (e.g. Allinder, 1994;

Ciyer et al., 2010; Ghaith & Yaghi, 1997; Newton, Leonard, Evans, & Eastburn, 2012; Sandholtz & Ringstaff, 2014). Item contents of personal teaching efficacy focus on the teacher believing in his or her "skills and abilities to bring about student learning" (Gibson & Dembo, 1984, p. 573). When studies cannot show relationships between teacher efficacy and behaviour, this can be due to a mismatch between item content and criterial tasks (Bandura, 1997; Pajares, 1996). Therefore, these existing teacher efficacy beliefs scales might not be sufficient predictors of preschool teachers´ behaviour with regard to assessing and promoting certain skills in young children. Yet, especially the promotion of certain skills is an important task preschool teachers have to accomplish (NAEYC, 2009). In terms of preparing children for school, early language and mathematical skills as well as social-emotional skills are educational domains of special importance in preschool education (NAEYC, 2009). In an interview study, Lara-Cinisomo, Fuligni, Ritchie, Howes, and Karoly (2008) showed that preschool and kindergarten teachers mainly agreed that emotional and social skills as well as cognitive skills, like number and letter knowledge, are child characteristics important for school readiness. Other preschool teachers stress the importance of social and physical development over academic learning for 4-year-olds (Lee, 2006; also Kowalski, Pretti-Frontczak, & Johnson, 2001). In Germany, the promotion of social-emotional skills can be seen as a traditional focus of preschool education, while early academic skills have received growing attention especially during the last two decades (Kuger, Rossbach, & Weinert, 2013). Yet, early mathematical and language skills are strong predictors of achievement in later years (e.g. Duncan et al., 2007).

In day-care centres, teachers can provide primary prevention or more individualized support to children who are lagging behind in specific domains. Despite its importance, only few studies have addressed the topic of preschool teachers´ self-

efficacy beliefs in these domains. Note that in this study, we refer to German child-care centres for children aged three to six years, where children are usually educated and cared for in mixed-age groups. Preschool institutions in Germany are not part of the school system, but fall under the administration of child and youth welfare. Teaching methods differ substantially from those in school settings in that a holistic, situational approach is followed, where learning mainly takes place in self-directed free-play activities or project work based on children´s own interests. Accordingly, there are no curricula for early child care comparable to school curricula or standards, yet preschool teachers can find orientation in education plans of the federal states or the conception of their institution (cf. König, 2009; Kultusministerkonferenz, 2015; Oppermann, Anders, & Hachfeld, 2016). Unlike school teachers, who receive their training at universities, most preschool teachers have completed vocational training (cf. OECD, 2006, for more information about the German preschool system).

Concerning education in early math, Oppermann et al. (2016) claimed that research regarding self-efficacy beliefs of preschool teachers is scarce. In their study, preschool teachers´ efficacy beliefs in their own mathematical ability mediates the effect of their mathematical content knowledge on their sensitivity to detect mathematical content in play based situations. However, this study does not provide information about perceived self-efficacy regarding teaching math or promoting early mathematical skills. Chen, McCray, Adams, and Leow (2014) used the Early Math Beliefs and Confidence Survey (EM-BCS) to assess preschool teachers' beliefs about math in preschools, their confidence in teaching math to preschool children and their beliefs in their own math abilities. Whereas their beliefs in math and their confidence in teaching math were very pronounced, they rated their own math abilities as rather poor. Results also showed that a lot of teachers felt insecure regarding the assessment of math

learning. For example, they felt unsure about how to assess children´s mathematical knowledge and skills, and also about using assessment results for the development of curricula. However, most teachers were very confident in adequately observing what children know about math and how to teach math in play-based or everyday situations and routines.

Regarding early language skills, Guo et al. (2010) found that preschool teachers´ self-efficacy beliefs predicted children´s print awareness. They also found that emotional support moderated the positive influence of teachers´ efficacy beliefs on children´s gains in vocabulary. This finding supports the assumption that quality characteristics of early education moderate the effects of self-efficacy and other educational beliefs on children´s developmental gains. However, the scale used by Guo et al. (2010) did not aim specifically at self-efficacy regarding the promotion of language skills.

Regarding social-emotional skills, to our knowledge there are no studies assessing how competent preschool teachers feel in assessing and promoting those skills in children. Most research hitherto seems to focus on children´s academic skills.

As Chen et al. (2014, see above) have shown, preschool teachers´ efficacy beliefs regarding teaching math differed from their confidence in their assessment of children´s skills as well as their confidence in deriving appropriate curricula from assessment results. Yet, providing children with the individualized education they need, requires teachers to be aware of children´s skills and their individual developmental stage. To be able to plan and provide adequate individualized and demand-oriented activities, thus, teachers need diagnostic skills and tools. Suggested means to assess skills in preschool settings are observations, interviews with the child and its family, and individual child assessments (NAEYC, 2009). Preschool teachers of 4-year-olds in

Lee´s study (2006) believed that curricula should be based on children´s interests and that to identify those interests, observations are necessary. Also, they uttered that it depends on a child which classroom practices are appropriate, meaning that not every practice is right for every child. The majority of teachers in this study stated that it is the teachers´ job to know about strengths and weaknesses of the children in their classrooms. Despite the importance of 'having detailed knowledge of the children in their classrooms, their abilities and interest' in order to teach children effectively (NAEYC, 2009, p. 5-8), most research in teacher efficacy focuses solely on teaching and not explicitly on the assessment of student´s or children´s skills. One German study recently addressed self-rated competencies in both tasks simultaneously (Schneewind, Böhmer, Granzow, & Lattner, 2012). In a sample of over 800 German preschool teachers, participants rated their own competencies in language related education as rather good. Likewise, they reported to feel rather competent in doing observations and documentations of children´s development. However, the study did not include other methods of assessment. Because the assessment and the promotion of children´s development requires different skills of teachers, one can presume that their self-efficacy beliefs regarding these two demands might differ. One teacher might feel very confident with regard to asserting whether a child is in need of individualized education, but might be unsure about how to provide this education adequately. Moreover, it is worth looking at self-efficacy beliefs in different domains, because as Ciyer et. al (2010) stated: 'a teacher who feels highly efficacious in one teaching area may feel less efficacious in another' (p. 133). Also, Lee and Ginsburg (2007) found that the preference for situations in which to promote literacy or mathematics differed from each other. Whereas preschool teachers indicated that they preferred daily routines to engage children in mathematics, they provided curricula based on children´s interests to foster

literacy and also focused strongly on non-academic domains like social development. With regard to mathematics, they emphasized content strongly, mentioning certain skills and knowledge children should learn. The authors also reported that some of their participants mentioned that they felt teaching mathematics was more difficult than teaching literacy.

Research Questions

Despite the broad consensus regarding the importance of early, individualized education, there is a lack of empirical research on how confident preschool teachers are with regard to accomplishing the demands of assessment and promotion of young children's skills in different domains. Thus, the present paper aims to find out how confident preschool teachers are in their competencies to assess and promote early language, mathematical and social emotional skills, respectively. In order to be able to provide an adequate answer to this question, we decided to first look at the structure of preschool teachers´ self-efficacy beliefs as assessed with a newly designed scale.

Method

Samples

105 preschool teachers participated in a pilot study. They were mainly recruited via a Facebook group for German preschool teachers and completed an online survey including demographical questions as well as 37 self-efficacy beliefs items. Participants were 18 to 62 years old ($M = 35.75$, $SD = 10.56$), had up to 43 years experience on the job ($M = 10.06$, $SD = 9.46$), and were mainly female (94.3 %). 69.5% received their education through vocational training and 32.4% held a college degree in early education.

In our main study, the self-efficacy items were part of a larger set of questionnaires that had been sent to over 600 child-care centres in the German federal state of Baden-Württemberg in autumn and winter 2015. Each centre received five questionnaires to be filled out by teachers and one for the centre´s director. A prepaid return envelope was provided for each centre as well as single envelopes for each participant to ensure confidentiality of their responses. Centres received 50 Euros as incentive for sending back at least two questionnaires. Approximately 20% of the centres we contacted participated in our study, resulting in data from 462 teachers from 122 centres. Only teachers who reported working with children aged four years or older were included in the analyses, since we were interested in assessment and promotion of school-related skills. Five participants were excluded from analyses because of missing data on more than half of the self-efficacy items. Thus, the final sample included 368 teachers from 118 child-care centres. Participants were between 19 and 69 years old (M = 40.47, SD = 11.92), and had an average job experience of 16 years (SD = 11.09, *range*: 0 to 46 years). The vast majority of participants was female (97.3%) and had received their education through vocational training (89%). 1.1% of the sample held a university degree in early education.

Measure

The items of the self-efficacy scale were statements regarding preschool teachers´ beliefs in their capability to assess young children's language, mathematical, and social-emotional skills, respectively, as well as beliefs in their capability to promote the same skills. Item content is kept on a medium level of specificity to remain a good level of generalizability (e.g. 'I believe I can provide good learning opportunities for children who need additional support regarding their language skills').

Participants were asked to rate their agreement to those statements on a 11-point scale from 0 (not true at all) to 10 (absolutely true). To avoid confusion about the terms we used in the questionnaire, we gave participants a short description of what we mean by *children in need of additional support*, and made clear that by talking about promoting language or mathematical skills we do not refer to teaching children to read, write, and calculate, but to promote relevant precursor skills such as rhyming or counting. We also clarified that we referred not only to standardized programs, but also to all activities they could use to promote these skills. Participants of the pilot study received 37 items. After preliminary item analyses the questionnaire was revised and thus the final version contained 21 items (see Table 1). In each domain three items focus on the assessment and four on the promotion of skills.

- Insert Table 1 here -

Pilot study analyses

In a first step, we conducted exploratory factor analysis (EFA) with an independent sample to get a first impression of the underlying subscales of this newly developed questionnaire. We used principal axis factor analysis with promax rotation for the final version of the questionnaire as described above. The data derived from the sample of 105 preschool teachers from the pilot study.

Pilot study results

Principal axis factor analysis revealed that three factors have an Eigenvalue greater than one, which accounts for 75% of the variance. Interpreting only factor loadings greater than .30, all items regarding social-emotional skills load on the first factor (cf. Table 1). All items regarding mathematical skills have their highest loadings on the second factor and all language items, except one item, show highest loadings on the third factor.

Despite minor crossloadings (cf. Table 1), a three-factor model separating the three educational domains was found to appropriately fit the data, explaining most of the variance. Item and scale analyses based on this three-factor solution are displayed in Table 1.

Main study analyses

In a second step, we used the sample of 368 preschool teachers from the main study to conduct confirmatory factor analysis (CFA) with MPlus to validate the EFA results. We tested the three-factor, domain-specific model as derived from EFA against three other models to assure its validity in comparison to the other models. As preschool teachers´ tasks include assessment and promotion in different domains alike, we computed a one-factor solution where variances and covariances can be explained by a single self-efficacy factor. Yet, assessment and promotion contain different tasks and thus skills, which we accounted for in a two-factor model in which educators self-efficacy beliefs regarding assessment can be explained by a different factor than their self-efficacy beliefs regarding promotion of skills regardless of the educational domain. However, assessing and promoting children´s skills in the three domains require different skills of teachers, respectively. Thus, assessing social-emotional skills might be easier for some preschool teachers than, for example, assessing or promoting mathematical skills. This is taken account for in a six-factor model in which each factor contains items that focus on assessment or promotion in the three domains, respectively.

As the wording of the items was parallel across domains, residuals of those items were allowed to correlate. Maximum Likelihood Robust (MLR) estimators were used to account for the slightly non-normal distribution of the data. To evaluate model fit, the following indices were used: Chi-square (χ^2), Akaike Information Criterion (AIC), Comparative Fit Index (CFI), Standardized Root Mean Square Residual

(SRMR), and Root Mean Square Error of Approximation (RMSEA). Preliminary item analyses indicated to remove the first item of the questionnaire from all further analyses.

Results

Confirmatory factor analyses showed that the goodness of model fit indices of the first two models were poor, however, goodness of fit indices for the domain-specific model revealed satisfactory results (CFI = .954, $RMSEA$ = .060, $SRMR$ = .043; see Table 2).

- Insert Table 2 here -

Item and scale analyses for the three domain-specific factors showed satisfactory item-total correlations and good internal consistencies (see Table 3). Correlations between the three factors were rather substantial: $r_{language/social-emotional}$ = .84; $r_{language/math}$ = .73, and $r_{social-emotional/math}$ = .70.

- Insert Table 3 here –

The six-factor model showed good fit indices (CFI = .972, $RMSEA$ = .048, $SRMR$ = .045). Yet, in this model, correlations between the assessment and promotion factors within the three domains were close to one (r = .90 for language, r = .96 for mathematical, and r = .93 for social-emotional skills)[1].

We first conducted further analyses on the basis of the more parsimonious, domain-specific three-factor model as we were interested in the differences between preschool teachers´ self-efficacy beliefs in the three domains, respectively. We therefore computed average scores for the three scales and computed a one-way repeated measures ANOVA with SPSS.

---

[1] Due to these high correlations, MPlus produced an error message, indicating a linear dependency between those latent factors.

Differences between domain-specific self-efficacy beliefs

Results show that, overall, preschool teachers trust in their competencies to assess and promote children´s skills in all three domains. Average scores of self-efficacy beliefs in all three domains reached rather high levels: $M_{language}$ = 7.80 (SD = 1.38), M_{math} = 7.25 (SD = 1.52), and $M_{social-emotional}$ = 7.53 (SD = 1.41). Similar results were obtained for participants of our pilot study (cf. Table 1).

The ANOVA shows that the average score in the three domains differ significantly, F(1.82, 668.37) = 45.26, p < .001. Due to violation of the assumption of sphericity, we used Huynh-Feldt corrected degrees of freedom (ε = .91). Bonferroni adjusted post hoc tests revealed that all average score differences are significant with p < .001[2]. Results show that the differences between each of the domains are significant, with language being the highest, followed by social-emotional, and math self-efficacy beliefs, consecutively. Effect sizes of the pairwise comparisons are small with $d_{math\ vs.\ social-emotional}$ = .19, $d_{math\ vs.\ language}$ = .38, and $d_{social-emotional\ vs.\ language}$ = .20.

Differences between self-efficacy beliefs regarding assessment and promotion

Because we were also interested in differences with regard to self-efficacy beliefs of assessment and promotion, we computed average scores for domain-specific assessment and promotion scales as well on the basis of the six-factor model. Reliabilities for the resulting six scales ranged from Cronbach´s α = .82 to .93. Dependent t-Tests were computed to check for differences between average scores in the assessment and promotion scales for each domain. With regard to the social-emotional domain, self-efficacy beliefs in assessment (M = 7.66, SD = 1.51) were found to be slightly higher

---

[2] Friedman´s ANOVA for non-parametric data showed the same results, χ^2(2) = 64.26, p < .001. Here, Wilcoxon tests were used as post hoc tests. The level of significance was adjusted to p = .017 using Bonferroni correction.

than those in the promotion of social-emotional skills ($M = 7.42$, $SD = 1.45$), $t(364) =$ 5.196, $p > .001$, $d = .16$. Self-efficacy beliefs in mathematical assessment accordingly were higher than those in promoting mathematical skills as well, $t(364) = 5.973$, $p <$ .001, $d = .17$. The same revealed to be true for language, where average self-efficacy beliefs regarding assessment ($M = 7.84$, $SD = 1.48$) were again higher than regarding promotion ($M = 7.77$, $SD = 1.42$). However, this last difference could not be assured statistically, $t(367) = 1.533$, n.s[3].

Discussion

Several studies focus on teachers' self-efficacy beliefs and research has shown relationships between teachers´ self-efficacy beliefs and their behaviour as well as their students´ outcomes. However, a lack of research on preschool teachers´ self-efficacy beliefs encouraged us to develop a new instrument. The questionnaire presented here assesses preschool teachers´ self-efficacy beliefs regarding the assessment and promotion of children´s early language, social-emotional, and mathematical skills. In this study we investigated the structure of teachers´ self-efficacy beliefs and analysed differences of self-efficacy beliefs in three educational domains and in the assessment and promotion of skills.

Structure of self-efficacy beliefs

Results of an EFA suggest a three-factor model regarding the structure of self-efficacy beliefs. Items referring to involving parents in the promotion of their children´s skills loaded on the same factor as items regarding social-emotional skills. In CFA, similar wording of the items was accounted for. Here, alternative models were computed and two of them showed good or acceptable goodness of fit indices. A six-factor model that

---

[3] Non-parametric Wilcoxon tests led to the same results.

differentiated between assessment and promotion of skills in the three domains, respectively, provided good fit indices, but showed high intercorrelations between latent factors. Thus, discriminant validity of this six-factor solution cannot be assumed (cf. T. Brown, 2006, p. 32), which leads to the conclusion that preschool teachers seem not to differentiate much between self-efficacy beliefs regarding assessment and promotion of skills, respectively. This supports the assumption of a three-factor model, differentiating between self-efficacy beliefs in the three domains, but not between assessment and promotion of skills. This model proved to fit the data well. Literature about the promotion of skills or compensatory education suggests that diagnostics or assessments should be the basis for providing individualized support to children (e.g. Behrensen, Sauerhering, Solzbacher, & Warnecke, 2011, p. 49). Thus, one would expect that teachers, in a first step, observe children´s skills before, in a second step, they decide on how to promote those skills if a child needs individualized support. Accordingly, a better differentiation between the assessment and promotion factors would have been expected. However, it is likely that teachers actually implement some kind of formative assessment and thus assess children´s skills while using means to promote the same skills. Furthermore, assessment and promotion of skills are not always differentiated in German research literature on early education either (Behrensen & Solzbacher, 2012) which might reflect that assessment is seen as a necessary part of promotion. Though, due to small sample sizes, these results can only be interpreted with caution.

Differences of self-efficacy beliefs between educational domains
Taking the domain-specific model as a starting point, we compared the average scores in order to uncover domain dependent differences in preschool teachers´ self-efficacy beliefs. Despite the homogeneity of teachers´ responses in our study, average scores in the three domains revealed to differ significantly. Participants reported highest self-

efficacy beliefs regarding the assessment and promotion of children´s language skills, followed by social-emotional skills and lastly by early mathematical skills. We also found higher correlations between self-efficacy beliefs regarding language and social-emotional skills than between those regarding math education and the two other domains. The average score differences are in accordance with Lee and Ginsburg (2007), who reported that some preschool teachers in their study felt that it is more difficult to teach math as compared to literacy. These results also reflect the attention the different domains receive in the literature or in more public discussions. Language skills, for example, are seen as central for all other domains and are emphasized in research as well as in practitioner guidelines (cf. NAEYC, 2009). Also, there are many initiatives and programs that aim at improving children´s language skills. Generally, kindergarten teachers´ self-efficacy beliefs in specific areas seem to be higher as compared to teachers of higher grades (Klassen & Chiu, 2010). In our study, participants knew that we were interested in their practices and beliefs in individualized promotion of skills, thus social desirability might have positively strained their responses. Moreover, indicating low self-efficacy beliefs in those areas would have indicated that they believed they were not able to fulfil certain job requirements.

It should be noted however, that the differences in average scores in our sample were not very big, effect sizes were small and even the lowest average scores, in mathematics, were still located on the upper part of the scale. In contrast, Garvis and Pendergast (2011) showed that preschool teachers´ self-efficacy beliefs in English and Math were equally high and even higher than their self-efficacy beliefs in arts education. However, these authors focused on teachers´ perceived self-efficacy in classroom management when teaching arts, math or language, respectively. They did

not explicitly ask how well teachers believed they were able to actually teach art or promote mathematical or language skills in children.

Across the three domains, we found rather homogenously high levels of self-efficacy beliefs. This homogeneity of responses across domains is rather surprising, given that other studies reported quite divers beliefs regarding what practices are developmentally appropriate in the different domains. For example, Benz (2012), when asking preschool teachers what young children primarily should learn regarding mathematics, counting was mentioned most often (48%). Some of the teachers also mentioned goals that are not part of the preschool curriculum like calculating with numbers up to 1000. Also, most teachers in Chen et al.´s study (2014) thought it was best to use everyday routines to promote mathematical skills. Still, a third of the participants believed in structured math instruction and about a fifth favoured a published curriculum. One reason for homogeneity in our sample could have been the used 11-point response scale, which is rather unusual in the related field and differed from other response scales used in other parts of the set of questionnaires participants in our study received. Dealing with this new format may have contributed to the low levels of observed standard deviations. This assumption is partially supported by the results of a subsample of our pilot study. Here, some participants ($N = 55$) responded to self-efficacy items only. Standard deviations were slightly higher in this sample ($SD_{language} = 1.78$, $SD_{social-emotional} = 1.77$, and $SD_{math} = 1.99$).

Differences in self-efficacy beliefs between assessment and promotion of skills
Other average score differences we found, despite the high correlations between the factors, were those between self-efficacy beliefs in assessment versus promotion of skills in the social-emotional as well as mathematical domain. Surprisingly, assessment scores were slightly, but significantly, higher than promotion scores. In most

educational plans and curricula, promotion of skills is emphasized and professional development workshops more often focus on promotion of skills instead of assessment. Moreover, research has shown that preschool teachers often are sceptical towards assessment. Teachers in Chen et al.´s (2014) study reported more confidence in their math teaching skills than in their capability to assess children´s corresponding skills. Accordingly, Baker, Tichovolsky, Kupersmidt, Voegler-Lee, and Arnold (2015) concluded that it is more difficult for preschool teachers to reliably assess children´s academic skills than for school teachers. They accounted for this by indicating a lack of applicable tools of formal assessments in early education. However, they also found that preschool teachers´ assessments of their children´s skills differed from objective assessment results. Thus, preschool teachers might tend to overestimate their capability to assess children´s skills. Regarding language, assessment and promotion of skills are more often mentioned alongside each other and preschool teachers are provided with more assessment as well as promotion tools compared to the other domains. Here, our results resemble those of Schneewind et al. (2012), who found that preschool teachers believed in their abilities to both assess and promote language skills in children.

Limitations

There are several methodological issues that have to be considered. First, the first item in our questionnaire was excluded from the analyses, as participants´ responses to this item differed from their responses to all other items. In future studies this problem might be solved by giving participants a practice item in advance to get them used to the scale. Second, more variance might have been found with more specific items. Third, as the six-factor model showed a lack of discriminant validity and sample sizes were small, results should be interpreted with caution. Moreover, means could not be calculated on a latent level and thus we were not able to control for measurement error.

Nevertheless, our results show that it is worth looking at more than one domain simultaneously as self-efficacy beliefs seem to differ across domains. It should also be kept in mind that providing high quality education requires some kind of assessment to be able to provide individualized support for each child, and that the strength self-efficacy beliefs in assessment might differ from self-efficacy beliefs in promotion of skills.

Implications and further research

Teachers´ self-efficacy beliefs have been described as context-related, domain- and task-specific (Pajares, 1996; Tschannen-Moran et al., 1998; Zimmerman, 2000). Yet, the items used in the present study only showed a medium level of specificity, which might reduce correlations with actual behaviour (e.g., Pajares, 1996), but at the same time might improve generalizability (Tschannen-Moran & Woolfolk Hoy, 2001).

To achieve a more sophisticated understanding of preschool teachers´ self-efficacy beliefs alternative research methods might be useful. Interviews for example allow researchers to simultaneously ask for underlying, more general beliefs and their relationship to self-efficacy beliefs as well as practice. This leads to another field of interest: the impact of preschool teachers´ self-efficacy beliefs on their action in practice and finally on children´s development. These relations have been shown for school teachers´ self-efficacy beliefs already (Allinder, 1994; Fackler & Malmberg, 2016; Gorozidis & Papaioannou, 2011; Moolenaar et al., 2012; Sandholtz & Ringstaff, 2014; Tschannen-Moran et al., 1998; Varghese et al., 2016) and can be anticipated for preschool teachers as well based on theoretical models of preschool quality (Kluczniok & Roßbach, 2014). Our questionnaire can be used to conduct similar research in the field of early education.

Another interesting field of research is the relationship between self-efficacy beliefs in the different domains and attitudes toward these domains. For example, Benz (2012) asked German preschool teachers to indicate their feelings toward mathematics by choosing adjectives. Most adjectives chosen were positive, as two thirds of the participants chose words like *useful* and, or *important*. In contrast to the present results however, a lot of teachers also chose negative adjectives to describe their feelings toward mathematics. Similarly, Lee (2006) found most teachers of her sample of preschool teachers of 4-year-olds thinking that teaching children academics like reading is not child-appropriate. Instead, they put more emphasis on the importance of social skills and preferred classrooms in which children were encouraged to interact with each other. Likewise, Kowalski et al. (2001) found that preschool teachers in the US rated social-emotional skills as most important and early math as well as literacy as significantly but equally less important. The more academic the items´ content was (e.g. involving writing of numbers or letters) the less important it was rated by participants. This poses the question how self-efficacy beliefs and attitudes towards different domains are related to each other, and moreover, how the two interact and affect educators´ pedagogical behaviour. Professional development could also benefit from research aiming at a deeper understanding of how preschool teachers develop their self-efficacy beliefs. From their research, Klassen and Chiu (2010) conclude that professional development needs to account for different career stages in order to effectively promote self-efficacy beliefs, which in turn can lead to higher job satisfaction. Thus, it would be interesting to look at the relationship of self-efficacy beliefs with job related factors like experience, professional training or satisfaction and alike. The self-efficacy beliefs questionnaire introduced in this study might be useful for further research in this field as well as for the evaluation of professional development

courses that focus on the assessment and promotion of skills in early childhood

education settings.

References

Allinder, R. M. (1994). The relationship between efficacy and the instructional practices

of special education teachers and consultants. *Teacher Education and Special*

Education, *17*, 86–95. doi: 10.1177/088840649401700203

Baker, C. N., Tichovolsky, M. H., Kupersmidt, J. B., Voegler-Lee, M. E., & Arnold, D.

H. (2015). Teacher (mis)perceptions of preschoolers' academic skills: predictors

and associations with longitudinal outcomes. *Journal of Educational Psychology*,

107, 805–820.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

Behrensen, B., Sauerhering, M., Solzbacher, C. & Warnecke, W. (2011). *Das einzelne*

Kind im Blick. Individuelle Förderung in der Kita [Individual promotion in

kindergarten]. Freiburg im Breisgau: Herder

Behrensen, B., & Solzbacher, C. (2012). Individuelle Förderung - in KiTa und

Grundschule. [Individual promotion - in kindergarten and primary school]

Retrieved January 2, 2017, from https://www.nifbe.de/images/nifbe/Infoservice/

Downloads/Themenhefte/Individuelle_Förderung_online.pdf

Benz, C. (2012). Maths is not dangerous – attitudes of people working in German

kindergarten about mathematics in kindergarten. *European Early Childhood*

Education Research Journal, *20*, 249–261. doi: 10.1080/1350293X.2012.681131

Brown, E. T. (2005). The influence of teachers' efficacy and beliefs regarding

mathematics instruction in the early childhood classroom. *Journal of Early*

Childhood Teacher Education, *26*, 239–257. doi: 10.1080/10901020500369811

Brown, T. A. (2006). *Confirmatory factor analysis for applied research.* New York:

Guilford Press.

Bullock, A., Coplan, R. J., & Bosacki, S. (2015). Exploring links between early

childhood educators' psychological characteristics and classroom management

self-efficacy beliefs. *Canadian Journal of Behavioural Science*, *47*, 175–183. doi:

10.1037/a0038547

Chen, J., McCray, J., Adams, M., & Leow, C. (2014). A survey study of early childhood

teachers' beliefs and confidence about teaching early math. *Early Childhood*

Education Journal, *42*, 367–377. doi: 10.1007/s10643-013-0619-0

Ciyer, A., Nagasawa, M., Swadener, B. B., & Patet, P. (2010). Impacts of the Arizona

System Ready/Child Ready Professional Development Project on preschool

teachers' self-efficacy. *Journal of Early Childhood Teacher Education*, *31*, 129–

145. doi: 10.1080/10901021003781197

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov,

P., … Japel, C. (2007). School readiness and later achievement. *Developmental*

Psychology, *43*, 1428–1446. doi: 10.1037/0012-1649.43.6.1428

Durlak, J. A., & DuPre, E. P. (2008). Implementation matters: A review of research on

the influence of implementation on program outcomes and the factors affecting

implementation. *American Journal of Community Psychology*, *41*, 327–350. doi:

10.1007/s10464-008-9165-0

Fackler, S., & Malmberg, L. (2016). Teachers' self-efficacy in 14 OECD countries:

Teacher, student group, school and leadership effects. *Teaching and Teacher*

Education, *56*, 185–195. doi: 10.1016/j.tate.2016.03.002

Fives, H., & Buehl, M. M. (2012). Spring cleaning for the "messy" construct of

teachers' beliefs: What are they? Which have been examined? What can they tell

us? In K. R. Harris, S. Graham, & T. Urdan (Eds.), *APA Educational Psychology*

Handbook, Vol. 2: Individual differences and cultural and contextual factors (p. 471–499.). doi: 10.1037/13274-000

Garvis, S., & Pendergast, D. (2011). An investigation of early childhood teacher self-efficacy beliefs in the teaching of arts education. *International Journal of Education and the Arts*, *12*(9), 1–15.

Ghaith, G., & Yaghi, H. (1997). Relationships among experience, teacher efficacy, and attitudes toward the implementation of instructional innovation. *Teaching and Teacher Education*, *13*, 451–458.

Gibson, S., & Dembo, M. H. (1984). Teacher efficacy: A construct validation. *Journal of Educational Psychology*, *76*(4), 569–582.

Gorozidis, G., & Papaioannou, A. (2011). Teachers´ self-efficacy, achievement goals, attitudes and intentions to implement the new Greek physical education curriculum. *European Physical Education Review*, *17*, 231–253. doi: 10.1177/1356336X11413654

Guo, Y., Piasta, S. B., Justice, L. M., & Kaderavek, J. N. (2010). Relations among preschool teachers self-efficacy, classroom quality, and children's language and literacy gains. *Teaching and Teacher Education*, *26*, 1094–1103. doi: 10.1016/j.tate.2009.11.005

Hegde, A. V, & Cassidy, D. J. (2009). Teachers' beliefs and practices regarding developmentally appropriate practices: A study conducted in India. *Early Child Development and Care*, *179*, 837–847. doi: 10.1080/03004430701536491

Klassen, R. M., & Chiu, M. M. (2010). Effects on teachers' self-efficacy and job satisfaction: Teacher gender, years of experience, and job stress. *Journal of Educational Psychology*, *102*(3), 741–756. doi: 10.1037/a0019237

Kluczniok, K., & Roßbach, H. (2014). Conceptions of educational quality for

kindergartens. *Zeitschrift Für Erziehungswissenschaft*, *17*(Supplement), 145–158. doi: 10.1007/s11618-014-0578-2

König, A. (2009). Observed classroom interaction processes between pre-school teachers and children: Results of a video study during free-play time in German pre-schools. *Educational and Child Psychology, 26*(2), 53-65.

Kowalski, K., Pretti-Frontczak, K., & Johnson, L. (2001). Preschool teachers' beliefs concerning the importance of various developmental skills and abilities. *Journal of Research in Childhood Education*, *16*, 5–14.

Kuger, S., Rossbach, H.-G., & Weinert, S. (2013). Early literacy support in institutional settings – A comparison of quality of support at the classroom level and at the individual child level. In M. Pfost, C. Artelt, & S. Weinert, *The development of reading literacy from early childhood to adolescence. Empirical findings from the Bamberg BiKS longitudinal studies* (p. 63-92). Bamberg: University of Bamberg Press.

Kultusministerkonferenz (2015). The educational system in the federal republic of Germany 2013/2014. A description of the responsibilities, structures and developments in education policy for the exchange of information in Europe. Retrieved April 13, 2017, from https://www.kmk.org/fileadmin/Dateien/pdf/ Eurydice/Bildungswesen-engl-pdfs/dossier_en_ebook.pdf

Lara-Cinisomo, S., Fuligni, A. S., Ritchie, S., Howes, C., & Karoly, L. (2008). Getting ready for school: An examination of early childhood educators' belief systems. *Early Childhood Education Journal*, *35*(4), 343–349. doi: 10.1007/s10643-007-0215-2

Lee, J. S. (2006). Preschool teachers' shared beliefs about appropriate pedagogy for 4-year-olds. *Early Childhood Education Journal*, *33*, 433–441. doi: 10.1007/s10643-

006-0059-1

Lee, J. S., & Ginsburg, H. P. (2007). Preschool teachers' beliefs about appropriate early

    literacy and mathematics education for low- and middle-socioeconomic status

    children. *Early Education & Development*, *18*, 111–143. doi:

    10.1080/10409280701274758

Moolenaar, N. M., Sleegers, P. J. C., & Daly, A. J. (2012). Teaming up: Linking

    collaboration networks, collective efficacy, and student achievement. *Teaching and*

    Teacher Education, *28*, 251–262. doi: 10.1016/j.tate.2011.10.001

NAEYC. (2009). Developmentally Appropriate Practice in Early Childhood Programs

    Serving Children from Birth through Age 8: Position Statement. Retrieved January

    2, 2016, from http://www.naeyc.org/files/naeyc/file/positions/PSDAP.pdf

Newton, K. J., Leonard, J., Evans, B. R., & Eastburn, J. A. (2012). Preservice

    elementary teachers' mathematics content knowledge and teacher efficacy. *School*

    Science and Mathematics, *112*, 289–299. doi: 10.1111/j.1949-8594.2012.00145.x

OECD (2006). Starting Strong II. Paris, France: OECD.

Oppermann, E., Anders, Y., & Hachfeld, A. (2016). The influence of preschool

    teachers' content knowledge and mathematical ability beliefs on their sensitivity to

    mathematics in children's play. *Teaching and Teacher Education*, *58*, 174–184.

    doi: 10.1016/j.tate.2016.05.004

Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational*

    Research, *66*, 543–578.

Sandholtz, J. H., & Ringstaff, C. (2014). Inspiring instructional change in elementary

    school science: The relationship between enhanced self-efficacy and tacher

    practices. *Journal of Science Teacher Education*, *25*, 729–751. doi:

    10.1007/s10972-014-9393-0

Sandvik, J. M., van Daal, V. H., & Adèr, H. J. (2014). Emergent literacy: Preschool teachers' beliefs and practices. *Journal of Early Childhood Literacy*, *14*, 28–52. doi: 10.1177/1468798413478026

Schneewind, J., Böhmer, N., Granzow, M., & Lattner, K. (2012). *Abschlussbericht des Forschungsprojektes "Studie zur Kompetenz und Zufriedenheit von Erzieherinnen in Niedersachsen". Projekt der Forschungsstelle: Professionalisierung frühpädagogischer Fachkräfte an der Hochschule Osnabrück (Projektlaufzeit: 09/2010 - 10/2012). Gefördert durch das Niedersächsische Ministerium für Wissenschaft und Kultur im Rahmen des Niedersächsischen Instituts für frühkindliche Bildung und Entwicklung (nifbe)* [Final report on the study on competencies and satisfaction of early childhood educators in Lower Saxony.]. Osnabrück.

Tschannen-Moran, M., & Woolfolk Hoy, A. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education*, *17*, 783–805.

Tschannen-Moran, M., Woolfolk Hoy, A., & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. *Review of Educational Research*, *68*, 202–248. doi: 10.3102/00346543068002202

Varghese, C., Garwood, J. D., Bratsch-Hines, M., & Vernon-Feagans, L. (2016). Exploring magnitude of change in teacher efficacy and implications for students' literacy growth. *Teaching and Teacher Education*, *55*, 228–239. doi: 10.1016/j.tate.2016.01.011

Wen, X., Elicker, J. G., & McMullen, M. B. (2011). Early childhood teachers' curriculum beliefs: Are they consistent with observed classroom practices? *Early Education & Development*, *22*, 945–969. doi: 10.1080/10409289.2010.507495

Zimmerman, B. J. (2000). Self-efficacy: An essential motive to learn. *Contemporary*

Educational Psychology, *25*, 82–91. doi: 10.1006/ceps.1999.1016

Table 1:

EFA rotated Factor Loadings, Means, Standard Deviations, Cronbach´s Alpha, and Item-total correlations from Sample 1 (pilot study)

Item No.	Scales and items	Factor 1	Factor 2	Factor 3	*M*	*SD*	*α*	*Item-total correlation*
	Language				8.10	1.48	.92	
06.	I believe I can effectively use observation / documentation to find out if a child is in need of individualized support regarding its language development.	.344		.619	7.93	2.03		.77
14.	I believe I can recognize if the development of language skills in a child is age-appropriate.			.806	8.35	1.65		.88
32.	I believe I can evaluate a child´s stage of language development appropriately.			.822	8.25	1.55		.89
35.	I believe I can arrange specific activities that support children´s language development.			.931	8.46	1.60		.86
18.	I believe I can provide good learning opportunities for children who need additional support regarding their language skills.			.712	8.08	1.69		.80
02.	I can promote language skills in everyday situations in children who need it.			.673	8.38	1.70		.61
10.	I can successfully involve parents in the promotion of their children´s language skills.	.486			7.52	1.78		.55
	Social-Emotional				7.95	1.55	.96	
13.	I believe I can effectively use observation / documentation to find out if a child is in need of individualized support regarding its social-emotional development.	.717			7.99	1.82		.80
21.	I believe I can recognize if the development of social-emotional skills in a child is age-appropriate.	.983			8.25	1.55		.90
30.	I believe I can evaluate a child´s stage of social-emotional development	.900			8.13	1.73		.92

appropriately.

No.	Item			M	SD	α
09.	I believe I can arrange specific activities that support children´s social-emotional development.	.840		8.22	1.59	.87
34.	I believe I can provide good learning opportunities for children who need additional support regarding their social-emotional skills.	.731		7.74	1.85	.86
25.	I can promote social-emotional skills in everyday situations in children who need it.	.826		8.05	1.66	.85
17.	I can successfully involve parents in the promotion of their children´s social-emotional skills.	.870		7.32	2.00	.78
	Mathematical			7.22	1.91	.96
31.	I believe I can effectively use observation / documentation to find out if a child is in need of individualized support regarding its development of mathematical skills.		.705	7.32	2.15	.83
07.	I believe I can recognize if the development of mathematical skills in a child is age-appropriate.		.825	7.14	2.19	.86
23.	I believe I can evaluate a child´s stage of development of mathematical skills appropriately.		.882	7.32	2.16	.92
03.	I believe I can arrange specific activities that support children´s development of mathematical skills.		.940	7.70	2.16	.85
11.	I believe I can provide good learning opportunities for children who need additional support regarding their mathematical skills.		.845	6.96	2.15	.88
36.	I can promote mathematical skills in everyday situations in children who need it.		.998	7.51	1.99	.91
27.	I can successfully involve parents in the promotion of their children´s mathematical skills.	.314	.642	6.61	2.14	.76

Table 2
Results of confirmatory factor analysis

Model	χ^2	df	AIC	CFI	RMSEA	SRMR
1. one-factor model	1162.740	151	24069.428	.757	.135	.079
2. two-factor model	1104.352	150	23988.164	.771	.131	.079
3. six-factor model	251.215	136	22814.954	.972	.048	.045
4. domain-specific three-factor model	341.363	148	22919.369	.954	.060	.043

Note. AIC = Akaike Information Criterion; *CFI* = Comparative Fit Index; *RMSEA* = Root Mean Square Error of Approximation; *SRMR* = Standardized Root Mean Square Residual. All χ^2-tests of model fit were statistically significant with *p* < .001.

Table 3:

CFA Factor Loadings, Means, Standard Deviations, Cronbach´s Alpha, and Item-total correlations from Sample 2 (CFA study), based on the domain-specific model

Item No.	Scales and items	Factor 1	Factor 2	Factor 3	*M*	*SD*	*α*	*Item-total correlation*
	Language skills				7.80	1.38	.90	
04.	Use of observation / documentation	.722			7.60	1.84		.70
12.	Age-appropriateness of language skills	.876			8.11	1.57		.78
17.	Evaluation of a child´s stage development	.894			7.81	1.61		.80
09.	Specific activities	.790			8.25	1.56		.79
14.	Good learning opportunities	.769			7.65	1.74		.76
19.	Involve parents	.713			7.44	1.69		.66
	Social-Emotional skills				7.53	1.41	.92	
10.	Use of observation / documentation		.816		7.61	1.75		.78
18.	Age-appropriateness of social-emotional skills		.916		7.64	1.66		.85
05.	Evaluation of a child´s stage development		.822		7.73	1.61		.78
21.	Specific activities		.845		7.79	1.54		.82
02.	Good learning opportunities		.663		7.13	1.96		.65
15.	Everyday situations		.761		7.74	1.73		.74
07.	Involve parents		.675		7.05	1.85		.68
	Mathematical skills				7.25	1.52	.93	
16.	Use of observation / documentation			.841	7.34	1.74		.81

06.	Age-appropriateness of mathematical skills	.852	7.46	1.76	.81
11.	Evaluation of a child´s stage development	.907	7.35	1.72	.87
03.	Specific activities	.726	7.51	1.96	.71
08.	Good learning opportunities learning	.802	6.84	1.89	.78
20.	Everyday situations	.804	7.42	1.70	.78
13.	Involve parents	.763	6.69	1.82	.74