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Suggested citation referring to the original publication:
AERA Open 5 (2019) 1, pp. 1–23
DOI https://doi.org/10.1177/2332858419828691
ISSN (online) 2332-8584

AERA Open
January-March 2019, Vol. 5, No. 1, pp. 1–23
DOI: 10.1177/2332858419828691
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Effective Professional Development for Teachers to Foster Students' Academic Language Proficiency Across the Curriculum: A Systematic Review

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This review summarizes features of professional development programs that aim to prepare in-service teachers to improve students' academic language proficiency when teaching subject areas. The 38 studies reviewed suggest that all of the profiled interventions were effective to some extent. The programs share many characteristics considered important in successful teacher professional development across different subject areas. They also include some features that appear to be specific to teacher training in this particular domain. This review supports the idea that professional development helps change teachers' thinking and practice and benefits students, if certain features are taken into consideration in its design and implementation.

Keywords: *professional development, language, cross-curriculum, content areas, in-service teacher training*

Language plays a central role in teaching and learning. Teachers use language to deliver the content that students are expected to learn, and students use it, for instance, to demonstrate the knowledge that they have developed (Lucas, 2011). It is thus self-evident that children and adolescents who have difficulty speaking, understanding, reading, or writing the language used in the institutions in which they are educated are likely to struggle in these same institutions. We know, in fact, that academic achievement and educational attainment are lower for students who grow up in a setting in which the predominant language is not the language used in the institutions in which they are educated when compared with students who have access to this language at home (Gogolin & Lange, 2011; Klein, Bugarin, Beltranena, & McArthur, 2004). This has momentous ramifications when one considers the proportion of students who struggle with the language used in school. In the United States, for instance, if we take just those students considered English-language learners, who struggle because their native language is not English or because their level of English proficiency is significantly influenced by a language other than English, then this alone represents around 10% of all public school students (McFarland et al., 2018 [data from 2015]).

This review examines professional development (PD) interventions that aim to prepare teachers to support their students in mastering language skills across the curriculum. Although we did not decide to consider only effective interventions, all of the studies who were eligible for this review did report some degree of effectiveness for all evaluated PD interventions. Accordingly, we examined the characteristics of PD programs for teachers that appeared suitable to ameliorate the difficulties that some students face with the language used in school.

Language Proficiency as a Prerequisite in the Educational System

Although students who are non–native speakers are a key concern, they are not the only students at risk of experiencing difficulties, since the language skills necessary for success in the educational system often differ from those used in everyday or home contexts. Typical tasks at school, such as explaining a phenomenon, comprehending and analyzing a text, or writing an essay, require proficiency in *academic language* (Cummins, 2008; Francis & Rivera, 2007; Schleppegrell, 2001, 2009), that is to say "the language used in schooling for purposes of learning" (Schleppegrell, 2009, p. 3). Academic language is associated with academic contexts and characterized by specific grammatical, lexical, and discursive features, although the nature of these features has only partially been systematically defined (Anstrom et al., 2010; Bailey, 2007; Gogolin & Duarte, 2016). Academic language involves mastery of oral and written discourse and encompasses aspects of literacy in which the focus is on higher-order skills rather than basic or technical skills, such as decoding single words (Fillmore & Snow, 2000; Halliday

& Martin, 1993; Scarcella, 2003; Schleppegrell, 2001). Originally, academic language was conceptualized as being distinct from basic conversational skills (Cummins, 2008), but there is now a diversity of views and conceptualizations of academic language, including some that are critical of the very concept and its implications (see, e.g., Bunch, 2014; MacSwan & Rolstad, 2003; Valdés, Capitelli, & Alvarez, 2011), as comprehensively summarized by Anstrom et al. (2010).

Some evidence indicates that all learners have more difficulty with the academic variant of a given language than with everyday language and that language proficiency and, in particular, academic language proficiency affects students' academic performance (Eckhardt, 2008; Heppt, Henschel, & Haag, 2016; Kempert et al., 2016; Townsend, Filippini, Collins, & Biancarosa, 2012). Research findings also indicate that the sociocultural background of students affects measures of language proficiency (Heppt et al., 2016; Uccelli, Galloway, Barr, Meneses, & Dobbs, 2015): Students whose academic language skills are stimulated and explicitly valued by their families usually meet the essential requirements for school success. In contrast, students whose experience of language in the home does not align with that used in school—who are often from low socioeconomic backgrounds or backgrounds strongly influenced by a non-dominant language—must learn the language of instruction while simultaneously having to master the academic content (Gogolin & Lange, 2011; MacSwan & Rolstad, 2003; Schleppegrell, 2004). Despite this, the language skills fundamental for subject-specific learning are commonly not explicitly taught at school, and mastery is implicitly presupposed (Brisk & Zisselsberger, 2011; Schleppegrell, 2001). Thus, while in the broadest sense all learners may be understood as learners of academic language, it is particularly students with low socioeconomic statuses and students who have grown up in an environment in which a language other than the teaching language is dominant (e.g., English-language learners) who are at risk of low academic success (McFarland et al., 2018; Stanat, Weirich, & Radmann, 2012).

The Need for Bolstering Students' Language Proficiency Within Content Areas

To reduce social inequality, the language skills required for success in educational institutions should be fostered within these same institutions. Students at all grade levels and from all social and linguistic backgrounds—especially those who have not been familiarized with academic language in their home contexts—should be provided with targeted support (Becker-Mrotzek, Schramm, Thürmann, & Vollmer, 2012; Lengyel, 2010). However, the development of language and content knowledge is considered to be interconnected (Schleppegrell, 2009). This becomes very apparent with technical terms—such as the vocabulary of genetics in science, for instance. This represents discipline-specific academic language that appears only within a content area. General academic language is, in contrast, used across content areas. When we refer to academic language as a whole, we are including both general and discipline-specific language (Anstrom et al., 2010; Shanahan & Shanahan, 2008; Wolf & Faulkner-Bond, 2016).

It is assumed that language support that ignores academic content can have only a limited positive impact on educational trajectories (Fürstenau, 2011). Consequently, several researchers and policies advocate instructional approaches that integrate language and literacy teaching into subject area teaching (see, e.g., Cheuk, 2016). They stress that teachers in all subject areas should be responsible for creating the conditions necessary for all students to succeed in meeting academic language and literacy expectations (e.g., Chamot & O'Malley, 1987; Fillmore & Snow, 2000; Leisen, 2011; Lucas & Villegas, 2011; Reich, 2013). Correspondingly, several concepts and programs have been developed and refined over the past years to make content accessible to all learners. Short, Fidelman, and Louguit (2012), for instance, summarized "best practices for integrating language and content from the professional literature and organized combinations of these techniques" (p. 336). Lee, Quinn, and Valdés (2013) emphasized "a focus on supporting language development by providing appropriate contexts and experiences" (p. 228). While existing approaches differ in their emphases and in the concrete practices that they suggest should be applied (see review by Anstrom et al., 2010), all are based on the idea that academic language and content should be learned simultaneously.

Effective PD for Teachers

Little is known about the effectiveness of programs that integrate language and literacy teaching into subject area teaching (Kucharz et al., 2014). Yet, their effectiveness does not depend on the program alone but also on the educators (Schneider et al., 2013) and how well they implement the given program (Kammermeyer & Roux, 2013). To successfully support language development, teachers need to possess specific kinds of knowledge and command specific skills (Bunch, 2013; Fillmore & Snow, 2000). However, most teachers are ill-equipped to address students' language proficiency (Bunch, 2013; Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009; Richter, Kuhl, Reimers, & Pant, 2012; Samson & Collins, 2012). In addition, content area teachers may not feel that they should be responsible for supporting language proficiency in their classes (Meltzer, 2002), and they may have lower expectations of students who are not completely fluent in the language used in school (Godley, Sweetland, Wheeler, Minnici, & Carpenter, 2006). This highlights the necessity for PD that tackles teachers'

beliefs and enables them to bolster students' language skills—in other words, *effective* PD.

PD is a very broad term and one that is used inconsistently in the literature. In this study, PD designates any purposeful, to some extent face-to-face, formalized and organized learning and/or training opportunity for in-service teachers. As widely agreed—for example, by Guskey (2000) and Lipowsky and Rzejak (2015), who both refer to Kirkpatrick (1979) and Wade (1984)—the effectiveness of teacher PD can be measured via the following levels: teachers' acceptance of and satisfaction with the PD intervention, teacher learning (changes in knowledge, motivation, beliefs, etc.), teachers' classroom practice, and student learning (Lipowsky, 2010; Lipowsky & Rzejak, 2015).[1] According to Yoon, Duncan, Lee, Scarloss, and Shapley (2007), there is a sequential relationship among effective PD, enhanced teacher knowledge, improved classroom teaching, and higher student achievement. The relationships among these four levels are, however, neither unidirectional nor linear (August & Calderón, 2006; Opfer & Pedder, 2011; Reinold, 2016). Changes in a teacher's beliefs may, for instance, be both a cause and an effect of improved student performance (Desimone, 2009; Guskey, 2002), and a teacher's satisfaction with a given PD program does not necessarily lead to changes in his or her knowledge (Goldschmidt & Phelps, 2007; Lipowsky & Rzejak, 2015). Several researchers have been able to estimate the impact of PD programs in various domains on both teachers and students. Hattie (2009), for instance, reported an overall effect size of $d = 0.62$ in his meta-meta-analysis. In the field of language and literacy, extensive teacher PD was found to be a significant common factor in effective supportive interventions (Biancarosa & Snow, 2006; Cheung & Slavin, 2012).

It is important to note, however, that multiple factors potentially affect the outcomes of teacher training. Apart from the characteristics of the program in question, these factors can include the characteristics of the participating teachers, facilitators, and school settings, as well as the interplay among these elements (Lipowsky, 2014). Some authors derived a range of common features of successful teacher training by analyzing teacher PD across multiple disciplines. These can be organized into features that relate to the framework and structure of the intervention (structural features), the content of the intervention (content-related features), and the way that the content is delivered (didactic features). One of the structural elements considered relevant is the duration of the PD program. Even though there is no linear relationship between time spent in a PD program and its success, longer periods of training seem to be necessary to change and extend teachers' generally stable beliefs and professional knowledge, as well as well-established classroom routines (Guskey & Yoon, 2009; Lipowsky, 2014; Reinold, 2016; Timperley, Wilson, Barrar, & Fung, 2007). Coherence with other learning opportunities and policies (Birman, Desimone, Porter, & Garet, 2000; Timperley et al., 2007); a link to participants' own experience, interests, and needs (Lipowsky, 2010; Müller & Papenkort, 2013; Zehetmeier, 2010); and the involvement of experts were also found to be crucial structural features of PD programs (Guskey & Yoon, 2009; Lipowsky & Rzejak, 2015; Timperley et al., 2007). When it comes to content-related features, effective teacher PD is characterized by a focus on the effective teaching of subject matter and on students' learning processes (Birman et al., 2000; Darling-Hammond et al., 2009; Garet, Porter, Desimone, Birman, & Yoon, 2001; Lipowsky & Rzejak, 2015). Didactic features considered important for effective PD are opportunities for active learning (Darling-Hammond et al., 2009; Ingvarson, Meiers, & Beavis, 2005) and cooperation among teachers (Müller, Eichenberger, Lüders, & Mayr, 2010), as promoted by, for instance, collective participation (Garet et al., 2001). In addition, successful PD is closely related to the individual teacher's practice (Darling-Hammond et al., 2009; Timperley et al., 2007); it also includes feedback and combines phases of input, the implementation of new knowledge in the classroom, and periods of reflection on the new practices (Lipowsky & Rzejak, 2015; Müller et al., 2010).

In most countries, there appears to be scant research evaluating PD schemes that target the knowledge, beliefs, and skills that teachers need in order to be able to support students in developing language proficiency in their content areas. The exception is the United States, where several researchers have examined such interventions. A number of authors summarized aspects of this literature and, in doing so, described some components of effective PD in this area and in related fields (August & Calderón, 2006; Bunch, 2013; DiCerbo, Anstrom, Baker, & Rivera, 2014; Knight & Wiseman, 2006; Zhang, 2014). However, to date, no systematic overview exists of the features that characterize PD in the specific domain of language support across the curriculum.

Aim of This Study

Features of effective teacher PD are known but they may differ across domains (Lipowsky & Rzejak, 2015). Thus, our aim for this study was to collate existing research and examine whether known features of effective teacher PD are important in the field of language support in content areas or if other elements play a role. We therefore sought to answer the following question: What structural, content-related, and didactic features characterize teacher PD programs that are suitable for fostering students' language proficiency across the curriculum?

Method

Inclusion Criteria

To answer this question, we conducted a systematic review. After a perusal of the literature in the field, we

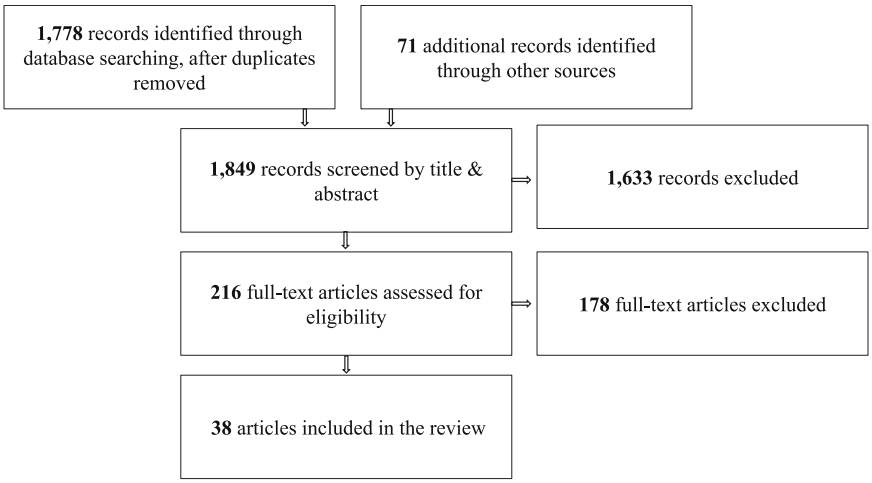

FIGURE 1. *Literature search process with numbers of articles considered.*

developed the following inclusion criteria: An article would be included in the review if (a) it evaluated the effectiveness of a PD intervention for in-service teachers that was designed to support them in integrating the development of language necessary for schooling into their teaching of academic content; (b) it was published between 2000 and January 2016; (c) it was written in English; (d) it was an empirical study; (e) the examined PD intervention targeted teachers at general education schools, including kindergarten (if part of primary education); and (f) at least six features of the PD program were described, with structural, content-related, and didactic components included.

As described earlier, the type of language support focused on here is quite specific. In line with the definition of academic language outlined earlier, we excluded PD aimed at preparing teachers for teaching initial or basic reading and writing, as well as initiatives that focused on foreign-language learning or targeted students with learning disabilities. Qualitative data were considered if the authors explicitly examined the impact of a PD program. Such data were also included to supplement the results with insights into barriers to and catalysts for teachers' learning and implementation of the content delivered during the PD program. Although we did not exclude studies based on quality concerns, we did exclude individual results within a study if they did not meet certain criteria (see Data Coding and Analysis section). We provide a short critique on study quality across all studies in the Designs, Methods, and Samples section.

Search Procedure

We searched for studies using a multistep process. First, we developed a comprehensive search syntax, including words to describe academic language or the target student population (e.g., "language," "literacy," "second language," "bilingual," "linguistically diverse") and, when appropriate, in combination with terms indicating that the language support took place in the subject areas (e.g., "mainstream," "across the curriculum," "sheltered instruction"). These keywords were further combined with "teacher professional development" and alternate terms (e.g., "teacher* training," "teacher* professional learning") as well as synonyms for "effectiveness" (e.g., "effic*," "impact"). Using this syntax, we searched the Educational Resources Information Centre and EBSCOhost databases, including PsycINFO, PsycARTICLES, Education Full Text (H. W. Wilson), and Psychology and Behavioral Sciences Collection. We identified 1,778 records. The first author screened and applied the inclusion criteria to titles and abstracts. A trained research assistant then independently rated 243 (approximately one-seventh) of the documents. Interrater reliability was 96%. Disagreements about whether a study should be included were discussed until consensus was reached. The full texts of the approved documents were then retrieved and screened. We also conducted a hand search in relevant journals. Additionally, we asked experts in the field for suggestions of pertinent studies. Finally, we examined the reference lists of all eligible studies. Another 71 articles were identified during these processes, which were then analyzed with the assessment procedure outlined here.[2]

Figure 1 illustrates the stages of the literature search with the respective numbers of articles identified, assessed, excluded, and retrieved (adapted from Moher, Liberati, Tetzlaff, Altman, & the PRISMA Group, 2009, p. 3). In sum, 1,849 documents were screened by title and abstract and 38 included in the final analysis. One document was a book chapter; two were research reports; three were dissertations; and 32 were journal articles, of which 31 were peer reviewed. All are referred to as *studies* in this review.

Data Coding and Analysis

To code and analyze the studies, we used qualitative content analysis with combined deductive and inductive category

application (Mayring, 2000). Accordingly, we developed a preliminary set of codes derived from the literature cited earlier on evidence-based characteristics of effective PD across different domains. We modified some of the codes to adjust them to the field of language support and added some codes that seemed necessary for describing the programs (e.g., names of the methods taught in the PD intervention). The first author coded every study by matching text passages to the codes using data-coding software (MAXQDA 12; VERBI Software, 2016). When appropriate, multiple codes were assigned to a given text segment. New codes were added if features appeared in the studies that did not match any of the predefined codes (e.g., taking into account students' home languages in the intervention). The resulting coding scheme comprised the following broad categories, each consisting of multiple codes: study (e.g., design, country); PD intervention (with subcodes grouped into structural, content-related, and didactic features); and effectiveness (divided into four outcome levels: teachers' acceptance of and satisfaction with the PD intervention, teachers' learning outcomes, teachers' classroom practice, and students' learning outcomes), including respective methodology used. If any other element of interest was emphasized in the results or discussion of a study, we coded it as *further results*.[3]

In a few studies, results provided for one or more of the outcome levels had to be excluded from the analysis (marked with dashes in Appendix Table A1), even if the authors claimed to have evaluated effectiveness at these levels. Results at the student level, for instance, were excluded if it was unclear if all sample students (apart from control groups) were taught by teachers who had participated in the examined PD. Results within individual studies were also excluded if they were described too vaguely and did not provide clear-enough information to be able to discern if the intervention was effective. An intervention was coded as effective at a given level if a positive effect was suggested in at least one area or on one scale at that level. Since coding was done by the first author only, interrater reliability could not be calculated. To ensure reliability of coding, the first author discussed uncertain cases with the second author and reviewed the coding a few weeks after completion of the initial coding. In addition, a research assistant spot-checked the coding. In cases of disagreement, coding was discussed until consensus was reached.

The coded text was subsequently examined, and codes that displayed similar aspects were subsumed under supercategories. It is important to note that although the effectiveness of the intervention was not a prerequisite for inclusion, all studies included suggested some effectiveness for all interventions on at least one of the four outcome levels. For this reason, we summarized features across all of the interventions. Since there were differences in the studies in terms of length and the amount of information provided about the PD intervention, we examined only whether a given component was present in a PD program. For each feature, we counted the number of interventions in which it was found. Finally, we searched those elements coded as *further results* for common elements.

Results

In this section, we first give an overview of the characteristics of the 38 studies included in terms of their designs, methods, and so on. We then outline the features characterizing the teacher PD programs aimed at fostering students' language proficiency across the curriculum that affected teachers or students in positive ways.

Designs, Methods, and Samples Used in Included Studies

The included studies were published between 2002 and 2015 and had all been realized in the United States (a notable amount in the Southern states), except for one study, which was carried out in the Netherlands. The 38 studies investigated the effectiveness of 29 PD interventions in total because some studies evaluated the same interventions in overlapping years with overlapping samples and were thus considered together, as was the case for the longitudinal studies by the authors associated with Olson, Kim, and Matuchniak; Lee, Deaktor, and Hart; as well as Lee, Adamson, and Santau (see Appendix Table A1 for individual studies).

In total, approximately 1,148 teachers and 16,650 students participated in the interventions.[4] Teacher sample sizes ranged from 6 to 198 per study. In terms of the distributions of the educational stages that the studies considered, the elementary grade levels (kindergarten–Grade 5/6) and the higher ones (Grades 6–12) were roughly evenly represented (elementary: 19 studies and 12 interventions; middle and high: 16 studies and 14 interventions; mixed: 3 studies and 3 interventions). Student samples included native speakers and non–native speakers with diverse socioeconomic statuses and ethnicities (with considerable numbers of Hispanic students). Demographic variables, such as age and mother tongue, were reported in only one third of the studies or less, which prevented further examination of these variables.

The studies differ substantially in their design as well as methodology and methodological rigor. Details are provided in Appendix Table A1. Eighteen studies used quantitative data only; three used a mainly qualitative approach; and 17 used mixed methods. Table 1 shows the number of studies that provided enough data to allow for conclusions to be reached about the effectiveness of the studied intervention at each of the four levels: teachers' reactions, including teachers' perception of the intervention's usefulness; teachers' learning; teachers' classroom practices; and, finally, students. It should be noted that most of the studies examined effectiveness on one, two, or three levels. Only the studies by Lee, Adamson, et al. (2008) and Brisk and Zisselsberger (2011) provided codable information about the effectiveness of a PD program over all four levels. Table 1 also shows the

TABLE 1
Data, Instruments, and Inclusion of Self-Assessments per Outcome Level

Outcome level	Studies with sufficient data, *n*	Instruments used for data collection	Studies that included self-assessments, *n*
Teachers' reaction	8	Surveys	8[a]
Teachers' learning	16	Surveys	10[a]
Teachers' practice	28	Observations, surveys	14[a]
Students	22	Tests, surveys	4[b]

[a]Assessed by teachers.
[b]One assessed by students and three assessed by teachers.

primary methods used for data collection (note that the term *surveys* includes both interviews and questionnaires) as well as the number of studies that included self-assessments at each of the four levels. For example, in all eight studies that provided enough data for our review on teacher satisfaction, these data were self-reported by the teachers, and half of the studies that examined improvements in classroom practice used teachers' perceptions about those practices.

Standardized/established and unstandardized/unestablished instruments were used, and there was high diversity among them. The dependent variables differed across studies and even within individual levels. By way of illustration, on the level of teacher learning, some researchers aimed to measure teachers' beliefs, while others used measures to capture teachers' knowledge. Effects on the student level were measured in terms of linguistic or academic achievement, due to the assumption—described earlier—that fostering students' language skills enhances academic achievement. Some researchers even used multiple measures and instruments per level. A case in point is the study by August et al. (2014), who tested students with a standardized vocabulary subtest, a researcher-developed assessment on academic language, and an assessment on science knowledge.

As shown in Appendix Table A1, some studies employed postintervention data only; some included pre- and postmeasurements; some compared control and treatment group results; and others combined comparative group and pretest-posttest measurements. Only a few studies used experimental trials (e.g., Kim et al., 2011). Thus, not all reviewed studies met high-quality standards for measuring PD intervention effectiveness. However, many more (69%) studies that focused on higher grade levels used control group designs than studies that focused on elementary grades (26%). Additionally, of those three quarters of the higher-grade studies that examined the student level, 83% used standardized instruments to measure student outcomes. In contrast, about half of the elementary-focused studies examined the student level, and only 50% of these used standardized instruments. Examples of other methodological issues include the small teacher sample sizes in many studies and the inappropriate use of methods. Some studies lack information on teacher or student sample size (marked with an asterisk in Appendix Table A1), and many were (partly) conducted by those involved in leading the programs.

As stated earlier, all 29 PD interventions evaluated in the 38 studies were reported to be somewhat effective on at least one of the four levels. Although some authors identified areas in which more effects or more pronounced effects might have been expected, there were only a few cases in which changes were not indicated on all levels examined. The PD features are reported in turn. Note that the numbers (*n*) given in the following refer to the numbers of examined PD interventions, not studies. Elements frequently found in further results are integrated into the appropriate sections below. Appendix Table A2 shows which features were exhibited in which studies.

Structural Features of the PD Interventions

When we refer to the *structural features* of PD, we mean those characteristics that relate to the wider conditions framing the PD interventions. These include the processes that take place during the planning and development of the PD.

Duration. While clear information about the total number of hours that teachers spent participating in the given program was provided for a limited number of PD interventions, the time span was reported for all but one (Brisk & Zisselsberger, 2011). Only four interventions were reported to be shorter than 3 months, and about two thirds continued for at least one school year. The longest programs, studied by Alvarez et al. (2012) and Lee, Adamson, Santau, and colleagues, lasted for >3 years. All but one (Henrichs & Leseman, 2014) provided recurring sessions and/or continuous support. Even for this program, which consisted of only a single workshop, the researchers reported some increase in teachers' academic language use and some transfer to students in terms of their language use for science tasks. However, effects appeared to be task specific.

Multiple delivery formats. Various PD formats were used, with workshops, training sessions, and courses (all referred to as *workshops* in the following) being the most common and used in all interventions but one, which used only collaborative learning cycles (Carrejo & Reinhartz, 2014). Coaching and mentoring were the second-most common format employed (in $n = 18$ interventions), followed by different types of group meetings (e.g., professional learning communities), classroom demonstrations, and the provision of curricular units. In a few cases, workshops and group meetings were partly web based (e.g., Brettschneider & Mather, 2005; Choi & Morrison, 2014). While the PD interventions that targeted elementary grades only and those that targeted middle and high school levels were very similar in respect to most examined features, there was a striking difference in terms of coaching/mentoring. This format was employed in 33% of elementary interventions and 86% of higher-grade-level interventions. Very few PD interventions involved a single format only. The majority employed at least two and up to four different formats. The program studied by Alvarez et al. (2012), for instance, comprised courses, coaching cycles, professional learning communities, and demonstration lessons.

Expert involvement. For the majority of training programs that we examined, facilitators and/or developers were described as having had relevant expertise. While some had expertise and experience only in education in general, most interventions ($n = 20$) had experts in the field of language—ESL (English as a second language; e.g., Hutchinson & Hadjioannou, 2011; Short et al., 2012) and literacy (e.g., Cantrell, Burns, & Callaway, 2009), for instance. Sometimes, expertise in a subject area was also involved. Usually, at least one of the experts came from outside the school at which the participating teachers taught. In many cases ($n = 22$), at least one of the experts was a researcher.

Consideration of teachers' needs, interests, and existing knowledge. In most cases ($n = 24$), efforts were made to formulate a program that corresponded to the needs of the participating teachers. This was attempted in a number of ways. Several programs involved teachers shaping the PD program to some extent, by choosing processes and content and sharing feedback on the training program. In the intervention examined by Anderson (2009), for example, the facilitator provided coaching when teachers requested it. He, Prater, and Steed (2011) conducted a needs assessment ahead of the intervention. Some interventions considered teachers' existing knowledge and experience in that they drew on materials that teachers had already used (e.g., August et al., 2014) or on content that teachers were already familiar with (e.g., from previous PD activities; e.g., August, Branum-Martin, Cárdenas-Hagan, & Francis, 2009; He et al., 2011). Other PD providers considered teachers' existing knowledge insofar as they explicitly designed complementary PD units and made sure that the program was coherent (e.g., Crawford, Schmeister, & Biggs, 2008; Lee & Maerten-Rivera, 2012). Incentives and support, as another way of considering teachers' needs and interests, were mentioned in several interventions ($n = 13$), as provided in the form of credits (e.g., Brettschneider & Mather, 2005), certificates (e.g., Minaya-Rowe, 2004), grants (e.g., Olson et al., 2012), time off from teaching (e.g., Cantrell & Hughes, 2008), or support from the principal (e.g., Ringler, O'Neal, Rawls, & Cumiskey, 2013). Whether attendance was voluntary or not was often not clearly discernable from the studies.

Content-Related Features of the PD Interventions

Content-related features refers here to what was taught in the PD programs and what teachers were expected to learn in these interventions.

Research- and theory-based approaches to fostering students' language proficiency. To affect students, the concept for fostering students' academic language skills communicated in the PD sessions needs, of course, to be effective. Across the interventions in the studies under review and even within individual interventions, various strategies and methods were addressed that aimed to improve students' language proficiency in the given content areas and that referred to a range of approaches, programs, and theories. The approach most often employed across the interventions ($n = 19$) was scaffolding (e.g., August et al., 2009; Lara-Alecio et al., 2012; Townsend et al., 2012), which comprises instructional strategies that teachers can use to "adjust the level and mode of their communication . . . for students at varying levels of [in this case] English proficiency" (Lee, Deaktor, Enders, & Lambert, 2008, p. 732). Examples for such strategies include providing particular words or phrases, paraphrasing, and restating terms by giving definitions or context (Echevarria, Vogt, & Short, 2004; Gibbons, 2015). It is worth noting that scaffolding was used in a larger percentage of interventions targeting elementary grades (75%) than higher grades (50%). Several PD interventions ($n = 10$) drew on sheltered instruction, which includes scaffolding strategies. All but one of these interventions referred to the strategies specified in the Sheltered Instruction Observation Protocol (Echevarria, Short, & Powers, 2006). Inquiry-based learning was another model adapted to foster students' language skills in some of the interventions ($n = 8$), with occasional reference to the Five E model (Bybee et al., 2006). While a few approaches were geared toward particular competences, like academic reading and writing (e.g., Greenleaf et al., 2011; Matuchniak, Olson, & Scarcella, 2014), most were more wide-ranging. Although many instructional approaches addressed in the PD interventions were not based

on rigorous empirical evidence, the effectiveness of several was indicated in previous research (e.g., Echevarria et al., 2006; Olson & Land, 2007; van de Pol, Volman, & Beishuizen, 2010), and all programs were based on research and theory to some degree.

Application-oriented knowledge. In all interventions, teachers were provided with strategies or knowledge about methods for fostering language proficiency. As such, new information was not just abstract but applicable to teachers' actual teaching. For example, in the 8-month program studied by Ringler et al. (2013), "teachers learned how to build background knowledge; how to focus on the language skills of reading, writing, speaking, and listening in the content areas; how to incorporate . . . learning strategies, and how to create classrooms with high student engagement" (p. 36).

Valuing and involving students' home languages and cultures. Corresponding with the student sample groups, the target students in all interventions were linguistically diverse. Studies referred to the various student groups using different terms, such as "monolingual" and "fluent English-speaking students," "multilingual students," "second-language learners," as well as "limited English proficiency" and "minority students." Yet, the clear majority of students targeted by the interventions were termed "English (language) learners." Consequently, involving and valuing students' home languages and/or cultures played a role in many initiatives (n = 20).[5] It was considered in a larger amount of elementary-focused interventions (83%) than those targeting higher grades (50%). The PD intervention studied by Minaya-Rowe (2004) was the only intervention to focus on a bilingual program. All other programs focused on monolingual language support, suggesting that the involvement of students' home languages does not require teachers to speak these languages. Instead, the emphasis was on teachers being encouraged to take into account students' cultural backgrounds and first languages. By way of illustration, in the interventions studied by McIntyre, Kyle, Chen, Muñoz, and Beldon (2010) and Montes (2002), teachers were encouraged to honor, acknowledge, and refer to students' experiences and backgrounds. August et al. (2014) and Lee, Deaktor, Hart, Cuevas, and Enders (2005) studied examples in which key terms were provided in the students' native languages.

Focus on student learning. For all PD interventions but one, we found a focus on students' processes of learning or understanding. Measures aimed at drawing attention to student learning included the following: highlighting potential challenges in students' learning processes, such as common misconceptions, as well as students' learning needs (Hart & Lee, 2003; Lee et al., 2005; Olson et al., 2012); equipping teachers with knowledge about topics such as language acquisition and registers (e.g., Anderson, 2009; He et al., 2011; Henrichs & Leseman, 2014); and referring to (state) standards (e.g., Lara-Alecio et al., 2012; Short et al., 2012). Many interventions focused on student learning by addressing how student performance or learning can be evaluated and assessed (e.g., Hutchinson & Hadjioannou, 2011; Keefe, 2006). In some programs, participants analyzed students' actual work and learning processes (see Active Learning section). Six studies highlighted an increase in teachers' sense of self-efficacy as a result of noticing improvements in student learning (e.g., Alvarez et al., 2012; Cantrell et al., 2009). Other didactic means employed to achieve a focus on student learning included having participating teachers discuss student learning and reflect on it, as demonstrated by Lara-Alecio et al. (2012), and letting teachers experience instruction from their students' perspective, as illustrated by Cantrell et al. (2009) and Lee et al. (2005). According to Reinold (2016), connecting a PD program with a subject can lead to teachers engaging more intensively with students' learning processes. In the studies under review, several PD endeavors were directly related to a subject area. Most of these interventions (n = 10) were connected with science, most often inquiry-based science, as in the programs studied by August et al. (2009) and Shanahan and Shea (2012). In a few cases (n = 5), the interventions also included teachers being taught content knowledge about their respective subject areas (e.g., Adamson, Santau, & Lee, 2013; Patrick, 2009).

Didactic Features of the PD Interventions

We use the term *didactic features* to describe the way in which the PD in question was implemented, with a focus on how teachers were meant to learn according to the intervention's design. The term is used for features that initiate and support teachers' learning during the interventions.

Cooperation and collaboration. In almost all training programs (n = 26), teacher cooperation and collaboration played a role. In many initiatives, they were promoted in the PD sessions themselves, in the form of group work (e.g., Greenleaf et al., 2011), sharing experiences about strategy implementation (e.g., Shanahan & Shea, 2012), or "working to create a collaborative culture where teachers encourage and support one another" (Ringler et al., 2013, p. 36). A different way of promoting participant interaction, including that outside of regular PD sessions, was having teams or groups of teachers from a single school participate (e.g., He et al., 2011; Lee, Maerten-Rivera, Penfield, Leroy, & Secada, 2008; Patrick, 2009). As He et al. (2011) argue, "grouping of teachers from the same school during the professional development could serve as a potential initiation of a school-based learning community to sustain professional development efforts" (p. 10). Forms of professional learning communities

were established as part of some PD interventions (e.g., Hutchinson & Hadjioannou, 2011; Shanahan & Shea, 2012), and collaborative interactions were frequently mentioned in the studies as being an essential element of PD (e.g., Batt, 2010; Crawford et al., 2008).

Input, application, and reflection. In every intervention, knowledge was imparted in one of a range of formats, such as presentations or readings. Only in one case, where the intervention did not include workshops, was the transfer of new knowledge not mentioned (Carrejo & Reinhartz, 2014). Application of the content learned during PD to real-life contexts and reflection on practice, skills, or beliefs were also elements of most of the interventions reviewed. Prevailing attitudes and beliefs related to particular groups of students and to new teaching strategies were cited by some authors as a challenge and were assumed to be a barrier to realizing the full potential of some interventions (e.g., Anderson, 2009; August et al., 2014; Cantrell & Hughes, 2008; Lee et al., 2005). According to Reusser (2005), video analysis, especially if combined with feedback, is an effective means of stimulating reflection and helping teachers become aware of implicit beliefs and practices. The analysis of recorded teaching sessions was part of a number of the PD programs (n = 7; also see Active Learning section). In the project studied by Townsend (2015), for example, teachers and a university researcher observed and reflected on video-recorded lessons that the teachers had taught. Coaching, as used in many interventions (e.g., Batt, 2010), usually integrated feedback and encouraged reflection on teachers' practices too. According to Lipowsky (2014), however, it is essential that input, practice, and reflection be systematically linked. Some authors explicitly cited this kind of interconnected approach when describing the PD that they had studied. In the PD investigated by Choi and Morrison (2014), "content was introduced by the university instructor, . . . implemented in real-life classrooms and collaboratively debriefed" (p. 417). Patrick (2009) reported that an "ongoing cycle of meeting, trying out new ideas, and talking about the challenges and successes of implementing these ideas engaged teachers in reflective thinking" (p. 91). In other cases, the extent to which these elements were linked was not deducible from the articles in question. Since video analysis and coaching were always provided in combination with workshops, we can assume that there was some combination of input, practice, and reflection. In some studies, coaching was cited as being essential in supporting teachers' efficacy and implementing instructional methods (Batt, 2010; Brisk & Zisselsberger, 2011; Cantrell et al., 2009; Cantrell & Hughes, 2008).

Active learning. Some form of active learning, as summarized by Birman et al. (2000), was reported for nearly all interventions. In most interventions (n = 25), teachers were given the opportunity to practice or apply what they had learned. In many interventions, participants discussed (n = 19), reviewed or analyzed student work (n = 8), and were given the chance to plan for instruction and develop lessons (n = 19). The last was more common in higher-grade-level PD (79%) than in elementary-focused PD (50%). Most PD interventions (n = 24) included opportunities for teachers to observe and/or be observed teaching, sometimes as part of coaching (e.g., Cantrell et al., 2009; Cantrell & Hughes, 2008). Such opportunities were realized per video (e.g., Greenleaf et al., 2011) or, more often, in real-life situations, as in the classroom demonstrations documented by Montes (2002), where "program staff showed teachers how to use the strategies studied during the in-service workshops, using actual classroom activities with teachers' own students" (p. 701).

Materials for language support. In a high number (n = 24) of interventions evaluated in the studies reviewed, teachers designed and/or were provided with materials to support them in increasing their students' language proficiency in the classroom. An example of the extensive use of materials can be found in the multiyear intervention studied by Lee, Deaktor, Hart, and colleagues, in which "teachers were provided with complete sets of materials, including teachers' guides, student booklets, science supplies, and trade books" (Lee, Deaktor, et al., 2008, p. 729). In many interventions (n = 19), the material consisted of lesson plans or curricular units provided by the facilitators (e.g., August et al., 2009) and/or developed or adjusted by the teachers themselves (e.g., Choi & Morrison, 2014). Lee, Adamson, et al. (2008) note the advantages of providing materials. Teachers in this study mentioned "not having to worry about searching for supplies themselves," which made the PD "worry free and less stressful" (p. 59). Providing readily applicable materials also addresses one of teachers' major concerns, mentioned in several studies: the amount of time involved in taking part in PD (e.g., Anderson, 2009; Batt, 2010; Cantrell & Hughes, 2008). Time was considered "probably the greatest challenge" (Brisk & Zisselsberger, 2011, p. 125). However, Henrichs and Leseman (2014) suggested that the choice of materials also matters; not all materials are likely to be equally suitable to achieving the intended results.

Discussion

The purpose of this investigation was to collate the existing research on teacher PD aimed at fostering students' academic language proficiency across the curriculum and to reveal the structural, content-related, and didactic features that characterize effective PD interventions in this field. The fact that 38 research reports were found that could be included in this review suggests that a reasonably large amount of research has been carried out in this field. Strikingly, in these reports, some degree of positive impact was indicated for all PD interventions, which

mirrors findings from reviews dealing with related research questions (e.g., Zhang, 2014). The analyzed interventions displayed many of the widely documented features of effective teacher PD, as outlined in the Effective PD for Teachers section, such as longer durations, expert involvement, and cooperation among teachers. It thus seems that key features of effective teacher PD in general are important in this particular field too, which supports the established elements of good practice. The benefits of some of the features may become more tangible when their interconnections are taken into account. Longer duration, for instance, can allow recurring phases of input, practice, and reflection.

Additionally, some characteristics seem to play a particular role in PD programs aimed at preparing teachers to foster language development in their subject area classrooms. While research- and theory-based approaches to fostering language skills represent effective ways of teaching subject matter—also known to be important in effective teacher PD—the combination of multiple delivery formats, the involvement of students' home languages, and an appreciation of cultural and linguistic diversity are referred to less widely in cross-domain research. Most programs involved a range of formats, such as workshops, coaching, and classroom demonstrations. A mixture of PD formats offers manifold opportunities to engage in learning activities, which Birman et al. (2000) also emphasized as being an important feature of effective PD. Although a variety of formats may not be unique to PD in this particular field, it might be especially relevant when teachers need to learn complex strategies, such as those appropriate for fostering language proficiency. Markussen-Brown et al. (2017), who studied language- and literacy-focused PD for early childhood educators, found the number of formats in the interventions to be significantly associated with educators' practice.

The fact that teachers were largely encouraged to acknowledge and refer to their students' home languages and backgrounds is more obviously linked to the focus on language in the PD programs reviewed. If teachers learn to build on what students already know, to draw parallels with the target language, and to deal with students' cultures and languages as an asset rather than a deficit, this could eventually benefit students' academic language and achievement (Genesee, 2017; U.S. Department of Education, 2016). This might be especially relevant for elementary teachers.

We also found that teaching materials played a role in the PD programs analyzed. Materials were designed to support the teachers in expanding their students' language skills in the classroom. Curricular units and lesson plans were frequently mentioned. In many cases, new materials need to be created and regular materials adapted to incorporate strategies that address students' academic language needs (August et al., 2009; Genzuk, 2011). While *using* appropriate materials might simplify the complex task of supporting language and content learning simultaneously, *developing* materials could be a valuable way of helping teachers understand the language-learning challenges that their students are facing.

Our assumption would be that change can be effected by integrating the various advantages of the different PD components outlined in this review. This review is not, however, able to offer any conclusions about which elements actually account for the effectiveness of a given program. Despite the fact that no interventions were judged ineffective seems to be affirmative, the consequence of this was that we were unable to contrast effective and noneffective interventions. Due to our dependence on information included in the studies under review, our ability to analyze data was restricted. Drawing further conclusions with confidence is hindered by the heterogeneous study designs, the sometimes vague reporting and missing information, and the extremely varied measures that the reviewed research draws on, which might indicate a lack of standardization and appropriate instruments in the field. We were not able to compare the quality and extent of the implementation of the various features of the PD interventions, for instance. This review is thus an important first step, but more research is needed to allow for causal conclusions to be made about the features and outcomes of PD in this field.

The positive findings should be interpreted with caution due to a lack of (methodological) quality in some of the studies. For example, the validity of self-reporting, as used in a number of studies analyzed in this review, is questionable (König, Kaiser, & Felbrich, 2012). Many of the teacher participants were also not randomly selected, which might be related to a high motivation of participants. The fact that all interventions included were somewhat effective could as well be a consequence of publication bias, "the tendency . . . to submit or accept manuscripts for publication based on the direction or strength of the study findings" (Dickersin, 1990, p. 1385). We did, however, try to avoid this bias by searching for unpublished studies. Yet, a few potentially relevant studies were not available (see Notes).

A major difficulty encountered during this study was defining PD and the type of language support that was going to be considered in this review and then creating the appropriate search syntax. This is likely a common issue when reviews are based on international research and in the field of education, where concepts are often not clearly defined and terms are used inconsistently. We tried to reduce the risk of missing terms by thoroughly examining the available literature and carefully choosing a variety of

synonyms for each term as well as different combinations of words for the syntax.

Academic language teaching in regular subject area classes is a relatively recent development, and it would appear that the United States has taken a pioneering role in evaluating PD in this field. Nevertheless, it seems somewhat surprising that we were not able to include any studies from the United Kingdom, Australia, Canada, or any other country other than the Netherlands in this review. It is thus unclear to what extent our results pertain to other countries. It also seems surprising that only one bilingual program was included, even though we used terms such as "bilingual" and "second language" in the syntax. It is worth noting that our database search did yield a number of studies from other countries, as well as studies about bilingual programs, but they did not fall under the scope of this review. This was for a range of reasons, including the fact that they described pedagogical frameworks or discussed teachers' perceptions and made suggestions for PD interventions, rather than evaluating them. Generalizability might also be limited in terms of subject areas and the target student population because many interventions in this review were related to science subjects and many focused on English-language learners.

Conclusion

This systematic review offers an overview of existing research that analyzes PD aimed at preparing teachers to support their students in mastering language expectations across the curriculum. Based on this research, it also reveals the beneficial results of such PD. Although we cannot infer which elements actually influenced the effectiveness of the programs analyzed, we are certainly able to describe which features characterize PD that show some effects in this field. These seem to be largely in line with research on teacher PD across all domains. In summary, this review suggests that the forms of PD likely to affect teachers and students are long-term and intensive forms that include multiple learning opportunities aimed at elaborating and practicing newly learned knowledge and strategies, provide practical assistance, enable and encourage teachers to work together, and consider teachers' needs as well as students' learning processes and home languages. This suggests that effective PD requires comprehensive preparation as well as structures and resources that allow for the integration of multifaceted and complex professional learning processes into teachers' working lives.

Importantly, this work reveals desiderata and provides a crucial foundation for future research in the field: To provide a clearer picture of what is needed for effective teacher PD, there is a need for more large-scale as well as controlled studies that could generate valid results and allow for causal conclusions. The publication of research with null results should be encouraged and well-designed instruments should be established. To add to this, interventions should be comprehensively described in all studies. To identify crucial features, they should be examined with experimental studies or meta-analyses. Additional qualitative research could help to fully understand the complex process of teachers' professional learning. Although it was beyond the scope of this review, it could be worthwhile to take a closer look into why little or no change was pinpointed in specific areas in some studies. It might also be necessary to examine why a few aspects were unequally distributed across the interventions that focused on lower grade levels and those that focused on higher grade levels. Additionally, more studies that systematically test all effectiveness levels are needed to gain insights into the relationships among the levels, as well as follow-up studies that determine the sustainability of effects. Importantly, the language development programs communicated in the PD programs should be evaluated to ensure that effective programs are being taught.

Although teacher PD is only one way among others of fostering academic language proficiency, it is one that policy makers can influence and one that seems worth investing in. This review provides orientation for administrators seeking to establish effective teacher PD programs for schools as well as for educators seeking to design and implement this kind of PD to provide every student with access to the type of language used in education. In the long run, this could help to reduce the disadvantages that students experience who have little exposure to academic language outside of school.

APPENDIX TABLE A1

Description of Included Studies With Samples, Designs, and Methods per Outcome Level

Author (Year): Program name	Country	Teachers, *n*	Students, *n*	Grade levels	Teacher acceptance	Teacher cognition	Teacher practice	Student language achievement	Student academic achievement
Alvarez et al. (2012): Quality Teaching for English Learners	US (TX)	33	2,480	High		Nonstand survey, self-assess	Nonstand survey, self-assess	Stand test, comp group; teacher survey	Stand pre-post test; teacher survey
Anderson (2009)	US (TX)	32	480*	Middle		Nonstand pre-post survey, self-assess, comp group	Pre-post nonstand observations, comp group	Stand test, comp group	Stand test, comp group
August et al. (2009): Quality English and Science Teaching	US (TX)	10	890	Middle			Nonstand pre-post observations, cluster-randomized, comp group	Nonstand / stand pre-post test, comp group	Nonstand pre-post test, comp group
August et al. (2014) Quality English and Science Teaching 2	US (TX)	15	1,309	Middle			Nonstand observations, randomized, comp group	Nonstand / stand pre-post, test, comp group	Nonstand pre-post test, comp group
Batt (2010)	US	15		Elementary	—	Nonstand survey	Stand observations; nonstand survey, self-assess	—	
Brettschneider and Mather (2005): Adolescent Literacy Collaboratory	US	14		High	Nonstand survey, self-assess	—			
Brisk and Zisselsberger (2011): Systemic Functional Linguistics PD	US (MA)	11	165*	Elementary	Nonstand survey, self-assess	Nonstand survey, self-assess	Nonstand survey, self-assess; nonstand observations	Nonstand teacher survey	
Cantrell, Burns, and Callaway (2009): Content Literacy Project	US (Southeast)	28		Middle, high		Nonstand survey, self-assess	Nonstand survey, self-assess	—	
Cantrell and Hughes (2008): Content Literacy Project	US (Southeast)	22		Middle, high		Stand pre -post survey	Nonstand pre-post observations		
Carrejo and Reinhartz (2014)	US (TX)	35	—	Elementary			Nonstand observations	—	—
Choi and Morrison (2014): ESOL Endorsement by CLMER	US (OR)	33		Elementary, middle, high		Nonstand discussions	Nonstand pre-post observations		
Crawford, Schmeister, and Biggs (2008): Enhancing English Language Learning in Elementary Classrooms	US	23		Elementary		Stand pre-post survey	Stand pre-post survey; nonstand pre-post observations		
Greenleaf et al. (2011): Reading Apprenticeship PD	US (CA)	105	1,575*	High		Nonstand pre-post survey, group randomized, comp group	Nonstand pre-post survey, self-assess; partly stand test, comp group; nonstand survey	Stand test, comp group; student survey, self-assess, comp group	Stand test, comp group
He, Prater, and Steed (2011): TESOL for ALL	US (NC)	22	235	Most elementary	Nonstand survey, self-assess	Nonstand pre-post survey		Stand pre-post test	

(continued)

APPENDIX TABLE A1 (CONTINUED)

Author (Year): Program name	Country	Teachers, *n*	Students, *n*	Grade levels	Teacher acceptance	Teacher cognition	Teacher practice	Student language achievement	Student academic achievement
Henrichs and Leseman (2014)	Netherlands	59	241	Elementary			Nonstand pre-post observations, randomized, comp group	Nonstand pre-post observations, randomized, comp group	
Hutchinson and Hadjioannou (2011): Modular Design for English Language Learners	US (PA)	25		Elementary		Nonstand pre-post survey, self-assess; nonstand document analysis	Nonstand pre-post observations		
Keefe (2006): Adapting Content to Empower ESOL Students	US (FL)	6	41	Middle, high			—	Nonstand pre (after PD)-post (15 days later), groups	Nonstand pre (after PD)-post (15 days later), groups
Lara-Alecio et al. (2012): MSSELL	US (TX)	12	246	Elementary			Nonstand observations; nonstand conversation, self-assess	Stand test, comp group; stand pre-post test	Stand test, comp group
Lee, Deaktor, Hart et al. Hart and Lee (2003)	US	75	2,000	Elementary		Nonstand pre-post survey, self-assess	Nonstand pre-post survey, self-assess; nonstand observations		
Lee, Deaktor, et al. (2008)									Stand / nonstand pre—post test, comp group
Lee et al. (2005)								Nonstand pre-post test	Stand / nonstand pre—post test, comp group
Lee, Adamson, Santau et al. Adamson, Santau, and Lee (2013)	US (FL)	198	2,000	Elementary			Nonstand survey, self-assess		
Lee, Adamson, et al. (2008)					Nonstand survey, self-assess	Nonstand survey, self-assess	Nonstand survey, self-assess	Nonstand teacher survey	Nonstand teacher survey
Lee et al. (2009)								Nonstand pre-post test	
Lee, Maerten-Rivera, et al. (2008)									Stand / nonstand pre-post test, comp group
Lee and Maerten-Rivera (2012)						Nonstand pre-post survey, self-assess	Nonstand pre-post survey, self-assess; nonstand pre-post observations		
Santau, Maerten-Rivera, and Huggins (2011)									Stand / nonstand pre-post test, comp group

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APPENDIX TABLE A1 (CONTINUED)

Author (Year): Program name	Country	Teachers, *n*	Students, *n*	Grade levels	Teacher acceptance	Teacher cognition	Teacher practice	Student language achievement	Student academic achievement
McIntyre et al. (2010)	US (Midwest)	23		Elementary	Nonstand survey, self-assess		Stand pre-post observations	—	
Minaya-Rowe (2004): EDCI 313 Bilingual Education and Biliteracy	US (CT)	15		Elementary, middle, high	Nonstand survey, self-assess		Nonstand survey, self-assess		
Montes (2002): Content Area Program Enhancement	US (TX)	107*	1,603	Middle	Nonstand survey, self-assess			Stand pre-post test, comp group	Stand pre-post test, comp group
Olson, Kim, Matuchniak et al.	US (CA)	103	1,640	Middle, high					
Kim et al. (2011): Pathway Project							Nonstand survey, self-assess, comp group	Stand / nonstand pre-post test, cluster randomized, comp group	
Matuchniak, Olson, and Scarcella (2014): Pathway Project								Nonstand pre-post test, cluster randomized, comp group	
Olson et al. (2012): Pathway Project							Stand / nonstand pre-post observations, comp group	Stand / nonstand pre-post test, cluster randomized, comp group	
Patrick (2009)	US (FL)	7		High		Nonstand survey, pre-post conversation, partly self-assess	Nonstand observations; nonstand conversation		
Ringler et al. (2013): Project Chief Educational Officer	US (NC)	14		Elementary, middle	Nonstand survey, self-assess		Stand pre-post survey, self-assess; stand observations	—	—
Shanahan and Shea (2012): SMILE PD program	US (CA)	21		Elementary		Nonstand survey, self-assess	Nonstand pre-post observations, comp group (high vs. low attenders); nonstand survey, self-assess		
Short, Fidelman, and Louguit (2012)	US (NJ)	77	1,444	Middle, high			Stand observations, comp group	Stand pre-post test, comp group	
Townsend (2015): Developing Content Area Academic Language	US	8	304	Middle			Nonstand observations	Stand pre-post test (with dosage effect)	

Note. Grade levels: elementary = kindergarten–Grade 5/6; middle = Grades 6–8; high = Grades 9–12. Asterisks (*) indicate estimated sample sizes. Dashes (—) indicate information excluded from analysis. CLMER = Center for Language Minority Education and Research; comp = comparison; ESOL = English to Speakers of Other Languages; MSSELL = Middle School Science for English Language Learners; nonstand = nonstandardized; PD = professional development; pre-post = pretest-posttest; self-assess = self-assessment; stand = standardized; TESOL for ALL = Teaching English to Speakers of Other Languages for Academic Achievement for Language Learners.

APPENDIX TABLE A2

Features Reported for the PD Interventions

	Structural features				Content-related features				Didactic features				
Author (Year)	Duration	Format	Expertise	Needs, interests, knowledge	Language support approach	Application-oriented knowledge	Home language / culture	Focus on student learning	Cooperation / collaboration	Input, application, reflection	Materials	Active learning	Further results
Alvarez et al. (2012)	3 years	Institutes; coaching; PLC; demos		Principal support	Scaffolding; sociocultural, sociolinguistic theory	Yes		Evaluation / assessment	Within sessions; collective participation	Input; application; reflection	Lessons (teacher developed)	Practice; analysis student work / learning; planning / develop; observation	Efficacy (student achievement); collaboration
Anderson (2009)	1–2 years	Training sessions; coaching; demos	External, researchers, language	Program shaping; coherence	SIOP; ESL strategies; Guided Language Acquisition Design	Yes	Yes	Knowledge about language	Within sessions; collective participation	Input; application; reflection; feedback		Discussion; observation	Efficacy (student achievement); collaboration; attitudes / beliefs; time
August et al. (2009)	9 weeks	Training sessions; mentoring	External, researchers, language, subject area	Program shaping; familiar content	Scaffolding; inquiry based, 5E	Yes	Yes	Standards; evaluation / assessment; science		Input; application; reflection; feedback	Lessons; teacher and student guide; instructional charts; supplies	Observation	
August et al. (2014)	15 weeks	Training sessions; mentoring	External, researchers, language, subject area	Program shaping; familiar materials	Scaffolding, inquiry based, 5E	Yes	Yes	Students' academic language needs; standards; evaluation / assessment; science		Input; application; reflection; feedback	Lessons; teacher and student guide; instructional charts; supplies	Practice; planning; observation	Attitudes / beliefs
Batt (2010)	1 year	Institute; workshops; coaching	External, language	Familiar content; principal support	SIOP	Yes	Yes	Evaluation / assessment	Within sessions	Input; application; reflection; feedback		Observation	Efficacy (student achievement); collaboration; efficacy (coaching); time
Brettschneider and Mather (2005)	1 year	Institute; coaching; team meetings; online group	External, researchers, language	Credits	Adolescent Literacy Support Framework	Yes			Within sessions; collective participation	Input; application; reflection; feedback	Lessons (teacher developed)	Practice; discussion; planning / develop; observation (video)	
Brisk and Zisselsberger (2011)	7 sessions	Sessions / meetings; coaching	External, researchers, language	Program shaping; familiar materials	SFL	Yes	Yes	Knowledge about language	Within sessions; collective participation	Input; feedback	Binder with explanations, suggestions for teaching strategies	Discussion; analysis student work / learning; observation	Time
Cantrell, Burns, and Callaway (2009)	1 year	Institute; coaching; team meetings	External, language	Program shaping	Literacy strategies	Yes		Students' perspective	Within sessions; collective participation	Input; application; feedback		Discussion; planning; observation	Efficacy (student achievement); collaboration; efficacy (coaching); time
Cantrell and Hughes (2008)	1 year	Institute; group meetings; coaching	External, language	Time off teaching	Content literacy techniques	Yes		Sharing artifacts of student learning	Within sessions; collective participation	Input; application; reflection; feedback	Lessons (teacher developed)	Practice; discussion; planning / develop; observation	Efficacy (student achievement); collaboration; attitudes / beliefs; efficacy (coaching); time
Carrejo and Reinhartz (2014)	1 year	Collaborative group meetings			Scaffolding; inquiry based, 5E; CALLA	Yes		Standards; evaluation / assessment; science; content knowledge	Within sessions; collective participation	Application; reflection	Lessons		

(continued)

APPENDIX TABLE A2 (CONTINUED)

	Structural features				Content-related features				Didactic features				
Author (Year)	Duration	Format	Expertise	Needs, interests, knowledge	Language support approach	Application-oriented knowledge	Home language / culture	Focus on student learning	Cooperation / collaboration	Input, application, reflection	Materials	Active learning	Further results
Choi and Morrison (2014)	18 months	Meetings; mentoring; face-to-face and online group meetings	External, researchers, language	Certification	SIOP	Yes	Yes	Knowledge about language; evaluation / assessment	Within sessions; collective participation	Input; application; reflection; feedback	Lessons (teacher developed)	Discussion; planning / develop; observation (video)	Collaboration
Crawford, Schmeister, and Biggs (2008)	1 / 2 year	Course; coaching; mentoring		Coherence; grant	SI; Total Integrated Language Approach	Yes	Yes	Evaluation / assessment	Collective participation	Input; application	Lessons (teacher developed)	Planning / develop; observation	Collaboration; time
Greenleaf et al. (2011)	1 year	Institute; coaching / mentoring	External, researchers, language, subject area	Program shaping; familiar content	inquiry based; Reading Apprenticeship	Yes		Student learning and needs; standards; evaluation / assessment; students' perspective; science	Within sessions	Input; application; reflection	List of reading materials; funds	Practice; discussion; analysis student work / learning; planning; observation (video)	Collaboration
He, Prater, and Steed (2011)	1 year	Sessions	External, researchers, language	Program shaping; familiar content; credits / certification	SIOP; models of ESL teaching	Yes	Yes	Knowledge about language; evaluation / assessment; students' perspective	Within sessions; collective participation	Input; application; reflection; feedback	Lessons (teacher developed)	Practice; discussion; analysis student work / learning; planning / develop	
Henrichs and Leseman (2014)	3 hours	Training	External, researchers		Academic language input	Yes		Knowledge about language; science	Within sessions	Input	Science-related materials	Discussion; observation (video)	
Hutchinson and Hadjioannou (2011)	2 semsters	Face-to-face courses; online discussion board; PLC	External, researchers, language	Program shaping; credits	Scaffolding; TESL strategies	Yes	Yes	Knowledge about language; standards; evaluation / assessment; content knowledge	Within sessions; collective participation	Input; application; reflection; feedback	Lessons (teacher developed)	Planning / develop; discussion	Collaboration
Keefe (2006)	7 weeks	Training course	External, researchers, language		SIOP; ESOL strategies	Yes	Yes	Knowledge about language; evaluation / assessment; students' perspective	Within sessions	Input; application; reflection		Discussion	
Lara-Alecio et al. (2012)	1 year	Workshops	External, researchers		Scaffolding; inquiry based, 5E; ESL strategies	Yes	Yes	Reflect on and discuss student learning; standards; evaluation / assessment; science		Input; application; reflection	Lessons; materials	Practice; discussion	
Lee, Deaktor, Hart, et al.[a]	1–2 years	Workshops; curriculum units / materials	External, researchers, language, subject area	Program shaping	Scaffolding; inquiry based	Yes	Yes	Potential challenges; knowledge about language; standards, evaluation / assessment; students' perspective; science; content knowledge	Within sessions; collective participation	Input; application; reflection	Lessons (teacher developed); units; booklets; teachers' guides; science supplies; books	Practice; discussion; analysis student work / learning; planning / develop; observation; present	Attitudes / beliefs

(continued)

APPENDIX TABLE A2 (CONTINUED)

	Structural features				Content-related features				Didactic features				
Author (Year)	Duration	Format	Expertise	Needs, interests, knowledge	Language support approach	Application-oriented knowledge	Home language / culture	Focus on student learning	Cooperation / collaboration	Input, application, reflection	Materials	Active learning	Further results
Lee, Adamson, Santau, et al.[a]	1–3 years	Workshops; curriculum units / materials	External, researchers, language, subject area	Program shaping; coherence	Scaffolding; inquiry based; literacy, ESOL strategies	Yes	Yes	Potential challenges; standards; evaluation / assessment; students' perspective; science; content knowledge	Within sessions; collective participation	Input; application; reflection	Lessons (teacher developed); units; booklets; teachers' guides; science supplies; books	Practice; discussion; analysis student work / learning; planning / develop; observation; present	Attitudes / beliefs
McIntyre et al. (2010)	18 months	Sessions; coaching; demos		Program shaping; familiar content	SIOP	Yes	Yes	Evaluation / assessment; students' perspective	Within sessions	Input; application; reflection; feedback	Lesson plan (teacher developed); material tools; books	Analysis student work / learning; planning / develop; observation (video)	
Minaya-Rowe (2004)	6 weeks	Training course	External, researchers	Credits / certification	SIOP; Bilingual Education and Biliteracy	Yes	Yes	Evaluation / assessment; students' perspective	Within sessions	Input; reflection		Practice; observation	
Montes (2002)	1 year	Training sessions; collaborative team work; demos	External, researchers	Time off teaching	CALLA	Yes	Yes	Evaluation / assessment; students' perspective	Within sessions; collective participation	Input; application; reflection; feedback	Lessons, materials (teacher developed); materials	Discussion; planning / develop; observation	Collaboration
Olson, Kim, Matuchniak, et al.[a]	1–2 years	Training; coaching; group meetings	External, researchers, language	Program shaping; grant; time off teaching	Cognitive strategies approach to literacy instruction	Yes	Yes	Learning needs; standards; evaluation / assessment; students' perspective; English language arts	Within sessions	Input; application	Lessons (teacher developed); tool kit; curriculum materials	Practice; analysis student work / learning; planning / develop; observation	
Patrick (2009)	8 months	Workshops; coaching; demos	External, researchers, language	Program shaping; principal support; grant	Functional language analysis; genre teaching cycle	Yes		Potential challenges; knowledge about language; standards; students' perspective; science; content knowledge	Within sessions; collective participation	Input; application; reflection: feedback	Lessons (teacher developed)	Practice; discussion; planning / develop; observation	Collaboration; time
Ringler et al. (2013)	8 months	Workshop; coaching; learning communities	External, researchers, language	Program shaping; principal support	SIOP	Yes	Yes	Evaluation / assessment	Within sessions; collective participation	Input; application; reflection; feedback	Teaching materials (teacher developed)	Practice; discussion; planning; observation	Time
Shanahan and Shea (2012)	2 years	Workshops / meetings; institutes; PLC	External, researchers, language, subject area	Program shaping; familiar content	Inquiry based, 5E; student-talk strategies	Yes	Yes	Potential challenges; standards; evaluation / assessment; students' perspective; science	Within sessions; collective participation	Input; application; reflection	Classroom materials	Practice; discussion; observation	Efficacy (student achievement)
Short, Fidelman, and Louguit (2012)	2 years	Institutes; workshops; coaching	External, researchers, language		SIOP	Yes	Yes	Standards; evaluation / assessment	Within sessions	Input; application; feedback	Lessons (teacher developed); sample lessons	Discussion; planning / develop; observation (video)	
Townsend (2015)	1 year	Workshops; coaching	External, researchers	Program shaping	Scaffolding; SFL; functional language analysis	Yes		Potential challenges; knowledge about language	Within sessions	Input; reflection	Lessons (teacher developed)	Planning / develop; observation (video)	Time

Note. 5E = Engage, Explore, Explain, Elaborate, Evaluate; 5E = Five E Model; CALLA = Cognitive Academic Language Learning Approach; develop = development; ESL = English as a Second Language; ESOL = English to Speakers of Other Languages; present = presentation; PLC = Professional Learning Communities; SFL = Systemic Functional Linguistics; SI = Sheltered Instruction; SIOP = Sheltered Instruction Observation Protocol; TESL = Teaching English as a Second Language.

[a]Multiple articles—see Appendix Table A1.

Authors' Note

Since the work described in the article was conducted, Anna Gronostaj's affiliation has changed to Die Deutsche Schulakademie.

Acknowledgments

Our thanks to Ben Fergusson and Lisa Cassell, who provided indispensable language assistance; to Max Borchelt for rating so many studies; and to the anonymous reviewers for their valuable comments on earlier drafts. We also acknowledge the support of Deutsche Forschungsgemeinschaft and Open Access Publishing Fund of University of Potsdam.

Funding

This work was supported by the German Federal Ministry of Education and Research (01JI1501A). The funding source had no involvement in any of the stages of this study.

Notes

1. Guskey (2000) added organization change as another level. However, it seems as if more attention is paid to the other levels and that organization change is relatively difficult to evaluate.

2. The full text of eight potentially relevant dissertations could not be obtained even after authors or their chairs had been contacted, which was attempted if contact details were available. Further details on the search process, the complete syntax, and a list of excluded studies can be provided by the corresponding author on request.

3. The coding scheme can be provided by the corresponding author on request.

4. If missing although applicable, the sample size was estimated by multiplying/dividing the number of the given sample (teacher or student) by 15, which is the average student:teacher ratio in the United States according to the Organization for Economic Cooperation and Development (2011).

5. If only the name or very little information on a widely known language instruction program was given, we assumed that the authors had assumed reader knowledge about that program. In this case, additional information on the program was sought in external sources and then coded. Thus, we always added the code *home language/culture* if Sheltered Instruction Observation Protocol—a widely known model—was reported as the model or one of the models used.

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