Vocabulary development in the early school years. Association with demographic factors, formal schooling and summer vacation, and the effects of a teacher Continuing Professional Development program.

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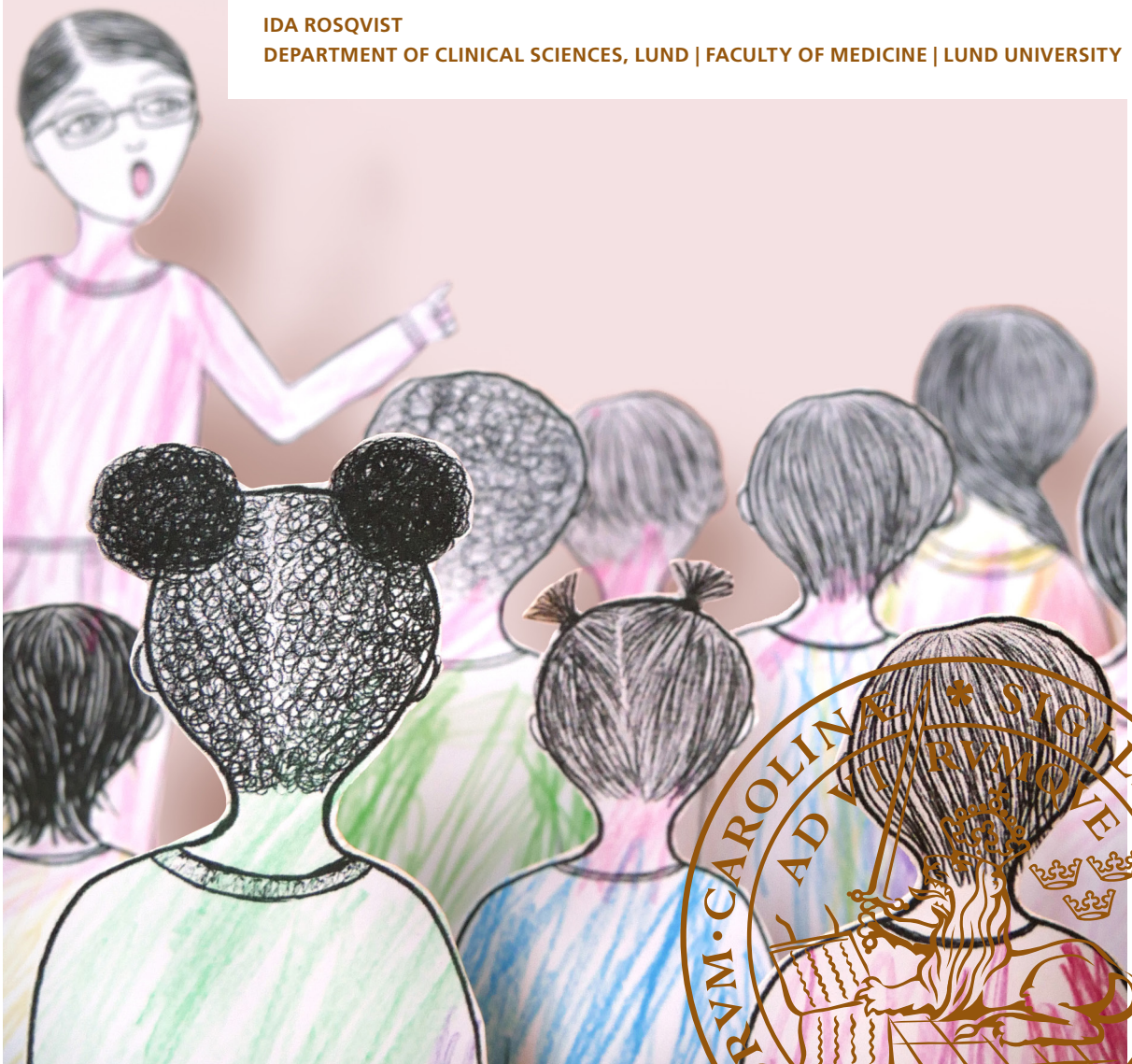

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LUND
UNIVERSITY

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ABSTRACT

Background: Well-developed vocabulary skills are crucial for academic success. Students having the language of instruction as a second language and students from lower socioeconomic backgrounds often have lower performance on vocabulary assessments. Teachers play an important role in supporting the vocabulary development of all students, regardless of background and educational needs.

Aims: To investigate how summer vacation and formal schooling, as well as demographic factors such as level of parental education and bilingualism, are associated with vocabulary development in the early school years, and to evaluate the effects of a language and communication focused teacher Continuing Professional Development (CPD) program on both the participating teachers and on the vocabulary development of their students.

Methods: The CPD program was delivered to teachers (n = 25) serving children in grade one and two (n = 209; age 6 – 9 years) and consisted of 11 weekly 90-min sessions introducing hands-on strategies to enhance language learning opportunities and interactions in the classroom. Both teachers and their students were assessed pre, post and at three months follow up after the CPD. Teachers were assessed with self-reports on activities and interactions in the classroom, and their self-efficacy of classroom management, as well as with qualitative analyses of statements made by the teachers in structured conversations. Students were assessed with a test battery targeting a broad range of language skills (including a Semantic Verbal Fluency/SVF task, and a Word Definition/WD task), as well as a non-verbal cognitive test. Background information was collected through parental questionnaires.

Results: Paper I: SVF performance was negatively affected by summer vacation and positively affected by formal schooling. Variance in development could not be predicteded by bilingualism, level of parental education, general language ability, or non-verbal ability. Paper II: Monolingual students outperformed bilingual peers on the WD task. However, bilingualism alone could not explain the variance in performance. Paper III: The CPD was well-received and appreciated by the teachers and qualitative analyses indicated signs of increased knowledge. However, no statistically significant effect was seen in self-reports on activities and interactions in the classroom, or self-efficacy of classroom management. Paper IV: The CPD might have a positive impact on the students' WD performance, but not on the SVF performance.

Conclusions: There is an interaction between several factors associated with students' vocabulary development, and no factor in isolation can explain the variance in performance. A CPD program of this sort may result in some signs of change in teachers' knowledge and their students' WD development, but there is no guarantee that taking part in a teacher CPD results in clearly improved teacher or student outcomes.

Key words

Vocabulary development; Language development; Word definition; Definitional skills; Semantic verbal fluency; Word fluency; Bilingualism; Multilingualism; Summer vacation; Summer slide; Summer loss; Summer learning loss; Continuing professional development; Teacher professional development; Teacher PD; CPD; Classroom language and communication; Intervention

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To my wonderful wordsmiths, E & A

Förälder: Du är en sån stjärna! Barn E (2:0 år): Nä, jag är måne!
Parent: You are such a star! Child E (2:0 years): No, I am moon!

Barn A (2:8 år): Vi e små naffsor som äter upp jordgubbarna i ett nafs
Child A (2:8 years): We are small jiffers that eat the strawberries in a jiffy

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Preface

> A rich vocabulary supports learning about the world, encountering new ideas, enjoying the beauty of language. A rich vocabulary enhances an interview, allows one to see the humour in wordplay, shores up what an individual wants to say, and, especially, wants to write.
>
> (Beck et al., 2013, p.1)

Prior to starting my PhD studies, I was working as a school-based speech-language pathologist (SLP) in a school in socioeconomically disadvantaged area, where all students used at least one more language other than the language of instruction, Swedish. Working there made my think a lot about the complex interplay between several factors, associated with language development, and in turn school achievements, not only at individual level, but also within the family, school and community at large.

Something that was often discussed with my educational staff colleagues was the need for supporting all students' vocabulary development, as it was evident that vocabulary gaps was a barrier for school achievements. But we also regularly discussed factors at school, at home, and in the community, associated with the students' school achievements. For example, we talked about how the summer vacation was a vulnerable period of time when many students lacked stimulating activities. Often the beginning of the fall semester was spent rehearsing skills that had declined over the summer vacation. I gained an increased insight to the many factors that can be involved related to students' opportunities to develop and learn at school. I also gained a curiosity the learn more about factors associated with language, and in particular vocabulary, development. I also wanted to learn more about how SLPs and teachers can cooperate and how different teaching practices can support the students' development. I joined the research project in 2017, and since then these have become the two overarching themes of this dissertation.

In this dissertation I will to a large extent treat language skills and development as a 'separate ability'. In reality, of course the picture is much more complex. What we, for example as SLPs, categorize as a language ability, or language task, can be seen in a different way depending on theoretical field, for example developmental psychology, educational theory, cognitive science, etcetera. So even if I largely disengage language skills and language development, it is of course related to various related, and interconnected cognitive systems.

Ida
Lund, March 2024

List of papers

Paper I

Rosqvist, I., Sandgren, O., Andersson, K., Hansson, K., Lyberg-Åhlander, V., & Sahlén, B. (2020). Children's development of semantic verbal fluency during summer vacation versus during formal schooling. *Logopedics Phoniatrics Vocology*, *45*(3), 134-142. https://doi.org/10.1080/14015439.2019.1637456

Paper II

Rosqvist, I., Andersson, K., Sandgren, O., Lyberg-Åhlander, V., Hansson, K., & Sahlén, B. (2022). Word definition skills in elementary school children – The contribution of bilingualism, cognitive factors, and social factors. *International Journal of Speech-Language Pathology*, *24*(6), 596-606. https://doi.org/10.1080/17549507.2021.2000027

Paper III

Andersson, K., Sandgren, O., Rosqvist, I., Lyberg Åhlander, V., Hansson, K., & Sahlén, B. (2022). Enhancing teachers' classroom communication skills – Measuring the effect of a continued professional development programme for mainstream school teachers. *Child Language Teaching and Therapy*, *38*(2), 166-179. https://doi.org/10.1177/02656590211070997

Paper IV

Rosqvist, I., Sandgren, O., Andersson, K., Lyberg-Åhlander, V., Hansson, K., & Sahlén, B. (2023). The effect of a teacher Continuing Professional Development (CPD) program on vocabulary development in elementary school children. Manuscript to be submitted.

Abbreviations

AICc	The Akaike information criterion, corrected version
ANOVA	Analysis of variance
ASIC	ActivitieS and Interactions in the Classroom
CALD	Culturally and linguistically diverse
CELF-4	Clinical Evaluation of Language Fundamentals 4th edition
CLS	Core Language Score
CPD	Continuing Professional Development
CSCOT	Communication Supporting Classroom Observation Tool
(D)LD	(Developmental) Language Disorder
EF	Executive Functioning
EFL	English as a foreign language
IF	Intervention Fidelity
L1	First language
L2	Second language
LLE	Language Learning Environment
LLI	Language Learning Interactions
LLO	Language Learning Opportunities
LMM	Linear Mixed Model
LPE	Level of Parental Education
ML	Maximum likelihood
PD	Professional Development
PF	Program Fidelity
PVF	Phonological Verbal Fluency
RCPM	Raven's Coloured Progressive Matrices
REML	Restricted maximum likelihood
RM-ANOVA	Repeated measures ANOVA
SD	Standard deviation
SES	Socioeconomic status
SLL	Summer learning loss
SLP	Speech-language pathologist
SVF	Semantic Verbal Fluency
TS	Total score
VF	Verbal Fluency
WD	Word Definition
WKn	Word Knowledge

Papers at a glance

	Paper I	Paper II	Paper III	Paper IV
Aims	To investigate the development of SVF ability during summer vacation versus during formal schooling. To investigate if development could be predicted by background factors	To investigate performance of monolingual group compared to bilingual group on a WD task. To investigate if variance could be explained by background factors. To evaluate the WD task.	To evalute the effect of the teacher CPD program on teacher outcomes. To describe the development and implementation of the CPD program.	To evaluate the effect of the teacher CPD program on the students' vocabulary development, measured by a SVF task and a WD task. To investigate if any intervention effect was modulated by background factors.
Data	SVF task, background factors: CELF-4 CLS, RCPM, bilingualism, and level of parental education	WD task, background factors: CELF-4 CLS, RCPM, bilingualism, level of parental education and school characteristics	ASIC, TSES subscale classroom management, structured conversations in groups	SVF task, WD task, background factors: grade, bilingualism, and school characteristics
Participants	68 students	208 students	25 teachers teaching grade 1 and 2 in mainstream school	209 students in the classes of the teachers participating in the CPD
Design	One group repeated measures research design three assessment points: before summer vacation (T1), after summer vacation (T2), and by the end of fall semester (T3).	Cross-sectional research design with one assessment point.	Two condition delayed-start intervention research design: direct intervention condition and a delayed intervention control condition, with three assessment points.	Two condition delayed-start intervention research design: direct intervention condition and a delayed intervention control condition, with three assessment points. A no intervention condition due to teacher drop out.
Results	SVF ability was negatively affected by summer vacation and positively by formal schooling. Variance in development could not be prediced by any of the included factors.	The bilingual group had lower scores compared to the monolingual group. 24.3% of variance was uniquely explained by CELF-4 CLS, and ~29% was shared variance between factors. Internal consistency of the test was $> \alpha = 0.7$.	No statisitcally signicant change on teachers' self-assessments as a result of the CPD. Qualitative analyses of statements indicated some change, and a need for more knowledge.	No intervention effect on SVF ability. Different developmental trajectories between the intervention conditions across the three assessment points indicated some positive intervention effect on WD ability. Intervention effect was not modulated by background factors.
Conclusions	Summer vacation causes a recess in the expected development of SVF ability. The recess is recouped after a semester of formal schooling. Included background factors could not predict the development.	The monolingual group outperformed the bilingual group on the WD task, but bilingualism alone could not explain the variance.	The particpants reported benefits of the CPD and showed signs of development, but no intervention effect was seen on self-assessments of classroom communication and management ability.	The teacher CPD might have a positive impact on WD score, but not SVF score. Improved vocabulary skills of the students as a result of their teachers taking part in a CPD are not guaranteed.

Lay summary

Background

During the school years, several different aspects of vocabulary knowledge are developed. Having a well-developed vocabulary in terms of for example breadth (how many words the person knows), depth (how much the person knows about the individual words in the lexicon), organization (how the word is linked to other words), and use of the words in different contexts is important for school success. In formal schooling, children also encounter other types of words (sometimes called 'academic vocabulary', or 'cross-curricular' and 'content specific' vocabulary), than is often used in everyday conversations.

Previous studies report that bilingual students, especially students learning the language of instruction as their second language, and students from lower socioeconomic backgrounds often have lower vocabulary skills. Several other aspects on individual, familial, school, and community level has also been linked to vocabulary development. However, much is still not known about the complex interplay between factors associated with different aspects of vocabulary development.

Teachers play an important role for developing the vocabulary skills of all students, regardless of background and educational needs. Previous international studies have indicated that vocabulary instruction is rarely in line with the evidence-base. One way to further develop the teachers' ability to support the vocabulary development of all students can be by offering professional development activities, such as a language focused Continuing Professional Development (CPD) program. However, there are gaps in the research base on language focused CPD programs for elementary school teachers that results in both increased teacher outcomes, and more important, increased student outcomes.

In Sweden, education is mandatory for ten years, starting with a preparatory school year at the age of six, and considered a basic right for all children. Swedish classrooms are often culturally and linguistically diverse. There is often a large distribution in terms of Swedish language proficiency, amount of school experience, gaps in subject knowledge, and special education needs, which place new demands on teachers.

Papers included in the dissertation

The four studies included in this dissertation have two overarching aims: 1. Investigating factors associated with vocabulary development in the early school years, and 2. Evaluating the effect of a teacher CPD program on both the participating teachers, and the vocabulary development of their students.

Participants in the studies were 25 teachers, teaching grade 1 or 2 in mainstream elementary school in southern Sweden. Teachers were recruited to take part in a CPD program aimed at developing the teachers' ability to support the language and communication development of their students. All students in the participating teachers' classes were also invited to participate, in order to evaluate the effect of the CPD program on the students' language development. A total of 224 students agreed to participate and took part in at least one assessment point (out of either three or four assessment points in total).

Teachers were divided into one direct intervention condition and one delayed start intervention condition. The delayed start intervention condition, consisting of both teachers and their students, served as a 'control condition' (with teaching-as-usual practices when the direct intervention condition took part in the CPD program). This was done to be able to compare the development of both the teachers, and their students, taking part in the CPD program, to the 'control condition'. Teachers and students in both conditions were assessed with different tasks before and after taking part in the CPD program. Paper I and II uses data that was collected prior to taking part in the CPD program, and Paper III and IV uses data collected before and after taking part in the CPD program. Teacher outcomes were self-reports and qualitative analyses of statements gathered in structured conversation.

The participating students' vocabulary skills were evaluated using two vocabulary tasks, in the language of instruction (Swedish). A Semantic Verbal Fluency (SVF) task, where the students were asked to say as many animals and as many clothes, they could think of during one minute for each category, was one of the tasks. SVF performance is, for example, linked to vocabulary size and organization, and how well the participants can search and retrieve words from the lexicon. A Word Definition (WD) task, where the participating students had to explain what ten different words, commonly used in the classroom setting in the early grades, was the other task. WD performance, is, for example, linked to vocabulary depth (how much knowledge the participants have about the included words), and how well they can formulate definitions that are clear and concise, in a conventional from. This is task hence requires several skills, including for example vocabulary skills, grammatical skills, and communicative skills (adapting to the listener).

Paper I

Paper I investigated how 68 (age range: 6:5–9:1 years) of the participating students' SVF ability (measured as the total number of correct words generated in the two categories) developed during the summer vacation versus during the fall semester when they took part in formal schooling. Previous studies have indicated a linear increase of SVF ability with increasing age during the school years. In Paper I, however, we found a setback in the expected development of SVF ability when the students returned to school after the summer vacation. When measuring again after one semester of formal schooling (the fall semester), this setback was recouped, but no additional gains compared to before the summer vacation were seen. This could mean that the development of SVF ability is related to activities and interactions that are perhaps more common in the school setting, and maybe less common at home.

Although, the average results for all participants showed a decrease following summer vacation and an increase following fall semester, different participants had different developmental trajectories. Paper I also investigated whether the difference in development during summer vacation and during formal schooling could be predicted by the level of education for the participants' parents, mono/bilingualism, the participants' general language ability, and/or their non-verbal ability. But these background factors could not predict the variance in development, neither during the summer vacation, nor during the fall semester.

Paper II

Paper II investigated the performance of 208 (age range 6:8–9:0 years) participating students' performance on the WD task. The WD task was scored for Word knowledge (WKn) 0 – 1 point, where students got one point if definitions included at least partially correct information. It was also scored for Word Definitions (WD) where the amount of information included in the definitions were scored on a scale from 0 – 3 points. The monolingual group of participants outperformed the bilingual group of participants on both measures (WKn and WD).

Paper II further investigated to what extent background factors could explain the variation in performance on the WD score. The background factors included were mono/bilingualism, level of parental education, 'school characteristics' (an index calculated for the school based the proportion of students with Swedish as first language and the proportion of parents with tertiary education), the participants general language ability, and their non-verbal ability. These factors were added 'stepwise' in statistical models aiming at explaining the variance in test scores. When only adding mono/bilingualism as a single factor, it could explain 15% of the variance. However, adding more background factors decreased how much variance mono/bilingualism in isolation could explain. With all five background factors included, mono/bilingualism only explained 0.44% of the variance (and the background factor was no longer statistically significant). This indicates that mono/bilingualism alone cannot explain variance in WD scores, but instead several

factors at individual, family, and school level interact. Analyses further showed that general language ability is linked to the WD performance.

Furthermore, the study showed that many participants lacked, had shallow, or even incorrect, knowledge of the included words. Students might use a word in some contexts, in a superficial manner, but lack a deep knowledge of the word, and how it is used in other contexts, which is important for teachers to be aware of.

Paper III

Paper III investigated the effect of the CPD program on teacher outcomes, based on self-reports and qualitative analyses of statements gathered during structured conversations. The CPD was in general well-received and appreciated by the teachers. Participants came prepared to the sessions and brought their own experiences and examples to discuss. Qualitative analyses indicated, amongst other things, signs of increased knowledge for the teachers, but also a need for further knowledge and development. However, no statistically significant effect as a result of taking part in the CPD program was seen on the teachers' self-reports on activities and interactions in the classroom, or their self-rated ability of classroom management.

Paper IV

Paper IV investigated the effect of the CPD program on the students' vocabulary development, measured by the SVF task and the WD task. The students SVF ability increased over time, but not as a result of their teachers taking part in the CPD program. For the WD measurement, analyses of the different developmental trajectories between the intervention conditions, indicated some effect of the CPD program on the students' WD performance. However, evidence is not sufficiently strong to conclude that this is solely a result of the CPD program.

Conclusions

In conclusion, there is an interaction between several factors associated with vocabulary development, and no factor in isolation can explain the variance. When analysing performance on vocabulary assessments, several aspects must be taken into account. Furthermore, a teacher CPD program of this duration, content, and approach may result in some signs of change in teachers' knowledge and their students' WD skills, but there is no guarantee that teacher CPD results in clearly improved teacher and/or student outcomes.

BACKGROUND

> Words make a language. They are used to talk about everything, from beekeeping to bicycling, from navigation to international banking. [---] We need them to communicate about events and ideas, technology, science, philosophy, and art. [---] Without words, there would be no sound structure, no word structure, no syntax. The lexicon is central in language, and central in the acquisition of language.
>
> (Clark, 1993, p. 1)

The role of vocabulary in language learning, testing, and teaching has been neglected for much of the 20th century. For example, in much of earlier literature on second language acquisition little attention is paid to vocabulary learning (Milton, 2009). This is unfortunate, since lexical skills are at the heart of communicative skills (Meara, 1996). However, there has been a shift from an overvaluation of morphological and syntactic skills, to now considering vocabulary skills the most important factor in language proficiency and academic success, partly because of the close association with text comprehension (Vermeer, 2001). The importance of well-developed vocabulary skills for academic achievement cannot be understated, especially in an academic system placing high demands on both written and oral language skills, such as the current Swedish curriculum for mainstream education (Läroplan för grundskolan, förskoleklassen och fritidshemmet 2022 [Curriculum for the compulsory school, preschool class and school-age educare 2022], 2022).

Vocabulary skills are often reported being lower in in bilingual children (e.g., Verhallen & Schoonen, 1993; Verhallen & Schoonen, 1998; Vermeer, 2001) and children from low SES backgrounds (e.g., Meir & Armon-Lotem, 2017; Spencer et al., 2012). In order to best support the development of vocabulary skills, teachers need to have knowledge of how to support all students, regardless of background, skills, and (special) educational needs. However, according to international studies, vocabulary instruction, as it is carried out in the classrooms, is generally not in line with recent research on effective vocabulary instruction (Graves, 2016). In the early school years, students are often not provided with enough opportunities to build a well-developed vocabulary (Dockrell & Messer, 2004). A reason for this might be partly that educators often report being unsure of how to support their students' vocabulary development (Anderson, 2024).

Continuing Professional Development (CPD) programs for teachers is increasingly used as a way of improving educators' knowledge about and skills in providing quality language environments for children. However, to what extent CPDs reach these goals, and weather any improvements in teacher outcome

measures in turn results in improvements in children's skills is not clearly indicated by the current research base (Markussen-Brown et al., 2017).

In the following section, aspects relevant for the scope of this dissertation are presented. Research on vocabulary development that occurs during the school years, as well as research on factors associated with children's development is reviewed. Furthermore, research on vocabulary instruction and research on professional development activities for teachers is presented. An introduction of the Swedish educational context is also briefly covered.

Vocabulary development during the school years

An extensive system of academic knowledge is built up during the successive school years and represented by word meanings and word relations (Verhallen & Schoonen, 1993). Vocabulary is the most critical component for comprehension and acts as vehicle for knowledge, as knowledge consists of the words passing between people (Black & Wright, 2024). Another metaphor used is seeing academic words as tools, which are used both for communicating and for thinking about subject content. Hence, students must be provided with opportunities to practice using words for these purposes when learning them (Nagy & Townsend, 2012). In order to support high-quality literacy and to support academic learning a broad range of information about each word is needed, including word meaning, lexical organization (i.e., how the word relates to other words), and how the word is used in different contexts (McKeown, 2019).

During the school years, different aspects of children's vocabulary skills are developed. Vocabulary *breadth* (i.e., vocabulary size: how many words the person knows) increases when the child encounters and learns new words. Vocabulary *depth* (i.e., depth of lexical knowledge: how much the person know about the individual words in the lexicon) increases when the child learns for example new meaning relations (how the word is connected to other words in terms of both paradigmatic and syntagmatic relationships) and meanings of familiar words (for example from concrete to decontextualized use of a word) (Schoonen & Verhallen, 2008).

Other proposed dimensions in descriptions of lexical knowledge is *size* and *organization* (Meara, 1996). One important aspect of vocabulary development relevant for school success is knowledge of word relationships, for example how words are organized hierarchically with co-ordinated and super-ordinated words and concepts (Verhallen & Schoonen, 1993). Different parts of speech are organized differently in the mental lexicon. Nouns have a more clear hierarchical organization with sub- and superordinate connections to other nouns, but the lexical organisation of for example verbs and adjectives is less structured and predictable (Marinellie & Johnson, 2004). School instruction influences the development of hierarchical word

relations as these are reinforced when used to categorize, abstract, generalize, and define knowledge (Ganuza & Hedman, 2017). School children do not only encounter new words and concepts but are presented with new meaning relations between words and concepts. A gradual shift from a concrete use of a word (for example talking about a specific pet when talking about cats), to being able to handle abstract concepts (for example talking about the 'Felidae family' with the co-ordinated concepts 'lion' and 'tiger', which is further superordinated by the concepts 'carnivore' and higher up in the hierarchy, 'mammal') takes place during the school years (Verhallen & Schoonen, 1993). When learning a new word, it is not stored as a separate unit in isolation, but connected to already existing words within the person's vocabulary (Schoonen & Verhallen, 2008). The mental lexicon is organized as networks of interconnected nodes specifying the word meaning, and there is a strong correlation between vocabulary breadth and depth measures (Vermeer, 2001).

Knowing a word is not a dichotomous distinction where you either know or do not know a word, but instead a continuum ranging from no knowledge, to recognizing, to knowing roughly, and to being able to describe accurately (Vermeer, 2001). Since words are not isolated units, but instead fit into many related systems, there a several things to know about specific words, and many degrees of word knowledge (Nation, 2022). Quite a lot has been written on the topic what it means to know a word (Meara, 1996) and there are several different proposed models for what it constitutes to know a word (see for example Beck et al., 1987; Dale, 1965; Nagy & Scott, 2000; Nation, 2001, 2022; Perfetti, 2007; Richards, 1976; Schmitt, 2014; Vermeer, 2001). The specific details of different proposed models are not as important as the overall concept, i.e., knowledge of words is not an all-or nothing premise, but instead a rather complex phenomenon where an individual's knowledge of a specific word can be seen as falling along an continuum (Beck et al., 2013).

Another important aspect of vocabulary development during the school years is what type of words the child encounter. Beck et al. (2013) has developed a three-tiered framework for vocabulary. Tier 1-words are words commonly used in everyday language, such as *happy*, *cat*, and *dance*. These words typically appear in oral conversations, and hence children are exposed to them frequently from an early age. Because of high exposure the meaning of tier 1-words rarely require explicit instruction at school. Tier 2-words are words that are found across a variety of domains, and are of high utility for mature language users, such as *complicated*, *reality,* and *compare*. Children seldom encounter tier 2-words prior to starting school, but they are essential in the school setting. Since tier 2-words play a large role in the language repertoire and because of their prevalence in written language explicit and rich instruction of tier 2-words at school can be most productive. Finally, tier 3-words are content or domain specific words, such as *fluorescent*, *fideicommissum*, and *factorize,* and they are often explicitly defined in textbooks or by teachers when encountering them. Since the frequency of tier 3-words often is

low and tightly associated with specific content areas, a general and rich understanding of word from the third tier is not of high utility for most students. Instead, these words are preferably covered in instruction when a specific need arises (Beck et al., 2013).

In summary, during the school years children's vocabularies are developed in terms of breadth, depth, organization, and level of abstraction, decontextualization, and generalization. This development is closely related to, and enhanced by, formal schooling.

Consequences of poor vocabulary skills

There is a growing body of evidence that academic language proficiency is important for accessing the content in academic talk and texts, learning and thinking 'like a scientist', and overall academic achievement (Nagy & Townsend, 2012). When entering school, all children are not equally prepared in using language in the expected ways or sharing the same understanding how certain ways of using language at school are expected (Schleppegrell, 2001). Children with poor language skills are at high risk of academic failure (Hulme et al., 2020). Risk factors for language and literacy failure include having the language of instruction as a second language, background factors related to socioeconomic status (SES), and individual language difficulties (for example, due to (Developmental) Language Disorder/(D)LD) (Rogde et al., 2019). Multiple risk factors are further associated with low language skills (Andersson et al., 2019).

Perhaps the most obvious aspect of academic language is academic vocabulary, and poor academic vocabulary knowledge has been identified as a barrier to student success (Nagy & Townsend, 2012). Gaps in vocabulary development appear to have a strong effect on reading and listening comprehension, and further academic attainment (Schwartz & Katzir, 2012). In particular, children learning the language of instruction as a second language are at risk of having both oral and written comprehension difficulties caused by lower levels of vocabulary knowledge, as this heavily impacts the ability to understand both oral and written language (Burgoyne et al., 2009).

Apart from risk of academic failure, language difficulties are also a risk factor for behavioural, social, and emotional difficulties (Clegg et al., 2015; Snowling et al., 2006). As language skills are essential for academic attainment, and future employment prospects, less-well off children's life chances are undermined when they fall behind in their language development, which may perpetuate a cycle of disadvantage and poverty (Law et al., 2017).

Factors associated with children's development

Socioeconomic status and language development

Language development is both shaped by abilities internal (intrinsic) to the child (e.g., intersects with genetics), and by factors external (extrinsic) to the child, and the variability in the contexts for language development has consequences for the language outcomes (Hoff et al., 2022). There is a widely accepted assumption that lower socioeconomic status (SES) has a detrimental effect on the wellbeing and development, for example cognitive and language development, of children and adolescents (Letourneau et al., 2013).

A range of indicators can be used as a proxy for socioeconomic status. Several variables related to education, occupation, income, or eligibility for means-tested welfare programs, with maternal education level being the most widely used, can be the base for measuring SES (Ensminger & Fothergill, 2003). Indicators of SES can either be used in isolation or combined to form a composite SES score. Data can be related to the individual her/himself, or to a geographical area as a whole. For a discussion on definition and measures of socioeconomic background, see for example Ensminger & Fothergill (2003) and Thomson (2018).

Socioeconomic factors may have an impact on how parents rear their children. But SES also influences processes occurring in social contexts, including families, schools, and neighbourhoods, which contributes to shaping individual development. SES may also mediate or moderate other key variables by interaction with other variables, for example individual characteristics (Ensminger & Fothergill, 2003). Hence, the relationship between SES and children's development is multifactorial on individual, familial, school, and community level in a complex interplay.

Regardless of which indicators are used to measure SES, a negative association between low SES and language development has been shown already from early ages (Law, Clegg, et al., 2019; Locke et al., 2002) to adolescence (Spencer et al., 2012). Children with lower SES backgrounds score on average 0.75 – 1 SD below average scores compared to the general population and up to 50% of the children from low SES backgrounds score 1 SD or more below average in the general population (Roy & Chiat, 2013). Since the performance on language tests in children from low SES backgrounds can be similar to the performance of children with (D)LD with mid-to-high SES backgrounds, it can be difficult to disentangle the effect of a disadvantaged background from a language disorder (Meir & Armon-Lotem, 2017).

Although a relationship between SES and other language skills has been shown (e.g., Law et al., 2011; Meir & Armon-Lotem, 2017), especially different aspects of vocabulary skills tend to be lower in children from low SES backgrounds (e.g., Horton-Ikard & Weismer, 2007; Meir & Armon-Lotem, 2017; Qi et al., 2006;

Spencer et al., 2012). Children living in poverty have considerably lower levels of vocabulary compared to peers from higher SES backgrounds (Lervåg et al., 2019).

To conclude, children from lower-SES backgrounds have weaker language skills, which are apparent already early on, and persist across the lifespan, which in turn is associated with poorer educational, mental health, employment, and quality of life-outcomes across the timespan (Reilly & McKean, 2023).

Bilingualism and language development

Throughout this dissertation, the term 'bilingual' is used to describe individuals using two or more languages in everyday life, in accordance with Grosjean (2008). Hence, this refers to a heterogenous group in terms of for example language proficiency and use, simultaneous/sequential language development, and majority/minority language status.

Children who are bilingual and from language minorities often reach lower levels of academic achievements compared to peers from the majority language group. This difference is often attributed to level of proficiency in the language of instruction, but also to for example SES background (Verhallen & Schoonen, 1998). The main difference seen in bilingual children is related to vocabulary acquisition with bilingual children often showing a smaller vocabulary, shallower word knowledge and less evolved word definitions (Verhallen & Schoonen, 1993; Verhallen & Schoonen, 1998; Vermeer, 2001). However, the use of conceptual scoring (i.e., calculating a total number of concepts in all languages used by the child when assessing vocabulary knowledge) might reduce the underestimation of vocabulary knowledge in bilingual populations (Holmström et al., 2016).

Interaction between SES, bilingualism, and language development

As with monolinguals, a relationship between SES and performance on language tasks has been shown in bilingual children and adults. However, in a bilingual population, there is a complex interplay between SES and other factors, such as amount of language exposure and minority/majority language status (Gathercole et al., 2016). For example, bilingual populations that have been studied in the USA usually belong to lower-SES backgrounds and use a minority status language with less language exposure compared to monolinguals, which are all factors associated with rate of language learning (Thordardottir, 2011). In Sweden, children with 'foreign background' (i.e., born abroad, or born in Sweden with both parents born abroad) often have lower SES background than children with 'Swedish background', and often live in areas with lower SES backgrounds and attend schools with lower levels of parental education (SCB, 2020). Consequently, the relationship between SES factors and language development in bilingual children is not always straight-forward (Gathercole et al., 2016). Therefore, it is important to be aware of

to what extent studies investigating for example the link between bilingualism and lexical knowledge takes the participants' heterogeneity in terms of exposure to languages, language dominance and preference, as well as socioeconomic background and type of education system into account (Schwartz & Katzir, 2012).

The effects of summer vacation on children's development

The effect of a lengthy summer vacation, often called 'summer (learning) loss' (SLL), 'summer (learning) slide', or 'summer setback', has been an area of interest in research since the early 20th century in the USA, with the earliest known study, investigating math computations, conducted by William White (1906) (Cooper et al., 1996).

SLL refers to a drop in the students' academic gains and/or a loss of acquired skills accomplished during the school year following the summer break from school, which is a part in the traditional school calendar (Menard & Wilson, 2014). This phenomenon has received an increased research interest in recent years (Travis et al., 2019). Three main areas of research are covered in the field of summer learning loss from 2010 and onward: reading and language, mathematics, and students from low-SES backgrounds (Gierczyk & Hornby, 2023). Summer learning loss has mostly been studied in K-12 schooling in the USA, but there is also some evidence of a summer learning loss at the college level (Dills et al., 2016). Most studies on the effects of summer vacation are conducted in the USA, and there is a lack of studies conducted in Europe (Gierczyk & Hornby, 2023).

A general decline in achievement scores following summer vacation was indicated by a review Cooper et al. (1996) of 39 studies conducted between 1906 and 1994. However, different skills are affected differently. The review by Cooper et al. (1996) showed that the detrimental effect of summer vacation is larger on mathematical skills than on language or reading skills based on a meta-analysis of the 13 most recent studies included. The summer loss was estimated to equal about one month of teaching, or one-tenth of a standard deviation relative to spring test scores. But losses ranging from one to two months in reading and one to three months of schoolyear learning in math have also been reported (Kuhfeld, 2019). A recent review of 15 studies on summer learning loss (Gierczyk & Hornby, 2023), published between 2012 and 2022 concluded that that the phenomenon is important and warrants further investigation, and there is still uncertainties regarding the effects of SLL, the factors playing a part, and which domains that are most vulnerable to the SLL phenomenon (Gierczyk & Hornby, 2023).

Swedish studies on SLL are scarce, and results mixed, (see Fälth et al., 2019; Grenner et al., 2022; Lindahl, 2007; Lindahl, 2001). There are few studies on the effect of summer vacation on different language abilities (usually vocabulary, e.g., word meaning), (see Hammer et al., 2008; Hayes & Grether, 1969; Lawrence, 2012; Mousley, 1973; Rojas & Iglesias, 2013; Wintre, 1986). Here too, results are mixed, and may be different depending on SES, mono/bilingualism, and individual starting

point and developmental trajectories. However, this may not generalize to today's educational contexts in Sweden.

Moderating effects

One of the possible moderating factors that has received most attention in research on SLL is SES. There is some evidence suggesting that socioeconomic gaps tend grow during the summer and to shrink during the school year (von Hippel & Hamrock, 2019), and that schooling has a compensatory effect on inequality related to language skills, although more research is needed to fully disentangle these patterns (Condron et al., 2021; Thompson et al., 2023). Students whose home-language is not the language of instruction may be more sensitive to SLL and return to school in the fall showing language setbacks (Kim, 2023; Lawrence, 2012). In Sweden, students from families speaking a minority language, living in areas with many different languages where Swedish is not the first language (L1) of the majority the inhabitants, may have limited opportunities to hear, speak, and read Swedish during the summer vacation (Fälth et al., 2019). In schools that mostly serves low-SES students, home-language status may be a stronger predictor of SLL compared to SES (Lawrence, 2012). Demir-Lira & Levine (2016) highlight the importance of considering the role of several factors, including biological and environmental, which interact at multiple levels in influencing developmental trajectories of typically and atypically developing children.

Some concerns have been raised regarding studies on SLL, where results may have been distorted by measurement artifacts (von Hippel & Hamrock, 2019). Another issue raised is that SLL effect may be obtained on one test only, and fails to replicate on other (Workman et al., 2023). Hence, results in individual studies on SLL must be interpreted with caution.

In conclusion, the phenomenon 'summer learning loss' is complex and not yet fully understood. Furthermore, there is not extensive research evidence to support any single intervention for addressing it (Gierczyk & Hornby, 2023).

Assessment of vocabulary

Since lexical knowledge is multifaceted, a person's vocabulary can be assessed in several different ways, investigating different aspects, (see for example Meara, 1996; Read, 2000). As evident from the preceding section, lexical knowledge is composed of multiple components for the learner to acquire and hence, assessment of lexical knowledge goes beyond matching a word with a synonym or picture (Schoonen & Verhallen, 2008). To capture some aspects of this complexity, the studies in this dissertation use two different vocabulary assessments; a Semantic Verbal Fluency task, and a Word Definition task, which will be briefly covered in the following section.

Semantic Verbal Fluency tasks

Verbal fluency (VF) tasks are frequently used in both clinical settings and research (Hurks et al., 2010) to assess the spontaneous word production within restricted search conditions (Villalobos et al., 2022). Two main VF tasks are currently recognized: Semantic Verbal Fluency (SVF; i.e., generating words belonging to a target semantic category), and Phonological Verbal Fluency (PVF; i.e., generating words beginning with a specified letter or phoneme) (Arán Filippetti et al., 2023). In SVF tasks, the participant is usually asked to name as many words as possible within a specified semantic category (such as Food, Animals, or Clothes), within a time constraint (often 60 s) (Troyer et al., 1998). Animals is the category most frequently used in research (Villalobos et al., 2022).

Since VF tasks are quick and easy to administer, and because the general scoring method (i.e., calculating the 'total score') is uncomplicated, it has become a popular assessment to use (Villalobos et al., 2022). The number of words produced within the semantic category used, minus rule violations and repetitions, gives the 'total score' (SVF TS), which is the most commonly used scoring of VF tasks (Troyer, 2000). Other analyses of SVF performance examine the strategic retrieval processes (i.e., clustering and switching) (Arán Filippetti et al., 2023) or analysing the correct scores as a function of time (i.e., examining the distribution of words within the time frame) (Hurks et al., 2010).

When generating words within pre-defined semantic categories, the participant is required to have access to their semantic knowledge and retrieval of their related vocabulary. Hence, one can gain insight in the participant's vocabulary structure and concept organization by interpretating the performance on SVF tasks (Jebahi et al., 2023). SVF tasks require searching the mental lexicon based on semantic characteristics (Ruffini et al., 2023). Word retrieval in SVF tasks requires retrieving associated words from the mental lexicon in an organized way (John & Rajashekhar, 2014). The task can therefore be used to assess the ability to strategically search and retrieve words from the lexicon and can provide important information about both the development of lexico-semantic networks and word retrieval strategies during childhood (Sauzéon et al., 2004). Performance on SVF tasks is also related to vocabulary size, with larger vocabulary size being associated with higher SVF task results (Bialystok et al., 2008).

A part being used to asses skills related to vocabulary, SVF tasks have a long clinical tradition as being used as a measure of Executive Functioning (EF) and is often included in EF test batteries (Kramer et al., 2014). SVF tasks are thus also frequently used in screening protocols to detect cognitive impairment in the context of for example brain injury or dementia (Villalobos et al., 2022). As VF tests require participants to find an appropriate strategy for guiding the search when generating words, they are used to assess executive aspects of verbal production, such as accessing elements in the lexicon, cognitive flexibility when switching between

response sets, as well as the ability to self-monitor and self-regulate (Villalobos et al., 2022).

Development of SVF ability and associated factors

During the childhood, vocabulary funds expand, speed of processing increases, and increase of efficiency in executive search occurs (Kavé & Knafo-Noam, 2015). A linear developmental trend in mean number of SVF TS, as well an increase in complexity of strategy use, has been shown during childhood and adolescence (John & Rajashekhar, 2014). A number of studies of different languages report an increase of SVF TS with increasing age, e.g., Australian-English (Chami et al., 2018), Brazilian-Portuguese (Becker et al., 2019; Hazin et al., 2016; Oliveira et al., 2016), Chinese (Chan & Poon, 1999), Dutch (Hurks et al., 2010; Resch et al., 2014; Van der Elst et al., 2011), Finnish (Klenberg et al., 2001), Hebrew (Kavé, 2006; Kavé & Knafo-Noam, 2015), Italian (Riva et al., 2000), Mayalam (John & Rajashekhar, 2014), Spanish (Álvarez Medina et al., 2023; Arán Filippetti et al., 2024; Matute et al., 2004; Olabarrieta-Landa et al., 2017), and Swedish (Tallberg et al., 2011).

A recent systematic review of cross-linguistic comparison of SVF ability in 15 different languages, including Swedish, using the semantic category Animals (Ardila, 2020) concluded that two major demographic factors, education and age, were significant factors accounting for a great part of the test score variance. Participants in the majority of the studies included in the review by Ardila (2020) were healthy adults, but some studies included children (age range in the different studies: 5 – 95 years). In some studies, education was the most influential factor, and in other studies the most influential factor was age. The effect of gender was inconsistent, but most studies found no significant differences between female and male participants. Furthermore, the effect of linguistic factors, such as type of language and word-length, was not evident (Ardila, 2020). Performance on SVF tasks is however affected by the semantic categories used, see for example, (Jebahi et al., 2023; Katzev et al., 2013; Koren et al., 2005; McGregor et al., 2018).

On average, bilingual participants produce fewer words during SVF tasks compared to monolingual participants (Gollan et al., 2002; Portocarrero et al., 2007; Rosselli et al., 2000; Sandoval et al., 2010). Bilingual participants speaking a marginalized language and/or a language with few native speakers, may obtain a very low score in the native language, even lower than in their second language (Ardila, 2020). Proposed explanations for the bilingual disadvantage in SVF tasks are interference between languages due to inhibition effects, slower retrieval due to more infrequent word use in each language, but without interference, and/or reduced vocabulary within the different languages (Sandoval et al., 2010).

There is a positive association between larger vocabulary size and higher performance on SVF tasks (Bialystok et al., 2008) and a link between language proficiency as bilingual participants on average produce more words in their dominant language compared to their non-dominant language (Blumenfeld et al., 2016).

The relationship between performance on different domains of cognitive ability assessed with intelligence tests (e.g., the five primary index scores in WISC-V: Verbal Comprehension Index, Visual–Spatial Index, Fluid Reasoning Index, Working Memory Index, and Processing Speed Index (Weiss et al., 2016)) and SVF results is unclear, as results in different studies are mixed, (see for example Ardila et al., 1998; Ardila et al., 2000; Pastor-Cerezuela et al., 2016; Resch et al., 2014).

An effect of level of parental education (LPE) on children's SVF TS performance has been shown in various studies (e.g., Álvarez Medina et al., 2023; Ardila et al., 2005; Hurks et al., 2010; Jacobsen et al., 2017; Klenberg et al., 2001; Olabarrieta-Landa et al., 2017; Resch et al., 2014; Van der Elst et al., 2011). Higher parental education level is associated with a better performance, and lower education level is associated with poorer performance.

Relationship between SVF ability and schooling

Lexical organization is essential for both effective vocabulary development and building academic knowledge during the school years (McKeown, 2019; Verhallen & Schoonen, 1993). The relationship is also reciprocal with lexical organization being positively influenced by school instruction (Ganuza & Hedman, 2017). The ability to retrieve associated words from different semantic categories, i.e., activities that in a way resemble SVF tasks, is required already in the early school years and throughout the later school years in the Swedish curriculum. For example, it is specified in the curriculum for grade 1 – 3 (Läroplan för grundskolan, förskoleklassen och fritidshemmet 2022 [Curriculum for the compulsory school, preschool class and school-age educare 2022], 2022) that taxonomy and items within categories and subcategories for animals and plants should be included in the instruction. The students should also be able to list, for example, different countries, tools, professions, religious symbols, and internal organs etc.

Word Definition tasks

Word Definition tasks (WD tasks) have been used for about a century in developmental research to explore children's concepts and vocabulary, largely because a straightforward approach to use, if you want to know what someone knows, is to ask them (Watson, 1995). Definitional skills have been investigated in the fields of speech-language pathology, education, and psycholinguistics (Gavriilidou et al., 2022).

In WD tasks, the participant is often asked a question like '*What does X mean?*' or '*What is X?'*, and the participant answers with something like '*X is Y*', where *X* is the word being defined ('definiendum'), and *Y* is the expression of meaning ('definiens') (Watson, 1995).

During a WD task, a series of inter-related activities take place, according to Artuso et al. (2022):

1. The underlying semantic representation (relevant word knowledge) of the word is activated
2. An assumption is made that the listener may not have the knowledge
3. Words that can be used to explain the word meaning are selected
4. The selected words are organized according to the language's grammatical/morpho-syntactic rules
5. Those grammatical rules are adapted in order to follow formal rules of a typical definition to achieve a 'semantic equivalence' between the word that is defined and the linguistic expression containing the most relevant information about the word (Artuso et al., 2022)

WD tasks can be considered metalinguistic in the sense that the participant is required to use language in order to explain language, i.e., combining formal and content components explicitly in linguistic expressions to communicate the semantic core of a word (Gini, 2004). It can also be viewed as a pragmatic task as the listener can be aided in processing the intention of the speaker by its use of a concise, clear, and complete expression (Gutierrez-Clellen & DeCurtis, 1999).

Since WD ability is a complex skill, requiring both linguistic and metalinguistic abilities, (Artuso et al., 2022), as well as pragmatic abilities (Gutierrez-Clellen & DeCurtis, 1999), it can be used to assess different lexical skills, grammatical skills, metalinguistic skills, and pragmatic skills, depending on for example choice of test items, and method of analysing responses.

Responses in WD tasks can be analysed in several ways, for example in terms of form, content, and/or communicative adequacy. WDs can for example be analysed based on the amount of information included (see Cox Eriksson, 2021; McGregor et al., 2012; McGregor et al., 2002; McGregor et al., 2013). Qualitative development of WD ability can be studied for example by examining quality of both semantic content and syntactic form, either by using a single coding system considering form and content in a joint score, (see Artuso et al., 2022; Belacchi & Benelli, 2017; Benelli et al., 2006) or coded separately as development of content and form is not always parallel (Gavriilidou et al., 2022), (see Dosi et al., 2021; Dourou, 2020; Dourou & Dosi, 2021; Dourou et al., 2020; Gavriilidou, 2015; Gavriilidou et al., 2022; Johnson & Anglin, 1995; Marinellie & Johnson, 2002, 2003, 2004; Marinellie & Yen-Ling, 2006).

The use of superordinates in definitions has been studied as they may describe developmental changes with age in definitional ability, and as they have been proposed to provide insights into organization and accessibility of category hierarchies within the mental lexicon (Skwarchuk & Anglin, 1997), (c.f., Benelli, 1988a, 1988b; Kurland & Snow, 1997; Snow, 1990; Watson, 1985, 1995).

A part from using WD tasks to assess different aspects of linguistic and metalinguistic skills in clinical settings and research, WD tasks also have a long tradition, dating back to early 20th century, of being used in tests batteries assessing

intelligence, as a subtest examining Verbal reasoning/intelligence (Gibbons & Warne, 2019; Markowitz & Franz, 1988; Nippold, 1995).

Development of WD ability and associated factors

Developmental studies of WD ability have shown that definitional skills improve gradually during childhood, adolescence, and adulthood, and that both quantitative and qualitative changes occur (Nippold, 1995). Development of different aspects of WD skills occurs gradually over time, with increases in the ability to integrate word knowledge with the linguistic formula for WDs, rather than by crossing dramatic developmental thresholds (Kurland & Snow, 1997).

Younger children often give contextualised WDs based on their own personal experience. Later on, children might describe perceptual or functional features of the word but leave out key defining attributes. A further development of WD skills can be seen in the use of abstract, generalised expressions including key defining attributes (Johnson & Anglin, 1995).

The use of a superordinate term to specify category membership, such as *vehicle* to describe the word *car* or the use of a dummy superordinate (usually (*some*)*thing*) is an important developmental characteristic of noun definitions. When a superordinate term is combined with distinguishing characteristics and used in a modifying clause it is called a formal, or Aristotelian, definition (i.e., *an X is a Y that Z* where *X* is the word being defined, *Y* is a superordinate term, and *Z* is a defining characteristic to separate *X* from other *Y*s.) (Marinellie & Johnson, 2004).

The Aristotelian definition, with the use of a superordinate term, seen in noun definitions could be due to the hierarchical organization of nouns in the internal lexicon, with sub- and superordinate connections to other nouns. Verbs and adjectives, on the other hand, are rarely defined by Aristotelian definitions, but are instead often defined using synonym verbs or adjectives (Nippold, 2006). This could be because verbs and adjectives are less structured and predictable in their lexical relations to other words (Marinellie & Johnson, 2003, 2004).

Different types of words are defined in different ways. Most research on word definition has focused on definitions of concrete nouns, rather than words from other parts of speech (Nippold, 2006). Since word definitions of, for example, verbs, adjectives, and abstract nouns have not been studied to the same extent as concrete nouns, less is known about those types of definitions (Gavriilidou, 2015).

Several factors have been shown to influence the formulations of definitions (Dourou & Dosi, 2021). Definitional skills are dependent on word characteristics, such as grammatical category (e.g., nouns, verbs, adjectives), word structure/morphological compositions (root, compound, inflected, derived), and/or semantic characteristics (Albert, 2016; Belacchi & Benelli, 2017; Entwisle, 1966; Gavriilidou, 2015; Gavriilidou et al., 2022; Johnson & Anglin, 1995; Marinellie & Johnson, 2003, 2004; Marinellie & Yen-Ling, 2006; Markowitz & Franz, 1988; McGregor et al., 2012), and word frequency (Entwisle, 1966; Marinellie & Johnson, 2003, 2004; Marinellie & Yen-Ling, 2006). WD performance can be also influenced

by what type of words are defined in terms of: level of abstraction (concrete versus abstract words) and motor-imagery (high imageable versus low imageable words) (Albert, 2016; Belacchi & Benelli, 2017; Cayol et al., 2020; El Euch, 2007; Gavriilidou, 2015; Markowitz & Franz, 1988; McGhee-Bidlack, 1991; McGregor et al., 2012; Reynolds & Paivio, 1968; Sadoski et al., 1997), and living versus non-living things (Hughes et al., 2005).

Definitional skills increase not only with age (Al-Issa, 1969; Albert, 2016; Belacchi & Benelli, 2017; Benelli et al., 1988; Benelli et al., 2006; Cox Eriksson, 2021; Dourou et al., 2020; Feifel & Lorge, 1950; Malekian et al., 2014; Marinellie & Yen-Ling, 2006; Maryam et al., 2020; Matloubi et al., 2018; Nippold, 1995; Nippold et al., 1999; Storck & Looft, 1973; To et al., 2013; Watson, 1985; Wehren et al., 1981; Wolman & Barker, 1965; Zarifian et al., 2015) but also as a function of educational level (Benelli et al., 2006; Dourou, 2020; Dourou et al., 2020; Kurland & Snow, 1997), and can be associated with reading proficiency (Nippold, 1999).

The role of gender in definitional ability has not been studied extensively, and results are mixed, but most studies report no statistically significant differences between female and male participants, (see Dourou et al., 2020; Feifel & Lorge, 1950; Gavriilidou, 2015; Matloubi et al., 2018; Wolman & Barker, 1965).

The relationship between performance on different domains of cognitive ability assessed with intelligence tests, and WD performance is still unclear, since results are mixed, (see Belacchi & Benelli, 2017; Belacchi et al., 2013; Wolman & Barker, 1965) Also, the relationship between WD and different EF skills remain unclear, (see Dosi, 2021; Dosi & Gavriilidou, 2020).

The few studies on WD performance related to SES factors indicates a relationship with lower SES being associated with poorer WD performance in both children (Dickinson & Snow, 1987) and adults (Kurland & Snow, 1997; Walker, 2001). However, it is unclear to what extent these older studies are representative for today's context.

Studies on WD ability has mainly focused on native speakers. Bilingual speakers' WD skills are less examined (Dourou & Dosi, 2021). Studies on WDs in bilingual participants have focused on, for example, WD performance in bilinguals compared to monolinguals (Charkova, 2001; Cox Eriksson, 2021; Dosi et al., 2023; Dourou, 2021; Dourou & Dosi, 2021; Vermeer, 2001), cross-language transfer of WD skills (Carlisle et al., 1999; Ordóñez et al., 2002), relationship between language proficiency and WD performance (Carlisle et al., 1999; Charkova, 2001; Ordóñez et al., 2002; Snow & et al., 1987), the relationship between school exposure/language of instruction and WD performance (Snow, 1990; Snow et al., 1991; Snow & et al., 1987), relationship between foreign language education at school (Charkova, 2001, 2003; Snow & et al., 1987) or schooling in a foreign language not spoken neither at home nor in the community (Kang, 2013; Lü et al., 2023).

Studies on WD skills in bilingual populations are heterogeneous in terms of participants' age, schooling, exposure to languages, minority/majority language

status, and SES, and results in individual studies may not generalize to other populations. However, some general tendencies can be seen in the literature: monolingual participants outperform bilingual participants on WD tasks (Cox Eriksson, 2021; Vermeer, 2001), but with increasing age, bilinguals might catch up with monolingual peers on some aspects of WD skills (Dourou, 2021; Dourou & Dosi, 2021). WD skills in bilingual populations seem related to school exposure, as WDs is an academic task common in the classroom, and may therefore be better in the participants' second language (L2) (if it is the language of instruction) compared to their first language (L1) (El Euch, 2007; Snow, 1990; Snow et al., 1991).

Relationship between WD ability and schooling

The opportunities to practice the use of formal definitions in classroom interaction influences children's WD skills (Gini, 2004; Gutierrez-Clellen & DeCurtis, 1999) and formal instruction reinforces and increases definitional skills (Artuso et al., 2022). Formal definitions are emphasized when teachers work on developing students' vocabularies in activities in schools (Gini, 2004). The gradual process of learning to combine content and form in a conventional way is influenced by formal instruction, and students first learn from appropriate models (for example in text books and their teachers' speech) (Benelli et al., 2006).

Studies by Snow (1990) and Snow et al. (1991) on bilingual second- through fifth-grade students with English as their second language (L2) and the language of instruction showed that school exposure to English was related to the ability to give formal definitions. The author concluded that the performance on definition tasks in an L2 is more strongly related to opportunities to practice this skill at school, compared to at home (Snow, 1990). While the native language used at home enhances the child's conversational skills, it does not seem to enhance language skills used in the classroom context, such as giving formal definitions (Snow et al., 1991). Hence, the development of decontextualized language skills is enhanced in the language used for instruction, more than in the non-instructional language (Malakoff, 1988). The study by El Euch (2007) of written WDs of concrete and abstract nouns in L1 (Arabic) and L2 (French), by secondary high school students in Tunis was in line with these findings. French (L2) was the language of instruction in some subjects that strongly calls for decontextualized language use, such as physics, chemistry, and biology. The participants' written formal WDs were better in their L2 than in their L1, which may be explained by the academic context were L2 was used, as writing formal definitions is an academic skill (El Euch, 2007).

Understanding and producing WDs play a role in several educational contexts and activities. Well-developed WD skills are beneficial with respect to academic success as the use of formal definitions are required in many academic tasks (Marinellie, 2010). The ability to understand and provide detailed, exact, and well-formed definitions is crucial in advancing students' academic knowledge (Lü et al., 2023). Word definitions can be used to explicate and clarify concepts and meanings (Artuso et al., 2022), and to prevent or repair misunderstandings in communication

(Marinellie & Johnson, 2004). Definitions are also often used in classroom vocabulary instruction as a source of information about new words, by consulting dictionaries, provided by the teacher, or elicited from the students (Scott & Nagy, 1997).

The meaning of key terms must be defined during lectures and debates at school to avoid misunderstandings and resolve conflicts. Definitions of certain terms, whose exact meanings may not be widely known, is also required in discussions or when writing reports, persuasive essays, informative articles (Nippold et al., 1999) or expository texts or essays (Marinellie, 2010). Definitions can also be used at school as a mean for the teachers to evaluate the students' word knowledge, for example students are often asked to provide WDs for words in the text when they are reading (Gutierrez-Clellen & DeCurtis, 1999), and the task to define terms also occurs in tests and quizzes (Marinellie, 2010).

Vocabulary instruction in schools

Although there is a consensus on the importance of vocabulary knowledge, decades of international studies show that there is a lack of attention to vocabulary instruction in schools and vocabulary instruction that is robust and systematic rarely takes place (Anderson & Gallagher, 2019; Gray & Yang, 2015; McKeown et al., 2018). Only a small amount of instruction time is devoted to vocabulary at any grade level (e.g., Connor et al., 2014; Nelson et al., 2015; Scott et al., 2003; Wright & Neuman, 2014). It is rarely in line with research and not sufficient in quality or intensity for students to achieve ownership of instructed words (e.g., Carlisle et al., 2013; Nagy & Townsend, 2012; Scott et al., 2003; Watts, 1995; Wright & Neuman, 2014). When vocabulary instruction does occur, it is usually only focused on brief definitions or synonyms by the teacher or calling on student to provide a definition or synonym of a target word (McKeown et al., 2018). In a study (Wright & Neuman, 2014) researchers found that vocabulary instruction by kindergarten teachers constituted of one-time, brief explanations of word meanings during 'teachable moments', and that word selection was unsystematic.

The lack of time and extent of vocabulary instruction is cause for concern, especially for students depending on schools in order to become proficient in the language of instruction (Scott et al., 2003). Furthermore, Wright & Neuman (2014) found that teachers serving schools in low SES areas explained words less often and were less likely to address sophisticated words, compared to teachers serving schools in higher SES areas, which could further contribute to, rather than to mitigate, vocabulary gaps related to SES. Methods of expanding the breadth and depth of the students' vocabularies should be identified, and components of effective vocabulary instruction must be defined, in order to address consistent achievement gaps (Black & Wright, 2024).

Research on vocabulary instruction in the Swedish context is mainly concentrated to instruction of English as a foreign language (EFL), but results here are in line with international studies of vocabulary instruction in general. In summary, Bergström (2023b) concluded that studies on vocabulary instruction and teaching material development (Bergström, 2023a; Bergström et al., 2021, 2022, 2023), shows that vocabulary is not thoroughly selected or planned, in neither instruction or development of teaching materials. Instead, vocabulary learning is primarily perceived as an incidental process. This may have serious implications for the language development of the students as it is likely that only a limited amount of vocabulary is learned. Given that neither EFL teachers, nor developers of teaching materials, likely organize the EFL classroom in ways that sufficiently support the students' learning, questions may be raised regarding the schools' provision of equivalent language education for all students and for their overall learning success (Bergström, 2023b).

During the last half decade there has been a sudden increase in research published on vocabulary development and instruction, which has revealed both persistent gaps, but also a progress toward exploration of more comprehensive vocabulary development programs within the educational setting (Black & Wright, 2024). Graves (2016) has outlined three crucial facts about vocabulary:

1. The vocabulary-learning task during the school years is enormous;
2. Even though there are far more words the students need to learn than can be taught, this is not a reason for not teaching any of them. Both teaching individual words and promoting students' ability to learn words independently is worthwhile, and;
3. Students from lower SES background and students with the language of instruction as their L2 often enter school with substantially smaller vocabularies compared to peers from higher SES background, and native speakers of the language of instruction. Vocabulary instruction must support both linguistically more advanced students, as well as to assist less linguistically advanced students to catch up with their peers, according to Graves (2016).

Educational theories in relation with vocabulary instruction

In a content analysis of articles published in literacy journals between 2007 and 2017, Moody et al. (2018) examined word-learning strategies described in the articles and identified on which educational theories they were built. They found that a combination of theories guided most strategy recommendations, i.e.: social constructivism and sociocultural theories, schema and psycholinguistic theories, motivation theory, and dual coding theory (Moody et al., 2018). Black & Wright (2024) further defined these theories in relationship to vocabulary instruction, as well as provided examples of theoretically grounded strategies for vocabulary instruction, in their scoping systematic literature review of articles published in

literacy journals between 2017 and 2021. Based on the theory characteristics outlined by Moody et al. (2018), the most common educational theories guiding vocabulary instruction in the included studies were schema or psycholinguistic theory (14 studies), followed by social constructivism and sociocultural theories (8 studies), dual coding theory (7 studies), and motivation theory (7 studies) (Black & Wright, 2024).

Schema and psycholinguistic theories

Vocabulary instruction rooted in schema/psychological theories emphasize the active role of students when constructing meaning. Schema theory refers to the conceptual and cognitive representation and structure of knowledge. Students bring their own experiences and background knowledge into the classroom, which is organized in students' minds in abstract forms called schemas, that emerge through social interactions (Moody et al., 2018). Schemas are cognitive patterns of knowledge and thoughts that can be seen as mental 'filing cabinets' where individuals keep stored information. When new learning occurs, it is easier to remember if there is already an existing (Moody et al., 2018) appropriate mental 'file' (Wright et al., 2016) which may assist the individual in encoding, processing, organizing, and retrieving information.

Social interactions activate previously stored schemas as well as facilitate the building of new ones, with vocabulary mediating this process. The activation of schemas provides a framework for explaining objects and events which results in comprehension. Psycholinguistic theory proposed that background knowledge interacts with processing strategies and conceptual abilities to produce comprehension (Moody et al., 2018).

Vocabulary instruction rooted in schema/psychological theories is for example when teachers ask questions to active background knowledge prior to an activity (Wright et al., 2016), and hence linking new learning to known concepts (Black & Wright, 2024), for example by connecting new words to synonyms and antonyms, creating concept maps, graphic organizers, and semantic maps, and using prior knowledge to construct word meanings of new words (Moody et al., 2018).

Social constructivism and sociocultural theories

Vocabulary instruction that is rooted in social constructivism/sociocultural theories implies that individuals have an active participation in the meaning-making process. Its Vygotskian perspectives, for example Zone of Proximal Development and scaffolding, are well-known aspects of sociocultural theory (Moody et al., 2018). In social constructivism, there is an emphasis that students' learning is achieved through social interaction with others, and that there is influence from the environment in which they learn. Comprehension is deepened when the student discusses content with teachers or peers. Sociocultural perspectives emphasize that knowledge is constructed through social interaction, especially when an individual interacts with someone more advanced who can help the student to gain

understanding of content at a higher level than can be achieved independently (Wright et al., 2016). A theoretical foundation for both social constructivism and sociocultural theory is that knowledge is constructed through interaction with others during social activities where learning is scaffolded by more advanced adults and/or peers, which enables learners to accelerate development of for example language (Moody et al., 2018).

Vocabulary instruction rooted in social constructivism/sociocultural theories is for example when students participate in collaborative discussions about new vocabulary and work cooperatively to construct definitions of words (Moody et al., 2018).

Dual Coding Theory

Vocabulary instruction rooted in dual coding theory (DCT) is based on the premise that two mental systems (or codes), verbal and nonverbal, processes environmental stimuli in the human mind. These two codes are independent but connected. The nonverbal code processes non-linguistic events and objects, while the verbal code is responsible for processing and representing language. Cognition occurs when representations from both verbal and nonverbal codes are connected, according to DCT (Moody et al., 2018).

Vocabulary instruction rooted in DTC is for example when a connection is made between our mental understanding of concepts and multiple sensory stimuli encountered in everyday life, such as when text about for example a scientific process like the photosynthesis is presented together with pictures or flow charts (Wright et al., 2016), or elicitation of mental images (for example 'What happened to a flower that did not get enough sunshine?') in order to concretize the abstract and produce a deeper understanding (Moody et al., 2018). Visuals are used by many teachers within vocabulary instruction, which is based on the premise of DCT. However, instruction must include a purposeful focus on contextual referents, in order for students to realize the connection between visuals and words and to understand and internalize new words (Moody et al., 2018).

Motivation theory

Vocabulary instruction rooted in motivation theory is based on the premise that motivation in students can increase through either intrinsic (e.g., curiosity, self-efficacy, and/or providing student autonomy) (Moody et al., 2018) or extrinsic means (e.g., using competition or a desired reward to achieve learning goals) (Black & Wright, 2024). Motivation theory gives a framework for describing why students chooses to or not to engage in activities, based on a comprehensive set of the student's beliefs, attitudes and goals for taking part. This can be used to explain why a student may avoid tasks (Wright et al., 2016), and teachers can customize the instruction to match the needs and interests of all students (Moody et al., 2018). Consistent modelling and application of self-regulation strategies can be used by teachers to enhance the student's self-efficacy and motivate them. Vocabulary

instruction rooted in motivation theory is for example developing word consciousness, in order to enhance interest of the students, using games or incorporation of technology for word-learning activities (Moody et al., 2018).

Research on effective vocabulary instruction

To ensure comprehension, simply knowing individual word meanings is not sufficient. Instead, rich interconnected knowledge of the concepts represented by the words drives understanding (Wright & Neuman, 2014). To support academic learning and high-quality literacy a broad range of information about each word is needed. Three key characteristics have been outlined in previous work by many researchers on theoretical perspectives on word knowledge, according to McKeown (2019):

1. Word knowledge consists of several aspects, including word meaning, how the word is used in different situations and syntactic constructions, and the relationship with other words;
2. Word meanings can differ in different contexts, e.g., the same word can be used in both a concrete and a metaphorical way; and
3. Learning a new word occurs gradually when encountering it in multiple contexts.

Since what it constitutes to know a word is a complicated and multifaceted matter, this has implications for how words are taught (Beck et al., 2013). Direct teaching of all necessary vocabulary a student encounters at school is impossible (Black & Wright, 2024). Instead, what kind, and how much, instruction is needed depends on what kind of learning is desired. When the goal is for the student to be able to use words covered in vocabulary instruction for both comprehension of text and to use them in their own writing, robust/rich vocabulary instruction is needed (Beck et al., 2013).

Based on the results of 40 years of research Graves (2016) has proposed a comprehensive plan for vocabulary instruction consisting of four components: 1. Frequent, varied, and extensive language experience; 2. Teaching individual words; 3. Teaching word-learning strategies; and 4. Fostering word consciousness. The aim is to support the vocabulary development of all students, no matter if they enter school with small vocabularies, adequate but not exceptional vocabularies, or already have rich vocabularies (Graves, 2016). For concrete examples of activities for deep, rich, and extended vocabulary instruction, and with words to target, see for example Beck et al. (2013) and Graves (2016).

Reasons mentioned for barriers to implement effective vocabulary instruction are, for example, teachers feeling unsure of how to best support the vocabulary development of their students, which words to teach, what instructional strategies to use, and also a challenge to make time for vocabulary instruction during the

school day (Anderson, 2024; Anderson & Gallagher, 2019). Supplying teachers with proper education on how to promote students' oral language in mainstream education classrooms is one way to address the diverse and vast oral language needs of elementary students (Spencer et al., 2024). Teachers may be empowered by achieving an understanding of what constitutes effective vocabulary instruction and why certain strategies effectively promote vocabulary development. This may allow them to evaluate and modify recommendations in order to fit the needs of their diverse students (Wright et al., 2016).

Teacher Professional Development activities

As early childhood educators and elementary school teachers build strong relationships with children during their regular contact, have in-depth knowledge of their students, and a possibility to integrate language enrichment interventions within educational objectives, they are key agents for supporting oral language development (Quigley et al., 2022). It is a worldwide priority to improve teaching practice, and in order to achieve high-quality and inclusive education system it is crucial to engage in professional development (Petersson-Bloom et al., 2023).

Definitions and terminology

Over the past four decades several terms have been used to refer to the professional learning and development activities in schools, and terms used also vary from country to country (Jones et al., 2023). Some terms that have been used over the years are In-service training (INSET), In-service education, Staff development, Continuing, or Continuous, Professional Development (CPD) or shortened to Professional Development (PD), and Professional Learning (PL). This also reflects changing perspectives and changing policies over the past four decades (Jones & O'Brien, 2024; O'Brien & Jones, 2014).

The term Professional Development (PD) has been used in the USA for quite a while and is strongly associated with both school-focused, and school-based formal study programs undertaken by teachers. The term Continuing Professional Development (CPD) was introduced to recognise that new knowledge and skills requires sustained engagement (Jones et al., 2023). TALIS (2009) uses a broad definition of teacher PD: "Professional development is defined as activities that develop an individual's skills, knowledge, expertise and other characteristics as a teacher". For an overview of the spectrum of different PD activities, such as training, coaching/mentoring, and action research, see Kennedy (2005, 2014).

Although, the term Professional Learning (PL), or extended to Professional Learning and Development (PLD) or Professional Development and Learning (PDL), has been proposed as the preferred term to refer to training, development and both informal and formal learning (Jones et al., 2023; O'Brien & Jones, 2014),

the terms CPD and PD are used throughout this dissertation, as those are the ones most commonly used in the referenced literature. For a further discussion on the topic of terms for PD/PL and their definitions, see for example Agrati (2021), Baumfield et al. (2023), and Evans (2019).

Research on key features for effective teacher PD

The effect of teacher PD has received a lot of research interest over the past decades. Prior to year 2000, formal studies of PD were still relatively rare, but several reviews have covered earlier research on PD for teachers (Kennedy, 2016), (see for example Borko, 2004; Kennedy, 1998; Lampert, 1988; Loucks-Horsley & Matsumoto, 1999; Mitchell & Cubey, 2003; Opfer & Pedder, 2011; Scher & O'Reilly, 2009; Timperley et al., 2007; Wei et al., 2010; Wideen et al., 1998; Yoon et al., 2007). The past two decades, research on PD is extensive. Some more recent reviews covering PD for educators from different angels are Basma & Savage, (2018), Baumfield et al. (2023), Darling-Hammond et al. (2017), Egert et al. (2018), Filges et al. (2019), Fullard (2023), Kalinowski et al. (2019), Kennedy (2016), Kraft et al. (2018), Markussen-Brown et al. (2017), Postholm, (2018), Sims et al. (2022), Sims et al. (2021), and Vangrieken et al. (2017). Two 'tertiary' reviews, or 'umbrella reviews' (i.e., reviews of reviews) in the field of teacher PDs are Cordingley et al., (2015) and Dunst et al. (2015). Furthermore, teacher PD in a European context have been described in Jones & O'Brien (2016) and Jones et al. (2023).

The goal of several reviews of PDs has been to define a list of 'key features', 'critical program design features', or 'key characteristics', such as content, program duration, number of contact hours, or types of learning activities, of effective PD. This, in turn, has led the field to embrace a number of key features of PD programs presumably defining high-quality PD (Kennedy, 2016), (see for example Blank et al., 2009; Dunst et al., 2015; Kennedy, 1998; Scher & O'Reilly, 2009; Timperley et al., 2007). Dunst (2015) has proposed six sets of 'key features' for PD for early childhood educators' to be effective:

1. Explicit explanation of the PD content's knowledge and practice
2. Active and authentic opportunities to practice and evaluate experiences
3. Inclusion of different types of components for the participants to reflect upon their knowledge and skills (for example group discussions, collective participation, opportunities to practice, tools for reflection and evaluation, self-assessments, and reflective conversations)
4. Coaching, mentoring, or feedback by the PD provider
5. Extended follow-up support, by for example PD providers or peers, to reinforce PD learning
6. PD of sufficient duration and intensity providing multiple opportunities to practice mastering the use of a teaching practice

PD activities including all or most of the six sets of key features are more likely to be effective than PD including fewer features according to Dunst (2015).

Hypothesized causal pathways of effective teacher PD

Several authors (e.g., Desimone, 2009; Dunst et al., 2015; Gersten et al., 2010; Kennedy, 2016) have proposed models for the steps in teacher PD, where the underlying hypothesized causal pathways are:

1. Teachers take part in high quality PD activities (for example in accordance with 'key features' identified by earlier systematic reviews);
2. As a result, teachers' increase for example their knowledge, skills, attitudes, beliefs, confidence and/or commitment;
3. Which leads to change in observed teaching practices and behaviour; and
4. In turn, student development, learning, performance, and/or motivation is increased

Furthermore, in Desimone's frequently cited 'proposed core conceptual framework' (Desimone, 2009), for evaluating the effect of PD on teacher and student outcomes the author has concluded that all steps in this process is iterative and interactive. In addition, this framework highlights that teacher PD takes place within a context. Teacher characteristics, student characteristics, and school characteristics play a part and may for example pose barriers to implementation. In addition, Kennedy (2016), has argued that 'key features' alone are not reliable predictors of PD success. Other aspects must be taken into account, for example, the participating teachers' motivation, selection and preparation of the PD providers, and the time-consuming and gradual way in which teachers incorporate new ideas into their ongoing teacher practise. This means that there are several possible 'points of slippage' in the process that might diminish the effect of the teacher PD (Kennedy, 2016).

As Markussen-Brown et al. (2017), among others, have pointed out, this hypothesized causal pathways of effective teacher PD (i.e., PD results in changed teaching knowledge and in turn practices, which results in improved student outcomes) at large still remain untested, as many PD studies lack reported student outcomes. Studies including both teacher and student outcomes rarely investigate whether student outcomes are in fact mediated by teacher outcomes.

For other proposed frameworks for linking teacher PD with teacher and student outcomes, see for example Cohen & Hill (2000), Hanssen (2006), Lipowsky & Rzejak (2015), Scher & O'Reilly (2009), Weiss & Miller (2006), and Yoon et al. (2007). For proposed frameworks for evaluating the effect of teacher PD, in addition to Desimone (2009), see for example the commonly used 'Kirkpatrick's four levels of training evaluation' (Kirkpatrick, 1959; Kirkpatrick & Kirkpatrick, 2016) and its use in evaluation of the effects of teacher PD (e.g., Lipowsky & Rzejak, 2015; Wade, 1984). For proposed conceptual frameworks for teacher learning see for example Borko (2004), Clarke & Hollingsworth (2002), Fullan (1982, 2015), Guskey (2000), Guskey (2002), Li & Sang (2023), Peressini et al. (2004), and Wilson & Berne (1999).

Language focused CPD programs

There are few studies evaluating the effects of PDs for schoolteachers or other education staff aiming to support the development of oral language skills and/or literacy skills (Ebbels et al., 2019). Studies evaluating the effect on teacher practise and student outcomes following CPD programs targeting vocabulary development are scarce (Jayanthi et al., 2015). The studies on the effects of language focused PD for schoolteachers have shown mixed results, see for example systematic reviews and meta-analyses of language-focused PD by Filges et al. (2019), Kalinowski et al. (2019), and Markussen-Brown et al. (2017).

The evaluation of The *Oral Language Supports Early Literacy* (OLSEL) in a cluster randomized trial (n = 1254 students; 602 intervention, 652 control) showed improved student outcomes across several oral language and reading measures compared to a control condition. The program consisted of six days teacher and principal PD aiming at enhancing student's expressive and receptive oral language skills and early literacy success in the early school years (Grade 1 and 2) (Snow et al., 2014).

The evaluation of The *Classroom Promotion of Oral Language* (CPOL) in a randomized controlled trial (n = 78 teachers; 40 intervention, 38 control,; n = 1,360 students; 687 intervention, 673 control) (Goldfeld et al., 2017), showed that teacher knowledge was improved by the PD (Goldfeld et al., 2021). However, they found no intervention effect on neither teacher practice in terms of teachers' use of language in the classroom (Eadie et al., 2022), nor in advancing student outcomes (oral language, literacy, mental health at the end of Grade 1, numeracy, reading, and writing skills at Grade 3) (Goldfeld et al., 2022). In addition, a study based on three case studies, describing observed and self-perceived changes in knowledge, practice and beliefs following taking part in the CPOL PD, found that despite their participation in the same PD, there were differences in teacher outcomes. Differences in teacher outcomes might be related to for example motivation or contextual barriers restricting personal growth (Stark et al., 2020). The program consisted of a four days PD for early years' teachers, and ongoing school implementation support.

The evaluation of *Teacher Study Group Professional Development program* (TSG PD program) in a multisite cluster-randomized controlled trial (n = 19 schools, n = 81 first grade teachers; 39 intervention, 42 control; n = 468 students; 217 intervention, 251 control) found improved teacher knowledge of vocabulary instruction, but not reading comprehension. Furthermore, the study found improved classroom observation on teacher practise for both vocabulary and comprehension instruction. Analysis of student outcomes showed no statistically significant intervention effect on Passage Comprehension or Reading Vocabulary. For the subtest Oral Vocabulary there was intervention effect with a moderately large effect size. However, this was only marginally statistically significant (Gersten et al., 2010). The program consisted of 16 75 minutes sessions taking place twice a month,

with 8 sessions focusing on vocabulary instruction and 8 sessions focusing on reading comprehension strategies.

Given the promising findings, the TSG PD program was later replicated at large scale by Jayanthi et al. (2018) in a multisite cluster-randomized controlled trial (n = 61 schools, n = 182 first grade teachers; 94 intervention, 88 control; n = 1680 students; 863 intervention, 817 control) to examine whether the findings would be replicated in a more statistically powerful design (i.e., with a larger sample). The replication study evaluated the effect of the TSG PD program on observed teaching vocabulary instruction, teacher knowledge in vocabulary, and student vocabulary outcome measure. Like the first study, the replication study resulted in statistically significant changes in both teachers' knowledge of evidence-based vocabulary instruction, and their observed teaching practices, following 10 75 minutes sessions focusing on vocabulary instruction. The PD was delivered by school literacy personnel, who had received a two-full-day training by the research staff. However, the replication study did not find an intervention effect for the students, in any of the standardized measures of vocabulary knowledge used as student outcomes measures (Jayanthi et al., 2018).

The studies by Heppt et al. (2022), Krulatz et al. (2022), and Schoeman et al. (2022) evaluating the effect of different teacher PD's aiming at promoting teachers' language-supporting skills in elementary school instruction all found some effect of PD on teacher outcomes, but did not include student outcomes.

The randomized controlled trial by Starling et al. (2012) (n = 13 teachers; 7 intervention, 6 control; 43 year 8 students with (D)LD; 21 intervention, 22 control) evaluated the effect of a SLP-led teacher PD aiming at training mainstream secondary school teachers to make modifications to their oral and written instructional language in the classroom. The effect pf the PD was evaluated on teaching practices and on oral and written language abilities of the students with (D)LD. They found a statistically significant intervention effect on the trained teachers' teaching practices, with large effect sizes, with the increased use of techniques maintained over time. For the participating students they found a statistically significant intervention effect on written expression and listening comprehension, with medium to large effect sizes, but not on oral expression or reading comprehension (Starling et al., 2012).

The present research project built upon an earlier research project, conducted at the department, implementing a SLP-led teacher CPD program aiming at improving teachers' strategies for supporting language development and interactions in the classroom, focusing on the participating teachers' verbal and body communication (voice, gesture, and gaze). Participants were twenty-five teachers, teaching grade 3 – 6. Following the 5-week CPD program, the participating teachers increased their knowledge, adapted new practices in their classroom communication, and reflected on prerequisites for effective communication in the classroom setting, according to qualitative analyses of teacher statements (Karjalainen et al., 2022). Furthermore, according to teachers' self-reports, the participants improved their self-reported

vocal health, decreased their self-perceived stress, and degree of burnout. They also increased their sense of self-efficacy of classroom management as a result of taking part in the CPD program (Karjalainen et al., 2019). The CPD program did not include student outcomes.

To conclude, there is more evidence of the effect of language-focused PD on teacher knowledge and practice, than on the translation into effect on student outcomes as a result of teachers taking part in PD. Although, some studies offer support for the underlying assumption that PD can change teachers' practices which in turn can change student outcomes.

Despite decades of extensive research on PD, many areas remain unclear. Currently, education research have strong ideas of student learning, but lacks well-developed theories about teacher learning, or how to enable teachers to incorporate new practices in their instruction (Kennedy, 2016). There is also currently a lack of evidence for how outside resource persons, such as researchers, can collaborate with educators to contribute to school development (Postholm, 2018), or, more specifically, if there are any additional benefits of SLP-led CPDs for educational staff aiming at high-quality teaching and interactions for all children (Ebbels et al., 2019). To explore the potential of CPDs to increase teachers' skills and, in turn, enhance students' learning possibilities, more research is needed (Petersson-Bloom et al., 2023).

The Swedish schooling system and student composition

Sweden currently has 10 years of compulsive school, starting with one year of compulsory preparatory school ('grade 0') the fall semester the year they turn six years old (SFS 2010:800 Skollag [The Education Act], 2010). The school years start in August and ends in June (SFS 2011:185 Skolförordning [Compulsory School Ordinance] 2011). The school year consists of a fall semester and a spring semester. Between two successive school year there is a 9 – 10-week summer vacation from June to mid-August. There is an ongoing societal debate in Sweden regarding the length of the summer vacation, the amount of instruction time, and mandatory vacation school. There have been numerous proposals to shorten the summer vacation, both locally and nationally, but all have so far been rejected.

Education is considered a basic right in Sweden and the guiding principle is that equal access to education should be provided for all children (Berhanu, 2019). The aims of the educational system are based on a concept of 'education for all', with equity, equal opportunities, and inclusion as the goal of schooling. There is a general view that the education system should be fair and provide access and opportunities regardless of living area, socioeconomic background, ethnic background, age, gender, or presence of disabilities (Frønes et al., 2020).

Sweden is nowadays a multilingual country where about 140 languages are used by children in Swedish schools. Culturally and linguistically diverse (CALD) classrooms with a large diversity in terms of amount of school experience, gaps in subject knowledge, and Swedish language proficiency place new demands on the teachers (Obondo et al., 2016). The proportion of students with 'foreign background' (i.e., students who are born abroad, or born in Sweden with both parents born abroad) within Swedish schools is increasing (SCB, 2020). Students categorized as 'newly arrived' (i.e., students who are born abroad, with both parents born abroad, and have immigrated to Sweden during the past four years) are unevenly distributed in municipalities and schools. In the 10% of the Swedish schools that have the largest amount of newly arrived students, the proportion of students with foreign background is about twice as high as the national average, comprising on average half of the student composition. In these schools the level of parental education is also lower than the national average (Skolverket [The Swedish National Agency for Education], 2018).

Students with 'foreign background' on average have poorer academic attainment in compulsory school, compared to students with 'Swedish background'. The gap between students born in Sweden compared to students born abroad, is larger in Sweden, than in other comparable countries. This might lead to inequities in further education and participation in the labour market in the long term (Grönqvist & Niknami, 2017). A considerable proportion of the gap in academic attainment can be attributed to the student's individual SES background and the SES in the living area. When comparing students with foreign background to students with Swedish background attending the same school, the gap is somewhat decreased. When controlling for both SES and living area, the gap between academic results for students with foreign background and students with Swedish background is almost completely erased (Grönqvist & Niknami, 2017).

Regardless of any special education needs, the education in Sweden should be inclusive for all children (Berhanu, 2019). Sweden has a smaller proportion of students in segregated special needs classes (1.5%) or segregated special needs schools (0.06%) compared to all other European countries except for Italy. Sweden has a tradition of considerable placement in mainstream schools for students with Special Education Needs (SEN) (European Union, 2012). The use of Individual Educational Plans emphasizes that teachers should adapt and personalise the mainstream curriculum by setting out long term and short term learning targets for students with SEN (European Union, 2012). The role of special educators further emphasizes inclusion since it often mainly consist of consultancy work with teachers or other educational staff in order to develop inclusive educational practices, instead of exclusively teaching students in difficult learning situations (Mattson & Hansen, 2009). School-based SLPs in Sweden also often have consultancy work or training of educational staff as a frequently occurring work task (Sandgren et al., 2023). Providing CPD and building up teachers' confidence in

working with a diverse student base, can make teachers be broadly in favour of inclusion (European Union, 2012).

Summary of the introduction

During the school years, several different aspects of vocabulary knowledge are developed. Having well-developed vocabulary skills is important for school success. Several factors, such as SES, bilingualism, and formal schooling have previously been associated with vocabulary development. Teachers play an important role for developing the vocabulary skills of all students, regardless of background and educational needs. Swedish classrooms are often culturally and linguistically diverse. There is often a large distribution in terms of Swedish language proficiency, amount of school experience, gaps in subject knowledge, and special education needs, which place new demands on teachers. One way to further develop the teachers' ability to support the vocabulary development of all students can be by offering professional development activities, such as a language focused CPD program.

AIMS

The four papers included in this dissertation have two overarching aims: 1. Investigating factors associated with vocabulary development in the early school years, and 2. Evaluating the effect of a teacher CPD program on both the participating teachers, and on the vocabulary development of their students.

Specific aims for each paper

Paper I

To investigate the development of SVF ability during summer vacation versus during formal schooling in students in the early school years. To examine whether the development during summer vacation and formal schooling could be predicted by general language ability, non-verbal ability, bilingualism, and/or level of parental education.

Paper II

To investigate performance of monolingual group compared to bilingual group on a WD task. To investigate if variance in WD performance could be explained by bilingualism, level of parental education, school characteristics, general language ability, and/or non-verbal ability. To evaluate the WD task.

Paper III

To evaluate self-perceived change in teachers' classroom communication skills following a CPD program. To describe the development and implementation of the CPD, and to present examples of challenges and solutions.

Paper IV

To evaluate the effect of a CPD program for teachers on their student's SVF and WD skills. To evaluate if student predisposition in terms of bilingualism, grade, or school characteristics modulates any intervention effect.

MATERIAL AND METHODS

Participants

Participants in the different studies were all recruited to take part in a comprehensive study evaluating the effect of a language and communication focused CPD program on both participating teachers and their students. Headmasters of schools that had recently taken part in other research projects headed by researchers in the current study were reached out to. A total of six public schools (school 1 – 6) from two municipalities (municipality A and B) in southern Sweden agreed to participate in the study. All teachers teaching grade 1 and 2 at the time of the study were then invited to participate in the CPD program, and all students in the classes of the participating teachers were invited to participate in the study. Informed consent was required for both teachers and for the legal guardians of the students to participate, in accordance with ethical guidelines, see the section on Ethical approval. During the school year 2017 – 2018 data from municipality A were collected, and during the school year 2018 – 2019 data from municipality B were collected.

Ethical approval and recruitment of participants

Research within this dissertation was carried out in accordance with to the Helsinki declaration of ethical principles for medical research involving human subjects (World Medical Association, 2013). In accordance with Swedish law on ethical review of research involving human individuals (2003:460), an ethical permit was required to conduct the research. The project was approved by the Regional Ethical Review Board in Lund (approval number 2016/567). (Errata: Paper I, II, and III have the minutes number (2016/8), instead of the approval number (2016/567)).

In accordance with ethical guidelines, informed consent was required to participate in the study. The participating teachers received oral and written information about the study by the research team. The teachers that agreed to participate in the study filled out a written questionnaire with background information, see Teacher background questionnaire.

For the participating students, written and oral information about the study was distributed by the participating schools to the legal guardians of all the students in the participating classes. An informed consent form was distributed together with a written questionnaire (henceforth referred to as the ‘parental questionnaire’) for the legal guardians to fill out. The package also included written child-directed information about the study and a consent form directed to the child. Legal

guardians were informed that they could contact the researchers for more information or if they had any questions. Informed consent form and parental questionnaire were returned to the teachers in a sealed envelope to avoid revealing to the teachers the decision to participate or not to participate in the study. The sealed envelopes were then further distributed to the research team by the teachers. Both participating teachers and students were informed that participation was voluntarily and that consent to participate could be withdrawn at any moment without consequences.

All data in the research project was pseudonymized, i.e. encrypted codes was used for all participants to pseudonymize data. The link between the code and the corresponding individual could only be reveal with an encrypted code key stored separately.

Description of participating schools

Three schools were recruited from each municipality (A and B). The schools from municipality A had a different student composition in terms of the proportion of students with 'foreign background' (i.e., either the student or both parents are born in a country other than Sweden) and parents with tertiary education compared to the schools from municipality B. Both municipality A and B also differed compared to the national average (Swedish National Agency for Education [Internet], 2019), see Table 1.

Table 1. Demographic information for the participating schools

School	Municipality	Proportion of students with foreign background (%)	Proportion of parents with tertiary education (%)
1	A	91[a]	19[a]
2	A	95[a]	40[a]
3	A	78[a]	26[a]
4	B	11[b]	85[b]
5	B	9[b]	82[b]
6	B	*	97[b]
National average		25[a]	58[a]

*Data unavailable [a]School year 2017 – 2018 [b]School year 2018 – 2019

Participant questionnaires on background information

Teacher background questionnaire

In the teacher background questionnaire, the teachers filled out background information on their teaching education and practice (graduation year, type and level of pedagogical degree, and number of years as a practicing teacher). For a description of the participating teachers, see the section below, and Paper III.

Parental questionnaire for participating students

In the parental questionnaire the legal guardians filled out background information about the student's language exposure and use, level of parental education (LPE), and any former or current SLP and/or special education services for the student. For a description of the participating students, see the section below, and Paper I, II, and IV.

Description of participating teachers

A total of 25 licenced teachers participated in the CPD. Informed consent was originally retrieved from 28 teachers but prior to the initiation of the CPD program three participants dropped out due to either change of employment or sick leave. One of these teachers dropped out at the beginning of the CPD. The students in this class had already completed the pre-assessment, and later completed the following two assessment points as well. This group of students is referred to as the 'no intervention group'.

Intervention groups of 3 – 7 teachers were formed by the researchers and headmasters. The teachers that completed the whole CPD program (n = 25) were allocated to either a direct intervention condition (n = 12) or delayed start intervention control condition (n = 13). Allocation was based on teams of teachers, instead of individual teachers, upon request by the participating schools, and to facilitate their everyday work.

All participating teachers held different formal pedagogical degrees (preschool teacher n = 1, primary school teacher n = 14, preschool + teacher education n = 8, recreation centre teacher n = 2). Number of years in occupation ranged from 1 – 24. The number of participating teachers from the six participating schools ranged from 2 – 11. At the time of the CPD the participating teachers were either teaching grade one (n = 16) or two (n = 9) in mainstream public schools, with Swedish as the primary curricular language. For detailed demographic data for the 25 participating teachers in the two intervention conditions, see Paper III.

Description of participating students

All students (n = 399) in the classes (n = 18) taught by the participating teachers were invited to take part in the study, and none were excluded based on special educational needs. Hence, the students mirror the heterogeneity typically seen in Swedish mainstream classrooms. However, legal guardians of two students gave their consent to participate but the students were not included in the study due to being newly arrived in Sweden and were judged to have insufficient Swedish language skills to understand instructions and participate in the tasks.

A total of 224 students (120 girls and 104 boys) gave their informed consent and participated in at least one data collection point. Reasons for missing student data

was mainly due to relocation of the family, before the start of the CPD (n = 13 students), a few cases of students relocating later on, declining to take part, or having difficulties in taking part in the assessments. A few missing data cases are due to uncertainties in the assessment situations or were removed for statistical reasons (being influential outlier).

A total of 106 (47.3%) of the participants were bilingual, i.e. using two or more languages in everyday life, in accordance with the definition by Grosjean (2008). According to the information from the legal guardians collected in the parental questionnaire, the participants used 24 different languages apart from Swedish. Furthermore, the bilingual group is heterogeneous in terms of amount of exposure to the languages used and at what age the child was first exposed to the languages used. Both simultaneous and sequential bilinguals were included. Information on relative use of languages was acquired for 79 of the 106 bilingual participants in the parental questionnaire. According to the parental questionnaire, 31 participants (29.2%) reported that they predominantly used a language other than Swedish (>60% of the time), 27 (25.5%) used the languages roughly equivalent amounts of time (40 – 60% of the time), and 21 (19.8%) reported that they predominantly used Swedish (>60% of the time on a daily basis). A total of 88 participants (83%) used one language other than Swedish, and 18 (17%) used two languages other than Swedish.

To assess the level of parental education (LPE) for the participants, a 3-point rating scale was used in the parental questionnaire, where 1 = mandatory schooling (equals 9 years of schooling in Sweden), 2 = high school (equals 12 years of schooling in Sweden) and 3 = university level. The highest level of parental education was chosen as the LPE for each participant in accordance with Hurks et al. (2010). There was a statistically significant difference in LPE between the monolingual and the bilingual group, with the parents of the monolingual participants on average having higher LPE. For detailed demographic data for the participating students included in the different studies, see Paper I, II and IV.

Study design

When conducting research in schools, methodological considerations must be adapted to fit the participating schools, and their needs. The school calendar sets up time boundaries which must be taken into account in the study design. However, by conducting research, and collecting the data, in the "natural environment" of the participants, a higher degree of ecological validity can be achieved.

The data collection took part during two consecutive school years: 2017 – 2018 and 2018 – 2019. The participating schools from municipality A took part in the project during the school year 2017 – 2018, and the schools from municipality B took part in the project during the school year 2017 – 2018.

The participating teachers and students were assessed at three data collection points: T1, T2, and T3. T1 took place at the beginning of the fall semester (late August to early September), T2 took place at the end of the fall semester (late November to mid-December), and T3 took place during the spring semester (March for the direct and the no intervention track, and late April to mid-May for the delayed intervention track). For an overview of the study design, see Figure 1.

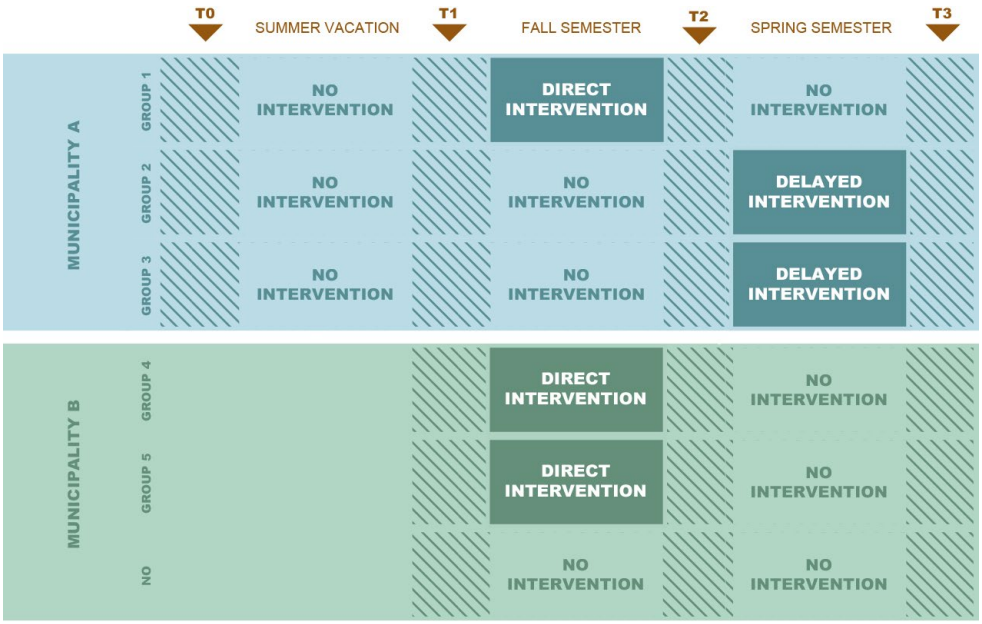

Figure 1. Overview of the study design

The original study design consisted of two baseline assessments for the participating students, to enable within-participant control, to control for developmental changes taking place regardless of any intervention. This data collection point is referred to as T0, and only participants in municipality A took part in this assessment. However, T0 took place before summer vacation, and T1 took place after the summer vacation. Since data analyses showed that summer vacation in itself can be regarded as a time period possibly affecting the children's development, T0 assessment could not be used to control for developmental changes. Therefore, T0 assessments were not collected for the participants in municipality B, who were recruited to the project later on. In Paper I, investigating the effect of summer vacation and formal schooling on SVF ability, this data collection point is used (and then referred to as T1, instead of T0)

The direct intervention condition received intervention between T1 and T2 (the fall semester). Hence, for the participants (both teachers and students) allocated to the direct intervention track T1 corresponds to before taking part in the CPD

program (baseline assessment). T2 corresponds to after the last session of the CPD program (post-intervention assessment). T3 corresponds to a three month follow up data collection point.

The delayed start control condition received intervention between T2 and T3 (the spring semester). Hence, for the participants in the delayed intervention track both T1 and T2 corresponds to baseline assessments. During this period of time, they had business-as-usual classroom practices. T3 for the delayed intervention track corresponds to after the last session of the CPD program (post-intervention assessment). The delayed intervention track does not have a three month follow up data collection point. This is due to the fact that it would have had to be carried out during the summer vacation, which was not feasible.

The data collection points for the group referred to as the 'no intervention condition' were the same as for the others. Due to teacher drop out they did not have a teacher receiving intervention between any of the assessment points.

Form and content for the CPD program

CPD form and tools used

The CPD program was completed within one school semester (during the fall semester for the direct intervention track, and during the spring semester for the delayed intervention track). Total duration of the CPD program was 16.5 hours which were spread out over 11 weekly 90-minute sessions. To accommodate the needs of the participating teachers, existing teachers' teams were held intact. The CPD took place at the participating teachers' school, or at a school nearby, in the afternoon.

The sessions in the CPD were led by one or two members of the research group. In total, four of the members of the research group, who are all certified and experienced SLPs, were involved in conducting the CPD program (Birgitta Sahlén, Viveka Lyberg-Åhlander, Ketty Andersson, and Ida Rosqvist). In two of the 11 sessions the teachers worked on their own, in collaborative pairs/triads, observing each other's practices in the classroom, filling out the Communication Supporting Classroom Observation Tool (CSCOT), Swedish adaptation (Dockrell, 2012; Dockrell et al., 2015; Waldmann et al., 2016), and giving feedback.

Components used in the CPD were interactive lectures on evidence-based strategies to use in the classroom to support language and communication development, in combination with practical activities and assignments to try out. The teachers formed collaborative learning pairs, or triads, in which they observed each other in the classroom and filled out the CSCOT (sessions 5 and 8) as well as gave each other feedback. Based on observations made in the collaborate pairs/triads

and in films recorded in the classroom, two sessions focused on feedback and practical group activities.

CPD content

The foundation for the CPD was informed by the CSCOT (Dockrell, 2012; Dockrell et al., 2015). The CSCOT is a tool for classroom observations covering three main dimensions: Language Learning Environment (LLE), Language Learning Opportunities (LLO) and Language Learning Interactions (LLI). The themes are derived from a review of the research literature on evidence-based ways to support the oral language development of children in the classroom (Dockrell et al., 2015).

Based on the content of the CSCOT, two overarching themes formed content and goals for CPD program: language learning in the classroom (sessions 3, 4, 7, 10) and teachers' verbal and non-verbal communication (sessions 6 and 9). In addition, classroom environment was also briefly introduced in the CPD, mainly as a lecture on room acoustics and how to improve room acoustics in the classroom (session 1) but was also discussed in relation to the teachers' own reflections throughout the course of the CPD program. However, this dimension was given less focus, as previous research indicates a higher awareness amongst teachers in this area, compared to LLO or LLI (Dockrell et al., 2015; Law, Tulip, et al., 2019).

Apart from the lecture on room acoustics, the first session of the CPD program also included an introduction of the form and content of the CPD program, practical information, and ground rules for participation were set up. During this session structured conversation on goals and expectations took place. Models for reflection (Gibbs, 1988; Kolb, 1984; Rolfe et al., 2001) and feedback was also introduced and discussed during this session.

CPD content related to supporting vocabulary development

The CPD program introduced and discussed a wide range of activities and strategies to support different aspects of the students' language and communication development. However, as this dissertation only reports the effect of the CPD program on vocabulary measures for the participating students, only the content in the CPD program related to vocabulary instruction will be described in more detail in this section.

Items in the CSCOT (Dockrell, 2012; Dockrell et al., 2015; Waldmann et al., 2016) related to supporting vocabulary development in the LLI dimension are for example how teachers can use commenting, extending, and labelling in their interaction in the classroom. Also, the use of symbols, pictures and real objects to reinforce language, modelling language that the students are not producing yet themselves, and encouraging students to use new words when they talk are items included. Items in the LLO dimension that can support vocabulary development are for example what opportunities the students have to participate in structured

conversations with both peers and with teachers and other adults, and opportunities to take part in teacher-led interactive book reading. Related items in the LLE dimension are for example good lighting and room acoustics to facilitate communication in the classroom, and that learning areas, resources and materials, as well as students' own work are labelled appropriately with words and pictures, and availability of both fictional and non-fictional literature in a variety of genres (Dockrell, 2012).

In the CPD program, both theoretical perspectives and concrete activities to support vocabulary development were introduced and discussed. Sessions focusing on vocabulary and vocabulary development included for example, the model for language divided into form, content, and use (Bloom & Lahey, 1978) related to vocabulary, and the three-tiered model for vocabulary by (Beck et al., 2013). Also, theory on what it means to 'know a word' and the gradual deepening of word knowledge was discussed (Nation, 2001). The CPD also included more general advice on vocabulary-supporting strategies in the classroom, such as an overview of strategies that work, or do not work, to support word learning (Steele & Mills, 2011). Throughout the course of the CPD program, practice, and assignments to use specific strategies and activities in the classroom between CPD sessions, related to supporting vocabulary development was encouraged.

Examples of concrete activities introduced in the CPD were the use of self-assessments of vocabulary knowledge with the students to foster awareness of gradual vocabulary development within the current subject area (Beck et al., 2013; Dale, 1965), and the use of a 'word wall' in the classroom (Cunningham, 2017) to foster students' word consciousness of new vocabulary. Furthermore, how teachers can work on lexical organization using associations and categorizations and how to use of graphic organizers such as the 'Frayer Model' with a definition, characteristics, examples, and non-examples of the word (Frayer et al., 1969), Semantic feature analysis charts to organize knowledge hierarchical and highlight relationships between and among the students' prior knowledge and new concepts (Anders & Bos, 1986), and 'Venn diagrams' (Venn, 1881) using a compare/contrast organizational structure were discussed. Strategies to use in interactive book reading to support vocabulary development, such as using synonyms and picture support, providing word definitions, and to support students to use new words (Wasik & Bond, 2001) was also included. Furthermore, collecting vocabulary introduced in the current content area in own 'dictionaries' including picture, student-friendly definition (Beck et al., 2013) and using the word in a sentence was introduced. In addition, some examples of word games, to increase student motivation was presented.

In total, various word-learning strategies, that were built on a combination of educational theories, i.e.: social constructivism and sociocultural theories, schema and psycholinguistic theories, motivation theory, and dual coding theory, (see Black & Wright, 2024; Moody et al., 2018), were included in the CPD program. As the program built upon collaborative peer learning from the participating teachers, the

discussions during the sessions were interactive and based on what experiences and thoughts the teachers' "brought to the table".

Procedure

The assessments of different aspects of the participating students' language skills, and a non-verbal cognitive assessment, were administered individually at the schools. Assessments took place in a separate room, during school hours. Assessments were conducted by either certified SLPs, or well-trained final year SLP students. A total of 10 assessors conducted the student assessments between 2017 and 2019. All assessors were native Swedish speaking. To ensure procedural fidelity, all tasks had written instructions for the assessors. All tests, and their individual test items, were administered in a fixed order, which was the same for all participants, and at all assessment points.

The test items in Clinical Evaluation of Language Fundamentals 4th edition (CELF-4) and Raven's Coloured Progressive Matrices (RCPM) were presented visually using the tests' booklets. Some of the responses were given non-verbally, i.e., the participating students pointed to their response in the booklets. The Semantic Verbal Fluency (SVF) task and the Word definition (WD) task were presented verbally by the administrators and the responses in the SVF and WD tasks were also given verbally by the participating students. Non-verbal test responses were noted on test forms. All verbal responses were audio recorded using the mobile application RecUp, Irradiated Software, LLC. When possible, responses were also transcribed orthographically in real-time. Verbal responses were later transcribed, based on the audio recordings and real-time orthographic transcriptions, and entered into a Microsoft Excel© spread sheet for scoring. All test forms and data were pseudonymized using an encrypted code. Code key for the participants was stored separately. Parental questionnaire was printed on paper and distributed with the consent form and filled out by hand before they were handed in to the teachers for further distribution to the research team. All teacher questionnaires were printed on paper and filled out by hand by the participating teachers, without the presence of members from the research group. The questionnaires were pseudonymized by the participants, using an encrypted code, before returning them to the research team. Code key for the participants was stored separately. All statistical analyses were performed using IBM SPSS Statistics Windows. Armonk, NY: IBM Corp (papers I – III: version 25, paper IV: version 27).

Assessments and data analyses

In the following sections participant assessments and data analyses are described. For an overview of assessment and data analyses in the different studies, see Table 2.

Table 2. Overview of assessments and data analyses in the different studies

	Paper I	Paper II	Paper III	Paper III
Participants	68 students	208 students	25 teachers	209 students
Background factors:				
CELF-4 CLS	X	X		
RCPM	X	X		
Bilingualism	X	X		X
LPE	X	X		
School characteristics		X		X
Grade				X
Outcome variables:				
SVF	X			X
WKn		X		
WD		X		X
TSES			X	
ASIC			X	
Structured conversations			X	
Data analyses	One-way repeated measures ANOVA with Time (T1, T2, and T3) as a within-group factor. Two multiple linear regressions to predict development of SVF total score during summer vacation and formal schooling, respectively, based on background factors.	Independent samples *t*-test for group comparison between ML and BL group on the WKn and WD. A hierarchical regression to investigate contribution to the WD score of background factors, Cronbach's alpha coefficient to investigate internal consistency of the test.	Independent samples *t*-test for group comparison score between the intervention to control condition for T1 to T2 change on ASIC and TSES. Paired samples *t*-test to compare pre- to post-intervention scores for ASIC and TSES. Inductive thematic analysis of structured conversations.	A series of Linear Mixed Models (LMMs) to compare developmental trajectories on SVF and WD between three intervention conditions (direct, delayed, no intervention). LMMs with three-way interactions investigating for subgroup analysis to investigate modulating effects based on background factors.

Assessments

The participating students were assessed with a test battery targeting a broad range of language skills, as well as a non-verbal cognitive test. Completing the whole test battery took approximately 45 minutes each data collection point. The participating students also filled out a written questionnaire assessing their experience of classroom environment and activities and interactions with the classroom teacher.

The participating teachers were assessed with two questionnaires, a case-based knowledge assignment about proposed actions to support two fictional students with different language and communication needs, and structured conversations in groups. Filling out questionnaires took approximately 20 minutes and the structured conversations lasted approximately 15 minutes each assessment point. Only the instruments and their results used in the studies in this dissertation will be presented here.

Cognitive and language tests for participating students

The participating students' results on CELF-4 and RCPM, respectively, from one data collection point, prior to the initiation of the teacher CPD, are used as background factors indicating general language skills, and non-verbal cognitive ability. The students' results on the SVF task and the WD task are used as outcome variables measuring different aspects of the students' vocabulary skills. In papers I, III, and IV data from three data collection points are analysed, to investigate developmental trajectories over time. Paper II is a cross-sectional study analysing data from a single data collection point.

Clinical Evaluation of Language Fundamentals 4th edition (CELF-4)

Four subtests of the Clinical Evaluation of Language Fundamentals - Fourth Edition (CELF-4) (Semel et al., 2003), Swedish adaptation (Semel et al., 2013) were administered to assess the general language ability of the children. The four subtests (i.e. Concepts and Following Directions, Word Structure, Recalling Sentences, and Formulated Sentences) together give the Core Language Score (CLS).

The CELF-4 CLS subtests were administered and scored according to the test manual (Semel et al., 2013). Subtest raw scores were converted to subscale scores, with a mean of 10 and a SD of 3. The subscale scores were then collapsed to form a CLS index score, with an expected mean of 100 and a SD of 15, in accordance with the test manual.

Raven's Coloured Progressive Matrices (RCPM)

Raven's Coloured Progressive Matrices Test (RCPM) (Raven, 2008) was administered to assess the non-verbal ability of the participating students. The RCPM consists of 36 elements with increasing difficulty. The child is asked to select the missing piece among 6 elements to complete a pattern. Raw scores are converted

to an index, with an expected mean of 100 and a SD of 15, which gives an estimation of the non-verbal component of Spearman's g-factor (Cotton et al., 2005). RCPM was administered and scored according to the test manual (Raven, 2008).

Semantic Verbal Fluency task (SVF)

In the SVF task the participating students were asked to say as many words within two different categories (Animals and Clothes) as possible, within one minute per category. The instructions to the participants included two examples from each category. Scoring of the SVF task was modified from Chami et al. (2018). The total number of words produced within the two categories (Animals and Clothes) together minus rule violations and repetitions gave the SVF total score. Scoring of the SVF task is thoroughly described in Paper I.

Word Definition task (WD)

In the WD task the participating students were asked to provide oral definitions of ten stimulus words in response to the question "What does 'XXX' mean?". Test items were chosen to represent cross-curricular words frequently used in the teaching situation in the current grades. They consisted of both concrete and abstract words and represented different grammatical categories. The ten stimulus words in the WD task were: jump (Swedish: *hoppa*), play (Swedish: *spela*), headline (Swedish: *rubrik*), choose (Swedish: *välja*), task (Swedish: *uppgift*), tell (Swedish: *berätta*), together (Swedish: *tillsammans*), ponder (Swedish: *fundera*), difference (Swedish: *skillnad*), and adult (Swedish: *vuxen)*. Number of responses where the participant gave at least partially correct information gave a Word knowledge (WKn) score (possible range 0 – 10 points). Amount of information included in the definitions gave a WD score (possible range 0 – 30 points). The development and scoring of the WD task are thoroughly described in Paper II.

Questionnaires for participating teachers

Two questionnaires were used to evaluate the effect of the CPD on the participating teachers self-perceived knowledge of classroom language and communication (ASIC), and their self-efficacy of classroom management (TSES). TSES is an already available instrument, and ASIC was developed within this project.

The Teachers' Sense of Efficacy, subscale Classroom Management (TSES)

The Teachers' Sense of Efficacy, subscale Classroom Management (TSES) (Tschannen-Moran & Hoy, 2001) is one of few validated instruments available that is also adapted to Swedish (Wedholm & Wideklint, 2015). The questionnaire was chosen to serve as a proxy for classroom communication skills, as classroom management is dependent on efficient communication skills. It consists of eight items measuring the teachers' self-perceived ability to manage the classroom,

organize activities and routines, and make expectations clear in order to continue planned activities, despite disruptive behaviour and unexpected events. A 9-point scale ranging from 1 (not at all) to 9 (a great deal) is used when answering the questions. A mean (possible range 1 – 9) is calculated for all answers and a higher score indicates a stronger perceived sense of efficacy of classroom management.

ActivitieS and Interactions in the Classroom (ASIC)

ActiviteS and Interactions in the Classroom (ASIC) is an instrument originally developed to evaluate children's experiences of their learning environment in terms of how they perceive their physical classroom environment as well as activities and interactions with the teacher (Brännström et al., 2022). Within this project the tool was modified to capture the teachers' self-perceived knowledge and ability to support language and communication development and how they perceive the environment in the classroom. The instrument originally consisted of 25 items, but after analyses of the participating teachers' baseline scores, before taking part in the CPD, five items were deleted to achieve a higher internal consistency, indicating a more consistent scale. The items are statements such as *I know how to develop the students' vocabularies* and *I think I am speaking with an appropriate speech rate*. Teachers respond to the statements on a 9-point scale (1 = fully disagree to 9 = fully agree). A mean (possible range 1 – 9) is calculated for all answers and a higher score indicates more positive perceptions.

Structured conversations in groups for participating teachers

At the first introductory session and at the last session structured conversations with the participating teachers took part. The teachers were asked questions about their expectations and goals with the CPD, CPD content, and their overall satisfaction with the CPD program by one of the researchers. All participants were encouraged to make a statement, and another researcher took notes of the teachers' answers.

Data analyses

All statistical analyses were performed using IBM SPSS Statistics Windows. Armonk, NY: IBM Corp (papers I – III: version 25, paper IV: version 27). Relevant assumptions were checked prior to performing any statistical analyses. The alpha level was set at 0.05 for all dependent variables.

Paper I

To investigate the development of SVF total score during summer vacation (T1 to T2) versus formal schooling (T2 to T3) a one-way repeated measures ANOVA (RM-ANOVA) with Time (T1, T2, and T3) as within-group factor was conducted. In order to adjust for multiple comparisons, Bonferroni correction was used for post-hoc analysis. Cohen's (Cohen, 1988; Richardson, 2011) benchmarks (0.0099 = small, 0.0588 = medium, and 0.1379 = large effect size) were uses to interpret effect size reported as ηp^2. In accordance with Cooper et al. (1996) a standardized mean difference, or *d*-index (Cohen, 1988), was calculated to estimate the effect of summer vacation and formal schooling, respectively, on SVF development. A *d*-index describes the change in scores, reported as standard deviations, relative to the sample's performance at the previous assessment point. A *d*-index of +0.25 means that the average achievement score in the sample is one-quarter standard deviation higher compared to the average achievement score of the sample at the previous assessment point. Cohen's (Cohen, 1988) benchmarks (0.2 = small, 0.5 = medium, and 0.8 = large effect size) were used to interpret effect size reported as *d*-index.

Two multiple linear regressions were calculated to predict the development of SVF total score based on the background factors LPE, Bilingualism, CELF-4 CLS, and RCPM score during summer vacation (T1 to T2) and formal schooling (T2 to T3), respectively. The change in SVF total score during summer vacation and during formal schooling was recalculated into a percentage relative to the previous score to compensate for differences in initial scores, in the multiple linear regressions.

Paper II

To explore any statistically significant differences between the monolingual and the bilingual group on the WD score an independent samples *t*-test was used. To explore any statistically significant difference between the monolingual and the bilingual group on the WKn score, an independent samples *t*-test with bootstrapping, using 2000 samples, was used since the assumption of normality weas violated. Values for "equal variances not assumed" are reported in both analysis (WD and WKn) since the assumption of homogeneity was violated for both variables.

To investigate the contribution of the background factors bilingualism, LPE, school characteristics, CELF-4 CLS and RCPM score to the WD score, a five-stage hierarchical regression (stage 1: bilingualism, stage 2: LPE, stage 3: school characteristics, stage 4: CELF-4 CLS score, stage 5: RCPM score) was conducted with WD score as the dependent variable.

The test was evaluated in terms of the level of difficulty of the ten test items by analysing the distribution of scores (0/1/2/3) for the whole sample, as well as for the monolingual and bilingual group separately. Furthermore, the internal consistency of the test was investigated using Cronbach's alpha coefficient.

Paper III

To evaluate the effect of the CPD program on the participating teachers mixed methods including both quantitative and qualitative analyses, were used.

To compare the participating teachers in the direct versus the delayed intervention condition, two independent samples *t*-test with TSES and ASIC mean change scores between T1 and T2, respectively, as dependent variables were performed. Mean change scores were measured as percentage relative to prior assessment point, to control for any differences in scores at T1.

To compare pre- versus post-intervention scores for all participants, regardless of intervention track allocation, two paired samples *t*-tests with TSES and ASIC scores, respectively, between pre and post, as dependent variables were performed.

To capture the effect of the intervention on the participating teachers using qualitatively methods, statements collected during the structured conversations taking part before and after the CPD program, were analysed inductively in accordance with Braun & Clarke (2006). Based on general initial coding, overarching themes, as well as sub-themes, were identified in the pre- and post-intervention statements, respectively.

Paper IV

To evaluate the effect of the CPD program on the participating teachers' students, any differences in developmental trajectories for SVF and WD, respectively, between the direct intervention, delayed intervention and no intervention groups were analysed. This was done by applying a series of Linear Mixed Models (LMMs) with Time (assessment 1, 2, 3), Group (delayed intervention: dummy coded=0, direct intervention: dummy coded=1, no intervention: dummy coded=2), Grade (1st, 2nd), School characteristics (index ranging 3 to 11), Bilingualism (monolingual dummy coded=0, bilingual dummy coded=1) as fixed effects and Time x Group as interaction term. A forward selection approach starting with a minimal model with Time, Group and Time x Group interaction was used. Grade, School characteristics and Bilingualism were added in Model 2, 3, and 4, respectively. Intercepts for Participants were included in all models as random effects.

To investigate any modulating intervention effect by background factors, a series of LMMs with three-way interactions were conducted investigating any modulation effect of Grade (Time x Group x Grade), Bilingualism (Time x Group x Bilingualism) or School characteristics (Time x Group x School characteristics) with the participants in the direct intervention and delayed intervention groups.

LMMs are often seen as superior to RM-ANOVAs as they are robust against violations of assumptions needed for RM-ANOVA, suitable for analysing data from multi-level sampling schemes, as well as robust against missing data. LMMs obtains higher statistical power than RM-ANOVA, especially under realistic circumstances (Quené & van den Bergh, 2004). As LMMs allows statistical evaluation of incomplete data, it possible to include participants with missing data points. To be included in the analysis the participants were required to have data from at least two

of the three data points. LMMs were also chosen to account for correlation of repeated measures, and to handle within-subject variance. Furthermore, LMMs are better at handling unbalanced samples in the different groups compared to RM-ANOVA, since LMMs use estimated margin means. This can to some extent compensate for differences in the groups regarding for example the sample's composition of background factors.

When carrying out the LMMs, a corrected version (AICc) (Hurvich & Tsai, 1989) of The Akaike information criterion (Akaike, 1973), was used in order to compare multiple competing models. This was done since this has been proposed to be the most appropriate when n/k is less than 40, with k being the number of fitted parameters in the most complex model (Symonds & Moussalli, 2011). The better of two competing models is the one with the lower AICc. To estimate effects in the LMMs, Restricted maximum likelihood (REML) was used. This was done since it gives unbiased estimates of the variance components (Saarinen, 2004), compared to maximum likelihood (ML), which gives biased variance estimates. To estimate the degrees of freedom, Satterthwaite adjustment was used. To adjust for multiple comparisons, and hence to protect against inflated type-I errors, Bonferroni correction was used for post-hoc analysis.

FINDINGS

In this section the main findings are presented briefly. Detailed descriptions of results are found in the respective papers.

Paper I

Paper I indicated that the development of SVF ability is negatively affected by summer vacation, as seen by a decrease of SVF TS equalling on average 0.27 SD. The decrease is recouped following fall semester, indicating that SVF TS is positively affected by formal schooling. The effect size for both summer vacation and formal schooling change is considered small, interpreted against Cohen's benchmarks (Cohen, 1988). No statistically significant additional gains are seen by the end of the fall semester compared to before the summer vacation.

The variance in development during summer vacation or formal schooling could not be predicted by the background factors CELF-CLS, RCPM score, Bilingualism, or Level of parental education.

Paper II

Paper II indicated that the monolingual and the bilingual group had similar response patterns on the WD score. However, the bilingual group on average had lower scores on both measures, i.e. Word knowledge, and Word Definitions.

When investigating how background factors explained the variance in WD scores for the participants, Bilingualism, entered in isolation, explained 15% of the variance of the WD score. However, when including all background factors in Model 5 (i.e. Bilingualism, LPE, School characteristics, CELF-4 CLS, and RCPM score), the only significant predictor was CELF-4 CLS. The CELF-4 CLS score uniquely explained 24.3% of the variance. Model 5 explained 54.8%, of which 29.29 percentage points were shared variance between the five included predictors. Hence, bilingualism alone cannot explain poor results on the WD task.

For both measurements (WKn and WD) the internal consistency (measured with Cronbach's alpha coefficient) of the test was $> \alpha = 0.7$. Hence, the WD task consisting of 10 test items can be regarded as representing one factor.

Paper III

Participating teachers were active when taking part in the CPD program and it was well-received and appreciated, according to teacher evaluations. Participants showed an interest in methods, discussed the CPD content in relation to their own teaching practices, and provided examples indicating a growing knowledge base. However, results in Paper III indicated no intervention effect on neither ASIC (i.e., the teachers' self-reported knowledge and ability to support language and communication development and how they perceive the environment in the classroom), nor TSES classroom management subscale (i.e., teachers' self-perceived ability of classroom management), when comparing the direct and the delayed intervention condition. Qualitative analysis of statements made by the teachers in structured conversations however, showed a somewhat different picture, indicating some signs of change and development after taking part in the CPD. It also indicated a continued need for more knowledge for the participating teachers in how to help all students develop their learning.

Paper IV

Paper IV indicated that there was no effect on the students' SVF ability as a result of their teachers taking part in the CPD program. However, analysing the different developmental trajectories of WD performance for the different intervention groups (i.e., direct/delayed/no intervention condition) indicated that there might be a positive effect of the CPD on WD skills. This is promising; however, we do not have strong enough evidence to conclude that the effect on this outcome variable can solely be attributed the teachers' participation in the CPD.

Subgroup analysis indicated no modulating effect of any the predictors (Grade, School characteristics, or Bilingualism) on the effect of the intervention for neither SVF total score, nor WD total score.

Furthermore, predicted estimates of the included parameters, showed that for both SVF TS and WD, grade 2 students outperformed grade 1 students, and monolingual students outperformed bilingual participants. However, school characteristics was the parameter resulting in the largest predicted estimates for both SVF TS and WD. Estimates for School characteristics had an almost linear relationship between lower School characteristics index for the school (i.e., higher proportion of students with Swedish as L2, and lower proportion of parents with tertiary education) and lower predicted estimates for both SVF TS and WD.

DISCUSSION

This dissertation provides insights regarding factors related to vocabulary development in the early school years, and the effect of a teacher CPD on both participating teachers and their students. In the previous section, the findings in the papers included in the dissertation are summarized. In the following section, the findings are discussed and contextualized. The overarching aim of the dissertation, as well as sub aims are discussed in the General discussion. Some strengths and weaknesses of the methodological choices in the dissertation are discussed under Methodological considerations, and some ethical considerations are discussed under Ethical considerations. Clinical implications based on the findings are summarized, and finally, under Future research some future directions for method development and research are suggested.

General discussion

In the following section the main findings will be discussed in relation to the two overarching themes of the dissertation; factors associated with vocabulary development in the early school years, and the effect of the teacher CPD on teacher and student outcomes.

Factors associated with vocabulary development

Contrary to prior studies indicating a linear developmental trend during childhood in mean SVF TS, results in Paper I revealed a setback in the expected SVF TS development following summer vacation. Hence, SVF ability seems to be prone to an SLL effect, i.e., summer vacation having a negative impact on the development of important scholastic abilities in children. Earlier research has indicated that the effect of summer vacation may differ due to individual background factors. This was not found in Paper I, as the development during neither summer vacation nor during formal schooling could be predicted by neither Level of parental education, Bilingualism, CELF-4 CLS, nor RCPM. However, the results must be interpreted with caution as the sample in Paper I had a higher proportion of children from low SES background and bilingual children, as well as lower results on non-verbal ability, and general language ability assessment than expected in an average sample of Swedish elementary school children. An increased sample size with a larger diversity in terms of background factors, for example to disentangle bilingualism

and socioeconomic factors, could reveal other tendencies when it comes to development of SVF TS both during summer vacation and during formal schooling.

Both Paper I and Paper IV showed a positive effect as a function of time during the school term on the students' performance on the SVF task. As concluded in the review by Ardila (2020) two major demographic factors, education and age, were significant factors accounting for a great part of the SVF test score variance. Paper I (n = 68 students) indicated that the positive effect of education, seen in adult studies, might be visible after a short period of time as a semester for elementary school children. Paper IV (n = 209 students) showed similar developmental trajectories during the school year, with a statistically significant effect of time on the SVF performance for both the intervention condition as well as the control condition.

Consequently, the development of SVF TS in elementary school children seems to be promoted by activities in school. As stated in the background, categorizing and naming is a common activity in multiple school subjects in the Swedish curriculum in the earlier grades (Läroplan för grundskolan, förskoleklassen och fritidshemmet 2022 [Curriculum for the compulsory school, preschool class and school-age educare 2022], 2022). The explanation for the decline in SVF TS performance we see in Paper I, following summer vacation, could be that this kind of structural work promoting vocabulary organization and size is carried out to a lesser degree by caregivers during the summer vacation, compared to at school.

Disentangling the effect of age on one hand, and education on the other hand, is hard when studying a child population with mandatory schooling. Studies of the effect of summer vacation (i.e., a period without formal schooling) can be one method to use. Paper I highlights the importance of formal schooling for the development of SVF TS, as it showed a decrease in performance following summer vacation, which was followed by an increase after one semester of formal schooling. In Paper IV, for both SVF TS and WD, grade was a statistically significant predictor, with estimated values for grade 2 students being higher compared to grade 1 students. This can be seen as a proxy for both age and education, as grade 2 students are both older, and have more educational experience than grade 1 students.

Paper II and Paper IV both showed lower scores (Paper II: WD, Paper IV: SVF and WD) for bilingual participants compared to monolingual participants. Paper II however, showed that bilingualism alone cannot explain poor WD results, but instead an interaction between several other factors must be taken into account. The predictor in Paper IV resulting in the largest predicted estimates was School characteristics. There was a general trend for both SVF TS and WD that the lower the school characteristics index for the school (i.e., higher proportion of students with Swedish as L2, and lower proportion of parents with tertiary education), the lower the predicted values are for both SVF TS and WD. The predicted estimates between higher and lower School characteristics, were much larger compared to the predicted estimates for Grade 1 compared to Grade 2, and bilingual compared to monolingual participants.

Paper II showed that with all background factors included, the only statistically significant predictor explaining the variance in WD performance was CELF-4 CLS. This is in line with earlier research highlighting that WD skills is a complex skill, requiring several linguistic, and metalinguistic, skills.

To conclude, findings in Paper I, II, and IV are in line with earlier studies indicating that the relationship between bilingualism, socioeconomic factors, and children's vocabulary development is multifactorial on individual, familial, and school/community-level in a complex interplay. When interpreting low vocabulary skills, the child's whole context, i.e. language exposure and use both at home and at school, socioeconomic factors at individual, familial, school, and community level, quality of instruction as well as the individuals school attendance/absence, must be considered. As pointed out by Buckingham et al. (2013); risk factors are interactive; with children from low SES-backgrounds being both more adversely affected by risk factors compared to their more privileged peers, but also more likely to experience these conditions.

Effect of the CPD on teacher and student outcomes

Within the current research project, the results of the CPD were evaluated on both teacher and student outcomes. This dissertation includes three teacher outcomes: two self-reports used to evaluate the effect of the CPD on the participating teachers self-perceived knowledge of classroom language and communication (ASIC), and their self-efficacy of classroom management (TSES), as well as qualitative analysis of statements made by the teachers in structured conversations (Paper III). The teachers were also assessed with a case-based knowledge assignment about proposed actions to support two fictional students with different language and communication needs (Manuscript to be submitted), which will not be discussed here.

Furthermore, this dissertation includes two student outcomes: the effect of the CPD on the student's vocabulary development, assessed with a SVF and a WD task. The students were also assessed with a standardized language test forming a composite score of receptive and expressive language abilities, reported elsewhere (Sandgren et al. 2023), an oral narrative task and a written questionnaire assessing their experience of classroom environment and activities and interactions with the classroom teacher, which will not be discussed here.

As proposed by several authors (e.g., Desimone, 2009; Dunst et al., 2015; Gersten et al., 2010; Kennedy, 2016) the underlying assumption of the effect of PDs for teachers is in its simplest form a three-step-process: 1) teachers knowledge and/or beliefs are altered as a result of taking part in PD activities, 2) this changes their teaching practices, and 3) as a result students' learning is altered (Kennedy, 2016). This means that ineffective PDs can be the result of several points of potential 'slippage'; for example inadequate training of those conducing the PD; or teachers or students not responding to the PD as expected (Burnett & Coldwell, 2021).

In the CPD program within this research project, we aimed to draw on the principles for effective teacher PD identified by previous studies, (e.g., Dunst et al., 2015; Markussen-Brown et al., 2017; Starling et al., 2012) for example by providing teachers with usable and practical techniques through interprofessional collaboration between SLPs conducting the CPD and the participating teachers. Another important principle was using CPD with multiple components, i.e., combining course content (interactive lectures) with coaching, feedback, collaborative work in teacher dyads/triads observing each other, filling out the CSCOT, and giving each other feedback, as well as reflection on progress. A great effort was also made to establish collaboration between researchers and practitioners and involve the schools in planning the CPD, to make the content relevant and the study design feasible. Furthermore, the CPD content was informed by evidence-based classroom-activities and interactions to support language development. Despite these great efforts made, the CPD resulted in modest changes in teacher and student outcomes, and some possible explanations will be discussed below.

One possible explanation is overall intensity (total number of hours of PD) and overall duration (time frame for the total program). In order to make the study feasible for the schools to take part in, all data collection had to be done within a school year, which set the bounders for the overall duration. Furthermore, the study design was partly replicating from Starling et al. (2012) which showed positive effect on student outcome following 10 weeks of teacher PD focusing on language modification techniques in the classroom. This resulted in the CPD in the current project being spread over one school term (a total of 16.5 hours over 11 weeks). The review by Markussen-Brown et al. (2017) indicated that longer duration of PD gave higher results. It has for example been proposed that teachers need at least 100 hours of CPD during the course of six months to learn a curriculum (Lorio & Woods, 2020). It has also been proposed by Kennedy (2016) that a minimum of overall duration of PD being an entire school year is desirable, as well as following the teachers for at least another full year after the completion of the PD (i.e., a total timeframe of 2 full years to conduct and evaluate the PD) in order to evaluate if the PD produces enduring changes in teacher practice. Furthermore, student achievements should preferably also be measured for a full year beyond the PD, as there can be a delayed effect of the program. According to Kennedy (2016) ultimate effects of PD is likely not fully detectable by the end of the PD. This in line with other research suggesting that teaching practices are improved gradually over time (Kennedy, 2016). Although, being the desirable intensity and duration, this reduces the potential PDs to just a small number of studies, as this is rarely feasible in neither research, nor clinical practice (e.g., SLP-led PD activities within schools).

Another explanatory factor could be the theory and research base underpinning the use of ‘key features’ to guide the planning of PD activities. Although, widely used, there has recently been critique against focus on listing ‘key features’ for effective PD identified by earlier systematic reviews, (see for example Asterhan &

Lefstein, 2024; Opfer & Pedder, 2011; Sims & Fletcher-Wood, 2021; Sims et al., 2022; Sims et al., 2021; Sztajn et al., 2011). Also the results of effects of PDs shown by meta-analyses has been questioned, (see Fullard, 2023). This calls for a call increased focus on the development, testing, and refinement of theories about teacher PD to make progress in understanding, policy making, and practice within the field (Asterhan & Lefstein, 2024).

Furthermore, as Kennedy (2016) argues: 'key features' alone may not be reliable predictors of effective PD programs. Other aspects must be taken into consideration, such as the people providing the PD (e.g., how they are selected and prepared for their work), the role of motivation in the teachers taking part in the PD, and as mentioned before; the time-consuming and gradual way in which teachers incorporate new ideas into their ongoing teacher practise. For a discussion regarding participating teachers' motivation, see the section on sampling for the participating teachers below in the section on Methodological considerations.

In the study by Starling et al. (2012) Program Fidelity (PF, i.e., the program being delivered as intended) was ensured using a detailed program manual covering several aspects of the CPD content as well as examples of application, as well as a meeting protocol used ensure consistency throughout the CPD. Since the current CPD built upon collaborative and interactive sessions with the teachers, such manual or meeting protocol was not feasible. Hence, the current study lacks a PF measurement.

Furthermore, participating teachers in the study by Starling et al. (2012) were repeatedly observed and rated to ensure techniques introduced in the CPD was actually implemented in their teaching practices. In the present research project, filmed, and rated, observations of teacher practice in the classroom were planned to be included as a teacher outcome evaluating the CPD. However, this was not granted by the Ethical review board. It has been recommended to have some sort of Intervention Fidelity measurement (IF, i.e., to what extent study participants, for example teachers, implement the intervention content, as intended) (Dusenbury et al., 2003) in order to reduce the risk of committing Type III-errors (Basch et al., 1985). Type III-errors refers to wrongly interpreting negative or null effects on an intervention as an indication of an ineffective program, when it could actually be attributed to implementation failure (Mendive et al., 2016).

Since the present research project included neither a PF measurement (i.e., the program being delivered as intended by the researchers), nor an IF measurement (i.e., the teachers changing their teaching practices as a result of the program), we cannot evaluate if there was 'slippage' based on program delivery (by researchers) and/or program reception (by teachers). Including PF and IF measurements in future studies evaluating the effect of teacher PD may provide insights to possible 'points of slippage' diminishing the effect of the PD.

Furthermore, the underlying assumption of PD that there is a clear connection between teacher knowledge, teacher practice, and in turn student outcomes, as stated earlier. Markussen-Brown et al. (2017) however, has stated that their results did not

support the theory of educator outcomes mediating child effects, at least in the educator outcome that had sufficient data to conduct analyses. Hence, there may be a more complex relationship between teacher knowledge and teacher practice than previously understood, according to Markussen-Brown et al. (2017) as indicated by Schachter et al. (2016). Again, as this research project did not include an IF measurement, we cannot evaluate whether the PD resulted in changed teaching practises. This is not unique to this research project. For decades, evaluations of teacher PDs mainly consisted of documenting the participating teachers attitude change, satisfaction, or commitment rather than evaluating the results of the PD (Desimone, 2009). Furthermore, as it has also been concluded by several authors, (e.g., Markussen-Brown et al., 2017) there is often a lack of evaluation of teacher PD on student outcomes. Hence, the underlying theory of change in educators resulting in improved student outcomes often remains untested (Markussen-Brown et al., 2017).

Other aspects that can explain the results are discussed in the following section, addressing Methodological considerations.

Methodological considerations

Study design and related analyses

In this research project we aimed at meeting the needs of the participating schools, their teachers, and students while also meeting methodological demands to be able to produce generalizable results. When meeting needs of the participating schools, trade-offs in methodological rigour had to be made. For example, requests from the headmasters related to scheduling affected allocation of teachers to the different intervention groups, and also set the time frame for intensity and duration of the CPD, and related data collection.

In addition, the control condition had to be in form of a waiting-control-condition, who received intervention between T2 and T3 (corresponding to the post to 3 month-follow up period for the direct intervention condition), instead of continuing business-as-usual practices during the whole data collection duration. This was a trade-off that had to be made to be able to recruit participating schools. As a result, it increases difficulty in interpreting the results obtained from data collection T2 and T3, for both teacher and student outcomes. This does not correspond to business-as-usual practice for the control condition, but instead corresponds to when that condition received intervention (i.e., pre-, and post-scores). These difficulties have been handled differently, in relation to data analyses, in Paper III and Paper IV, respectively. In Paper III the different time periods for teacher outcomes (i.e., T1 to T2 and T2 to T3) have been analysed separately (using independent samples *t*-tests). In Paper IV, LMMs including all data collection points and participants was used

(including data from the small group of students whose teacher did not participate in the CPD, i.e., the 'no intervention track').

Hence, the direct intervention condition received intervention between T1 and T2, the waiting control condition received intervention between T2 and T3 (instead of business-as-usual practices), and the 'no intervention track' did not receive any intervention. Therefore, in addition to only conducting Time x Group interaction analysis, developmental trajectories over T1/T2/T3 between the three conditions was compared for both SVF TS and WD. This was done using post hoc pairwise comparisons for the predicted means, for the three groups, at the three assessment points, for SVF TS and WD, respectively.

For SVF TS both the Time x Group interaction and post hoc tests showed no intervention effect. For WD, post hoc tests indicated an intervention effect despite showing only marginally significant Time x Group interaction when including all three conditions. This calls for making through considerations regarding how to analyse data, when planning the study design of an intervention study.

Although, it is more desirable to have a control condition who have business-as-usual-practices during the whole data collection period for the direct intervention condition, this might none the less be impossible in order to successfully recruit participants. When having a delayed-start intervention condition as a control condition, the data analyses and interpretations of results must be more thoroughly considered, compared to a study design using a control condition who does not receive intervention.

Samples and data

Participating teachers

Despite demographic differences (see under Participating students below), needs and interests of the headmasters and teachers in both municipalities were similar. Headmasters from both municipalities expressed a need to develop the teachers' ability to engage students in interactions during the lessons as well as managing challenging student behaviour, as stated in Paper III. There were also no statistically significant differences between municipalities in teachers' baseline score for TSES or ASIC. Hence, despite large differences in student composition, it was indicated that teachers might have similar self-perceived perception of the classroom environment and their own teacher behaviour and ability to manage challenging student behaviour and keeping focus on the teaching, as well as similar needs for development.

How effective a teacher PD is, is heavily dependent on the participating teachers' motivation to learn as well as to change their teaching practices (Kennedy, 2016). In accordance with ethical guidelines, participation in research projects like the current one, requires an informed consent, i.e., participation is voluntarily, and that participants can withdraw their consent at any time, without facing any

consequences neither at the present time, nor in future studies. As participants chose to take part in a PD, there is a risk of sample bias with participating and non-participation teachers being different in their motivation to learn and adapt changes. The opposite would be to have mandatory assignments to the PD, for example as required by the school's headmaster. This is regularly the case for 'ordinary' teacher PD taking place within the working hours at the school but is not permitted within research as it violates ethical guidelines. According to Kennedy (2016), mandatory participation may result in comparability in the motivation to learn and adapt changes between intervention and control condition. However, it can also result in neither group being motivated to learn and change their practice, which is likely going to affect treatment effect negatively. Teachers who are not motivated to learn are likely to forget about the program when returning to the classroom (Kennedy, 2016).

Within the current research project there is a risk of sample bias with participating teachers being more motivated to learn and change practices, as participation was voluntary. There is, however, also a risk that some participants, although giving their informed consent, lacked motivation to learn and change, which might impact the effectiveness of the program. This matter will be further discussed in the section on Assessment and analyses for the teacher outcomes below, as well as under Ethical considerations.

A total of 28 teachers gave their informed consent to participate, of which 25 took part in the CPD, giving a teacher attrition rate of 10.7%. Reasons for leaving the study were sick leave ($n = 2$) and change of employment ($n = 1$). A risk of attrition bias cannot be excluded, although, since reasons for leaving the study were unrelated to the intervention, it can be regarded to have little or small impact on the results (Bankhead et al., 2017).

More problematic related to teacher outcome data, is the fact that only about half of the teachers in the delayed intervention condition completed all self-reports, at all three assessment points, which gave a substantial data loss for the quantitative teacher outcomes. The reasons for the teachers not participating in all assessments is unknown but could be related to that some participants had not fully understood the study design, and reasons for conducting multiple assessments, which could be indicated by remarks like "I have already filled out this one" when returning empty questionnaires to the researchers. It could also be related to other, unknown reasons, such as overall workload for the teachers or lack of motivation.

Participating students

Six schools from two municipalities were included in the study. As stated before, the schools from the two different municipalities had differences in student composition in terms of proportion of students with 'foreign background' and parents with tertiary education, compared to each other, as well as compared to the national average. To accommodate the needs of the participating schools' teams of teachers, as opposed to individual teachers, were assigned to a group and then

allocated to either an intervention condition (i.e., the CPD program) or a delayed intervention control condition. Altogether this led to differences at baseline assessment for the students between the intervention and the control condition, with better student achievements for the intervention condition. It also led to uneven distribution of first and second-grade students across intervention conditions.

As stated before, 57% of the invited students gave their consent to participate. The student sample was representative of the schools' student cohorts regarding the proportion of monolingual and bilingual participants, (see Sandgren et al., 2023). However, the reason for the other 43% of the invited students declining to participate can be due to some sort of self-selection for unknown reasons. The lowest proportion of student participations were in the schools having the highest proportion of students with 'foreign background' (school 1 and 2, see Table 1). In these two schools, almost all students were either born abroad themselves or had both parents born abroad. The low student participance in these schools could be related, for example, to the parents having difficulties understanding the information and consent form. For a further discussion regarding student consent, see Ethical consideration.

Of those 224 students who gave their consent and participated in at least one assessment point, 209 had at least two assessment points and where therefor was included in the analyses in Paper IV evaluating the effects of the CPD on student outcomes. This equals 6.7% missing data on the student outcome measures. Relocation of the family before the start of the CPD was the reason for 13 out if these 15 students. This gives a student attrition rate of 5.8% which can be regarded as a low risk of attrition bias (Bankhead et al., 2017).

When evaluating the effect of the CPD on student outcomes (Paper IV), LMMs were chosen, amongst other reasons, to compensate somewhat for unbalanced samples in the three groups. LMMs use estimated margin means which to some extent can compensate for differences in the groups in regard to for example the background factors and baseline achievement. Nonetheless, the unbalance between the intervention and the control condition, and also the no intervention condition, might confound the results and compromise the comparability between groups. However, three-way interactions investigating any modulating intervention effect by background factors (Grade, Bilingualism, and School characteristics, respectively), with the participants in the direct intervention and delayed intervention groups were not statistically significant for neither SVF total score, nor WD total score, indicating no modulating effect based on these predictors.

Future studies should nonetheless aim at addressing unbalanced groups between intervention conditions. There might, however, be a trade-off between increasing participants in order to obtain higher statistical power, and only approaching for example schools with similar demographical conditions. Preferably intervention and control conditions are both balanced in relation to each other, as well as mirrors society at large. With the heterogeneity we see between schools and communities

in Sweden today, this does pose great challenges when attempting to conduct ecologically valid research within the school setting.

Assessments and analyses

According to Kennedy (2016) improving student development is the ultimate goal of teacher PD, however student achievements can be measured differently. Broader array of content tends to be covered while using conventional standardized tests or educational assessments, which may be less sensitive to the content and purpose of specific programs. On the other hand, developing tailored instruments that are more proximal to the specific program, with the intention to capture specific program effects might be expected to show greater program impact (Kennedy, 2016). For both teacher and student outcomes within this research project, we chose an array of instruments, with some being more closely aligned with program goals, but for the most part instruments were more distal, to avoid a risk of a positive bias for example in the teachers' self-reports, see Paper III for a further discussion.

Choice of instruments to use in a Swedish context is also limited by the fact that Swedish is a comparably small language, and the availability of instruments adapted to Swedish is limited, compared to what is available for larger languages, especially English.

Teacher assessments

The two teacher self-reports were the TSES Classroom management subscale (Tschannen-Moran & Hoy, 2001), which was chosen because it is one of few available instruments adapted to Swedish (Wedholm & Wideklint, 2015), validated on teachers, and used in a similar study (Karjalainen et al., 2019). ASIC (Brännström et al., 2022) was adapted to teachers within this project, and a tailored instrument more aligned with intervention content and goals.

In line with Karjalainen et al. (2019) and Wedholm & Wideklint (2015), the participating teachers had a bit higher ratings on the TSES (i.e., indicating a higher self-reported self-efficacy of classroom management) already at baseline, compared to the validation study on teachers across five countries (Klassen et al., 2009) and higher than the scores from pre-service teachers at the beginning stage of their teacher practices (Duffin et al., 2012). Although neither TSES, nor ASIC, shows neither a floor, nor a ceiling effect, the baseline assessments show that the teachers rated both their self-efficacy of classroom management and their interactions and activities in the classroom at the higher end (i.e., better self-rated ability) of the scale, already prior to taking part in the CPD program. High baseline assessments might result in less opportunities to improve ratings after the CPD. This can mean that the instruments are not fit to evaluate the effect of a CPD, at least in a smaller sample like this one. It can also reflect a "*I know it all and there is nothing new to learn-attitude*" (Gersten et al., 2010), which in turn might result in varying levels of

teacher engagement and involvement by the participating teachers, which is likely a reality when conducing PD research according to (Gersten et al., 2010).

In general, during the CPD program, the research group felt that the teachers were interested in taking part, but the engagement and involvement varied between different teachers. There were some expressions from participating teachers that they "did not need the CPD", or that they had other obligations they would rather spend (their limited) time on. There were also expressions that they really wanted to take part in the project but were stressed about other work assignments they had to do. According to Kennedy (2016), the education system is "noisy" from the teachers' point of view; i.e., multiple, and conflicting, messages regarding the importance of different aspects of teaching practises and related tasks, surround the teachers. Focusing on one of these important tasks, or ideals, may lead to compromises in their effectiveness with another task or ideal (Kennedy, 2016).

In addition to the quantitative teacher outcomes (TSES and ASIC), qualitative analyses of teachers' statements collected at structured conversations pre- and post-the CPD program were used to evaluate the effect of the CPD. The quite opposite of expressions stating some participants felt that they did not need the CPD, mentioned before, was brought up in the structured conversations. This was reflected in the theme "*I (still) need more*" (see Paper III), were participating teachers after the CPD program expressed a continued need for more knowledge. Some examples were how to support the development of special student groups, or specific areas, indicating an uncertainty about how to support all students in developing their learning.

Furthermore, as mentioned before, an objective evaluation of changes in teacher practices, for example by rating filmed observations in accordance with the CSCOT, carried out by a blind rater, would be preferred as a teacher outcome, in addition to self-reports and structured conversations. But as this was not approved by the Regional Ethical Review Board (as filming in the classroom would also include filming students who declined taking part in the research project), this was not feasible.

Student assessments

Student assessments were chosen with the purpose to evaluate the effect of the teacher CPD. Hence, the chosen tasks in Paper I and II were dependent on which assessments were included in the student test battery evaluating the CPD. In addition, the information retrieved from the parental questionnaire (for example LPE and the participating students' language use) was also chosen with this purpose.

Students were assessed with a test battery consisting of a range of different language tasks, as well as a non-verbal cognitive task at baseline testing, and a written questionnaire. To keep the total duration of the assessment at a minimum, since participants were young children, a selection of which assessments to include had to be made. CELF-4 CLS subtests (Semel et al., 2013) was chosen as an outcome measure since the aim of the CPD was to strengthen overall language

abilities. It is also one of were few standardized and validated instruments, available in Swedish, capturing both receptive and expressive language skills in the age group. CELF-4 CLS and the narrative task (MAIN Multilingual Assessment Instrument for Narratives (Gagarina et al., 2012)) were instruments used that were more distal to intervention content. As reported in (Sandgren et al. 2023) there was no intervention effect on CELF-4 CLS performance. The effect of the CPD on the narrative task is yet to be analyzed.

As vocabulary development is related to not only size, but also for example to depth and organization, two vocabulary tasks (a two category SVF task and a ten-item WD task) were included as student outcomes. These were more aligned with CPD content, compared to CELF-4 CLS and the narrative task. The chosen categories in the SVF task (Animals and Clothes), and the ten items in the WD task, however, were unknown to the participating teachers. They were not chosen to be aligned with specific words targeted by the teachers, but instead aligning with vocabulary that can be assumed to be frequently used in the classroom in the lower grades.

Although not standardized, the administration and scoring of the SVF task and its chosen categories has a long tradition of similar use in both research and clinical practise. The WD task, however, had to be developed within the research project, prior to data collection, as there was no already available instrument to use. It was piloted on a small number of children to assure feasibility. It was, however, not possible to fit a more thorough pilot testing and analysis of the instruments usability before using it in data collection. Instead, the instrument was evaluated after it had been used, see Paper II, which is unfortunate, as changes to the instrument (i.e., task administration, test items, and scoring method) based on findings could not be made then.

The evaluation showed that internal consistency indicated that the ten test items could be regarded as representing one factor, and the test showed neither floor, nor ceiling effects. However, the proportion of test scores equal to score 0 (no correct information) and score 1 (partially correct information but not defined in a conventional way) was large (often 60% or more), indicating that it was a difficult task, and/or difficult test items, for many participants. Based on these findings, there are several different aspects to consider when developing a WD task for the current age span, including for example word frequency, grammatical category, and level of concreteness.

Since vocabulary development, and hence assessment of vocabulary knowledge, is multifaceted, a broader range of vocabulary tasks would have been desirable to include, but this was not possible due to total duration of student assessment time. Furthermore, assessments were only done in the language of instruction (Swedish). Including vocabulary assessment of the bilingual participants' other languages would be valuable but was not feasible. Data analyses possible are also constrained by the research project's time frame. With more than 200 participants, taking part in three, or four, assessments, the amount of data collected is extensive. It has

required a substantial amount of time to transcribe, score (including interrater-reliability scoring), and analyse. The total number of words collected within the SVF task is approximately 20.000. The total number of word definitions analysed are more than 6000. The SVF TS was used to analyse SVF performance. Using a more a more detailed scoring of the participants' performance can give an insight into underlying cognitive mechanisms involved in carrying out the task (Villalobos et al., 2022). For the WD task, a binary score (0 – 1 points) was used for the WKn score. For the WD score a scoring method combining both content and form (0 – 3 points) aspects was used. Using a scoring method analysing form and content aspects separately, as development of content and form not always change together and in the same ways (Gavriilidou et al., 2022), might provide a better insight to different aspects of the development of WD skills. However, increasing number of vocabulary tasks, SVF categories and/or WD items, or conducting more detailed data analyses would not have been feasible within the research projects' time frame.

Ethical considerations

As stated before, this research project required, and was granted, an ethical permit. A project like this raises a series of questions regarding ethical issues. For example: even if informed consent is required, how can we make sure all participants: a) understand the information, and b) consent truly is given voluntarily?

In this project the participants were teachers and children. For the children both the children and their legal guardians were required to give consent to participate. The research group approached schools, and the headmasters were the ones who agreed to the research project taking part at their schools. However, as commented by the Regional Ethical Review Board in Lund in the ethical permit, the headmasters themselves should not be involved in recruiting the participating teachers, due to the dependence relationship. Teachers were recruited by the research team from the grades that the projected aimed at (grade 1 and 2). The headmasters made room in the participating teachers' schedules to participate. The teachers were informed by the research team that participation was voluntary and that they could withdraw their consent at any time. All approached teachers agreed to participate (there were some dropouts later on, due to change of employment or sick leave).

Since the CPD took place at school, during the teachers' working hours, and was initiated by the headmasters, one can ask if teacher participation was truly voluntarily, or if there was an expectation from the headmasters that they should participate. Even if informed consent was required, it is difficult to judge how well this was the case for all teachers, and if they truly felt they had the possibility to decline or withdraw consent to participate.

The teachers that gave consent to participate then distributed information and consent forms to the children, and their legal guardians, in their classes to sign

(consent or not consent to participate). Consent forms were return in sealed envelopes to the teachers for further distribution to the research team. About half of the students gave their consent, which an indication that it was perceived as voluntary. However, since a large proportion of the participants have Swedish as their second language, many legal guardians might have low level of proficiency in Swedish. It is not certain everyone fully understood the information and consent form. It is also possible that some legal guardians trust the school and sign what is given to them by the school. This could be the case for some participants in the project. It might have been better also to give oral information, using an interpreter for those who need it, and written information that was translated to the languages spoken by the families. However, this was not feasible given that about 400 families were approached, and participants used 24 different languages apart from Swedish.

The data collection from the participating children took place at school, during school hours. The children had the opportunity to "withdraw their consent" at any time. Again, it is questionable to what extent the participating children fully understood the premises for taking part or declining to take part. A few children said that they did not want to participate in some of the assessments or tasks and hence, did not have to participate. But in general, my experience is that small children often do what adults ask them to do. The general perception by everyone collecting data from the participating children, however, is that most children enjoyed the sessions and thought the tasks were quite fun to do. Everyone collecting data also had training and experience in assessing children and handling situations that might occur. It is, however, possible that the situation might be unpleasant for the participants in any way. For example, they might feel uncomfortable or feel that the tasks are hard for them to do. Therefore, it is important to not collect more data than is necessary in the project, to keep assessments to a minimum.

Regarding teacher outcomes, the written questionnaires were filled out by the teachers without the presence of members from the research group. The questionnaires were pseudonymized by the participants, using an encrypted code, before returning them to the research team. Code key for the participants was stored separately to minimize the risk of participating teachers modifying their answers in order to please the research team. However, the structured conversations with the participating teachers were conducted by members from the research team providing the CPD. There is a risk that the teachers felt that they wanted to please the research team and modified what they said in the structured conversations at the end of the CPD program. Another option might have been to have structured conversations with an external part that is not involved in the CPD. This, however, would mean that the teachers would not have a relationship with that external part. It could thus be harder for the teachers to talk about their experiences when the external part does not share the same experience.

Clinical implications

Based on the findings in the studies included within this dissertation, some clinical implications can be made, relating to several aspects of both SLP and teacher practise. Below, I will mainly focus on clinical implications for SLPs.

Assessments and interpretations of vocabulary skills

- As shown in Paper I, the SVF task performance was lower following the summer vacation. The results should be considered when conducting SVF tasks on children directly following a lengthy summer vacation. This also has implications for the interpretation of SVF performance of children with high levels of school absence.
- When interpreting low vocabulary scores, the context of the child (e.g., school characteristics, school attendance/absence, level of parental education) must be taken into account as these factors may contribute to the variance in performance. This is especially important for bilingual children living in low-SES areas and attending schools with a large proportion of bilingual students, and low parental education.
- Vocabulary knowledge is multifaceted, and assessment should include other aspects than vocabulary breadth instruments using a binary scoring. WD tasks can be used to assess the students' ability to formulate clear, concise and correct WDs, which is an important academic task, and can give insights to vocabulary depth of the included words.
- A WD task of words used in the teaching situation may provide important information on the students' vocabulary depth. As shown in Paper II, many children had no, or even incorrect, knowledge of the included words. Teachers should be aware that lexical deficits can be evident not just in terms of vocabulary size but also in vocabulary depth.

The effect of teacher CPD on teacher and student outcomes

- Preparations for a teacher CPD program are time-consuming and need lots of thorough considerations.
- Changing teaching practices is likely a time-consuming process.
- A teacher CPD program of this form, content, intensity, and duration, might result in some signs of change in both teacher and student outcomes. However, a clear effect on teacher outcomes, or the students' vocabulary development, is not guaranteed.

Future research

In the Discussion section, including the section on Methodological considerations I have discussed several aspects, for example, study design, instruments, and data analyses, to take into considerations when planning future research projects. In the following section, I will further lay out some directions based on previous research, and suggestions for moving forward.

Factors related to vocabulary development

Paper I, II, and partly IV investigated the associations between socioeconomic factors, cognitive factors, and bilingualism and vocabulary development, but cannot answer the causal relationship between predictors and outcomes. The associations can for example be moderated/mediated through other factors. The factors included in these studies were LPE as a proxy for family level SES, school characteristics as a proxy for school level SES, RCPM score as a proxy for non-verbal ability, mono/bilingualism (as a binary category), CELF-4 CLS as a proxy for general language ability, and grade as a proxy for both age and educational experience.

A commonly used SES proxy in child development studies is level of parental (or only maternal) education. According to Jacobsen et al. (2017) proposed explanations for its relationship with cognitive and language development are for example higher educated parents providing more cognitive stimulation to their children, reading more to their children, and using longer sentences and a richer vocabulary with higher lexical variety. But also, that parenting style and parent-child interactions, available instructional material and learning opportunities, and social support offered to children may differ as a function of parental education (Jacobsen et al., 2017).

However, socioeconomic status also influences children's development through its associations with other factors. In the early years, children from low SES backgrounds are more likely to have infant health outcomes that are associated with cognitive impairments, such as low birth weight and preterm birth. Children from disadvantaged families are also less likely to have experiences that supports the development of for example vocabulary and oral language skills (Buckingham et al., 2014). In the school years, according to Buckingham et al. (2013), multiple SES-related factors may affect the development. Individual-level factors are for example gene–environment interactions, home learning environment, sleep, school attendance, and school mobility as well as individual ability and time spent in literacy activities. School-level factors are for example teacher quality and school practices, such as instruction (Buckingham et al., 2013).

Other SES-related factors that may affect the development is for example malnutrition and chronic stress. There is an association between lower SES and higher levels of stress, which in turn might impact both cognitive performance and

brain regions (Hackman & Farah, 2009). How parents interact with their children, during activities such as play, reading aloud, play, and other interactions that involving child-directed speech and supporting children's language development, might also be affected by level of financial stress (Roby & Scott, 2022). Risk factors inferring with cognitive development is especially important during the first years of childhood (MacIntyre et al., 2014).

In Paper I the included predictors (Bilingualism, LPE, CELF-CLS, and RCPM score) were not statistically significant predictors of development of SVF total score during neither summer vacation, nor formal schooling. In Paper II the included predictors (Bilingualism, LPE, School characteristics, CELF-4 CLS, and RCPM score) explained about 55% of the variance in WD performance, of which approximate 30 percentage points was shared variance between the included predictors. This leaves almost half of the variance unexplained. Future research can further aim at disentangling the (causal) relationship between both internal and external factors, at individual, familial, school, and community level, and different aspects of vocabulary development. Not only different language skills and cognitive skills (for example EF and Theory of Mind), but also other factors that has been connected to development of vocabulary skills could be included in future studies. For example, individual level factors such as sleep, nutrition, and health issues, and family level factors such as caregiver-child interactions, literacy material availability, presence of chronic stress and parental depression, and school level factors such as student characteristics and teaching practices, community level factors such as violence, and society level factors such as minority/majority language status and associated oppression could be factors to include in future studies.

In the present studies within this dissertation, 'bilingualism' was used as binary category. However, bilingual populations are in fact is diverse in terms of language proficiency and use, simultaneous/sequential language development, and majority/minority language status, which could be considered in futures studies. Furthermore, including assessment of the participants' all languages, and not just the language of instruction, would be beneficial in future studies.

As the relationship is multifactorial and interactive, this probably calls for multifactorial actions at individual, familial, school, community, and societal level in order to support the vocabulary development of all children. However, more research is needed to best target efforts made.

Future studies evaluating the effect of language-focused teacher PD

This study aimed at evaluating the effect of the CPD program on both teacher and student outcomes. However, as stated in the Discussion, some program and study design weaknesses have been identified, which may be considered when planning future studies. One way forward can be to build on the proposed core conceptual framework for evaluating PD on teachers and student (Desimone, 2009) when

planning what instruments and assessments to use to evaluate a CPD program. This could possibly identify 'points of slippage' diminishing the effect of the CPD.

The current CPD program introduced a wide range of language and communication supporting techniques in the classroom. Another approach for future studies could instead be a CPD program focusing on a narrower scope of teaching practice, for example to focus solely on strategies for vocabulary instruction.

CONCLUSIONS

In the following section, some concluding remarks regarding factors associated with vocabulary development, and the effect of the CPD program on teacher and student outcomes will be made.

Factors associated with vocabulary development

Below, I will make some conclusions on the associations between factors associated with vocabulary performance, as measured by a Semantic Verbal Fluency task, and a Word Definition task, based on the findings in the papers included in the dissertation.

- SVF TS performance in the earlies school years is, on average, positively affected by formal schooling, and negatively affected by school absence during the summer vacation. The SVF development could be predicted by bilingualism, level of parental education, general language ability, or non-verbal ability.

- For both SVF TS and WD, students in grade 2 outperformed students in grade 1. Grade can both be regarded as a proxy for age, and for educational experience, as grade 2 students are both older and have more schooling experience than grade 1 students. Paper I highlighted the importance of formal schooling for the development of SVF ability. For WD, it is not possible to disentangle an age effect from an educational effect, based on the included studies and analyses made.

- For both SVF TS and WD, monolingual students outperformed bilingual students. Paper II however, showed that bilingualism alone cannot explain poor WD results, but instead the variance in performance can be explained by general language ability, and shared variance between the included factors bilingualism, level of parental education, school characteristics, general language ability and non-verbal ability. However, almost half of the variance in the WD performance could not be explained by the included factors, indicating that other factors are related to WD performance.

- In Paper IV, the parameter resulting in the largest predicted estimates for both SVF TS and WD was School characteristics which can be regarded as a proxy for school-level SES factors. Predicted estimates between higher and lower School characteristics were much larger compared to the predicted estimates for Grade 1 compared to Grade 2, and bilingual compared to monolingual participants.

- To conclude, Papers I, II, and IV are in line with earlier studies indicating that the relationship between bilingualism, socioeconomic factors, and children's vocabulary development is multifactorial on individual, familial, school, and community level in a complex interplay. When interpreting low vocabulary skills, the child's whole context, i.e. language exposure and use both at home and at school, socioeconomic factors at individual, familial, school, and community level, quality of teaching instruction, as well as the individual's school attendance/absence, must be considered.

Effect of the CPD on teacher and student outcomes

The underlying assumption of teacher PD is that there is a connection between teachers taking part in a PD activity, which changes their knowledge, skills, attitudes, beliefs, confidence and/or commitment, and in turn their teaching practices and behaviour, which alters their students' learning trajectories. Although it was not possible to evaluate the teachers practices as a result of the CPD program, due to restrictions in the ethical permit, the CPD program was evaluated on both teacher and student outcomes. Below are some conclusions based on the studies included in this dissertation.

- Participating teachers were in general interested and active during the CPD program and gave an overall positive evaluation of it.

- For the teachers' self-reported self-efficacy of classroom management (i.e., for example how to handle disruptions in the classroom, while keeping focus on the teaching), and their self-reported ability regarding actions and interactions in the classroom (for example voice use and speech rate, and ability to support the students' vocabulary development), the teachers rated their ability high already prior to taking part in the CPD program. Comparisons between the intervention and the control condition revealed no statistically significant changes on teachers' self-reports as a result of taking part in the CPD.

- Qualitative analyses showed a somewhat different picture. During the CPD, participating teachers discussed the content in relation to their teaching practices and gave numerous examples indication a growing knowledge base. Thematic analyses of statements after taking part in the CPD showed increased knowledge for example in relation to language and communication strategies, useful materials, leadership/classroom management, and physical environment, and a need for more knowledge.

- Effect on the students' vocabulary development was evaluated with two outcome measures: a Semantic Verbal Fluency task and a Word Definition task. Results indicated that the CPD might have a positive impact on WD performance, but not on SVF performance.

- To conclude, Paper III and IV indicate that CPD program of this sort may result in some signs of change in teachers' knowledge and their students' WD development, but there is no guarantee that taking part in a teacher CPD results in clearly improved teacher or student outcomes.

Sammanfattning på svenska

Bakgrund

Under skolåren utvecklas flera aspekter av elevernas ordförråd. För skolframgång är det viktigt att ha ett välutvecklat ordförråd både gällande bredd (hur många ord personen kan), djup (hur mycket kunskap personen har om de olika orden i ordförrådet), organisation (hur ord relaterar till andra ord), och hur ord används i olika sammanhang. När barn går i skolan möter de även andra typer av ord, än vad som brukar användas till exempel i vardagliga samtal. Detta kallas ibland ’akademiskt ordförråd’, eller ’ämnesövergripande’, respektive ’ämnesspecifika’ ord.

Det finns tidigare studier som visar att flerspråkiga elever, och då särskilt de som lär sig skolspråket som ett andraspråk, och elever som kommer från lägre socioekonomiska förhållanden, ofta presterar lägre på ordförrådstester. Men det finns även flera andra faktorer, på individ-, familje-, skol-, och områdesnivå, som har kopplats till ordförrådsutveckling. Fortfarande är det mycket vi inte vet om det komplexa samspelet mellan olika faktorer associerade med olika aspekter av ordförrådsutveckling.

I Sverige har vi för närvarande tio års skolplikt, som startar med förskoleklass höstterminen året då barnet fyller sex år. Skolgång räknas som en rättighet för alla barn. I svenska klassrum finns ofta en mångfald av kulturer och språklig bakgrund. Det finns ofta en stor spridning gällande språklig förmåga, skolbakgrund, kunskapsluckor, och stödbehov bland eleverna, vilket ställer nya krav på lärarna.

Lärare spelar en viktig roll när det gäller att stötta ordförrådsutvecklingen hos alla elever, oavsett bakgrund och stödbehov, i skolan. Internationella studier har pekat på att ordförrådsundervisning sällan är i linje med vad som rekommenderas utifrån forskning, och många lärare uppger sig vara osäkra på hur man stöttar ordförrådsutvecklingen för alla elever. Olika lärarfortbildningsinsatser kan vara ett sätt att vidareutveckla lärares förmåga att stötta elevernas ordförrådsutveckling i klassrummet. Det finns bara ett fåtal forskningsstudier på lärarfortbildningar inriktade på att stötta elevernas språkutveckling som visar positiva resultat på dels de deltagande lärarna, men ännu viktigare, på deras elevers språkutveckling.

Avhandlingens delstudier

De fyra delstudierna i den här avhandlingen har två övergripande syften: 1. Undersöka faktorer som är associerade med ordförrådsutveckling i de tidiga

skolåren. 2: Utvärdera effekten av en lärarfortbildning på de deltagande lärarna, samt på deras elevers ordförrådsutveckling.

Deltagarna i studierna var 25 lärare, som undervisar i årskurs 1 och 2 i grundskolor i södra Sverige. Lärarna rekryterades för att ta del i en lärarfortbildning med syftet att vidareutveckla lärarnas förmåga att stötta elevernas språk- och kommunikationsutveckling. Eleverna i de deltagande lärarnas klasser bjöds också in att delta i studien, för att kunna utvärdera effekten av lärarfortbildningen på elevernas språkutveckling. Totalt tackade 224 elever ja samt deltog vid minst ett testtillfälle (av totalt tre eller fyra testtillfällen, beroende på grupptillhörighet).

Lärarna delades in i två olika 'interventions-villkor' som antingen fick gå lärarfortbildningen direkt eller längre fram. De lärare som fick gå fortbildningen längre fram fungerade som en 'kontrollgrupp'. Kontrollgruppens lärare undervisade som vanligt under den period då direktinterventionsgruppen fick lärarfortbildning. Detta gjordes för att kunna jämföra utvecklingen mellan de lärare, och deras elever, som gick lärarfortbildningen, med kontrollgruppens lärare, och deras elever, som hade ordinarie undervisning.

Lärarna och eleverna i båda interventionsvillkorer testades med olika uppgifter före och efter deltagande i lärarfortbildningen. 'Kontrollgruppen' hade två bedömningstillfällen innan de sedan deltog i fortbildningen. Direktinterventionsgruppen hade ett uppföljande bedömningstillfälle tre månader efter lärarfortbildning. Kontrollgruppen hade inte detta uppföljningstillfälle efter tre månader, då det i så fall hade hamnat under sommarlovet. Studie I och II använder data som är insamlad innan de deltagarnas lärare genomgick lärarfortbildningen. Studie III och IV använder data som samlats in innan och efter lärarfortbildningen, för att utvärdera effekten av denna.

De deltagande elevernas ordförråd bedömdes genom två ordförrådsuppgifter. En av uppgifterna var en ordflödesuppgift, där eleverna skulle säga så många djur respektive så många kläder de kunde komma på under en minut per kategori. Ordflödesförmåga är, bland annat, kopplat till ordförrådsstorlek och -organisation, och hur väl deltagaren kan söka och plocka fram ord från ordförrådet. Den andra uppgiften var en orddefinitionsuppgift där de deltagande eleverna skulle förklara betydelsen av tio ord som är vanligt förekommande i undervisningssituationen i de tidiga skolåren. De tio orden var: hoppa, spela, rubrik, välja, uppgift, berätta, tillsammans, fundera, skillnad och vuxen. Orddefinitionsförmåga är, bland annat, kopplat till ordförrådsdjup (hur djup kunskap deltagaren har om de olika orden i uppgiften), och hur väl deltagaren kan formulera tydliga och koncisa definitioner, i en konventionell form. Den här uppgiften kräver alltså flera olika förmågor relaterade till ordförråd, grammatik och kommunikativa förmågor (som att anpassa svaret till lyssnaren).

Studie I

Studie I undersökte hur 68 deltagande elevers (åldersspann: 6:5 – 9:1 år) ordflödesförmåga utvecklades under sommarlovet, respektive under höstterminen

när de deltog i undervisning. Tidigare studier har visat en stadig ökning av ordflödesförmågan med ökad ålder, under skolåren. I Studie I, fann vi istället en nedgång i ordflödesförmågan när eleverna kom tillbaka till skolan efter sommarlovet. Deltagarnas poäng var alltså i genomsnitt lägre efter sommarlovet, än innan sommarlovet. Vid en ny bedömning i slutet av höstterminen hade eleverna hämtat igen nedgången, men det fanns ingen statistiskt säkerställd utveckling jämfört med bedömningen innan sommarlovet. Detta kan innebära att ordflödesförmågan utvecklas av aktiviteter och interaktioner som är vanliga i undervisningssituationen, men kanske är mindre vanliga i hemsituationen.

I Studie I undersökte vi även om skillnader i utveckling under sommarlovet samt under höstterminen kunde förklaras av bakgrundsfaktorer. De bakgrundsfaktorer vi inkluderade i studien var föräldrarnas utbildningsnivå, en/flerspråkighet, deltagarnas generella språkliga förmåga, samt deras icke-verbala förmåga. Dessa faktorer kunde dock inte förklara de skillnader vi såg i utvecklingen mellan olika deltagare, varken under sommarlovet eller under höstterminen.

Studie II

Studie II undersökte 208 deltagande elevers (åldersspann: 6:8 – 9:0 år) prestationer på orddefinitionsuppgiften. Uppgiften bedömdes med två mått: ordkunskap, där eleverna fick ett poäng per ord om definitionen innehöll åtminstone delvis korrekt information. Uppgiften bedömdes också utifrån mängden information som orddefinitionerna innehöll på en skala från 0 – 3 poäng per ord. Gruppen med enspråkiga deltagare presterade högre än gruppen med flerspråkiga deltagare på båda måtten.

Studie II undersökte vidare i vilken omfattning bakgrundsfaktorer kunde förklara skillnader i prestationer på orddefinitionsmåttet. De bakgrundsfaktorer som inkluderades var en/flerspråkighet, föräldrars utbildningsnivå, ‘elevunderlag’ (ett index uträknat för de olika skolorna baserat på andel av eleverna som har svenska som modersmål, samt andel elever vars föräldrar har eftergymnasial utbildning), deltagarnas generella språkförmåga, samt deras icke-verbala förmåga. Dessa faktorer lades till ”stegvis” i statistiska modeller. När enbart en/flerspråkighet lades in i modellen så kunde det förklara 15 % av spridningen i prestationer. Men när fler bakgrundsfaktorer lades till, så sjönk andelen som en/flerspråkighet i isolering kunde förklara. Med alla fem bakgrundsfaktorer inlagda i modellen så kunde flerspråkighet i isolering enbart förklara 0.44 % av spridningen i prestationer (och den var heller inte längre statistiskt säkerställd). Så även om de flerspråkiga deltagarna i genomsnitt presterade lägre än de enspråkiga deltagarna så är det inte flerspråkighet i sig själv (till exempel i form av att flerspråkiga deltagare inte exponerats lika mycket för svenska som de enspråkiga deltagarna har gjort) som kan förklara den här skillnaden vi ser mellan grupperna. I stället ser vi en interaktion mellan faktorer på individ-, familje-, och skolnivå. Analyserna visade även att generell språklig förmåga är kopplat till prestation på orddefinitionsuppgiften, vilket

inte är förvånande då det är en komplex uppgift som kräver flera olika språkliga och kommunikativa förmågor.

Vidare såg vi i Studie II att många deltagare saknade, hade en grund, eller till och med felaktig, kunskap om de tio ord som ingick i uppgiften. Elever kan kanske använda ett ord, på ett ytligt sätt, i vissa sammanhang, men sakna en djup kunskap om ordet och hur det används i andra sammanhang. Brister i ordförrådet innebär alltså inte bara relaterat till ordförrådets storlek, utan även i ordförrådsdjup, vilket är viktigt för lärare att vara medvetna om.

Studie III

Studie III undersökte effekten av lärarfortbildningen på lärarna, baserat på självskattningar samt kvalitativa analyser av vad lärarna uttryckte under strukturerade samtal före och efter deltagande i lärarfortbildningen. Lärarfortbildningen togs överlag emot väl och var uppskattad av de deltagande lärarna. Deltagarna kom förberedda till tillfällena och hade med sig egna erfarenheter och exempel att diskutera. Kvalitativa analyser indikerade, bland annat, tecken på ökad kunskap hos lärarna, men också att de uttryckte att de fortsatt behövde mer kunskap, kring till exempel hur de ska stötta alla elever i deras utveckling. Lärarnas självskattningar av aktiviteter och interaktioner i klassrummet samt klassrumsledarskap visade ingen statistiskt säkerställd effekt av att lärarna deltagit i fortbildningen.

Studie IV

Studie IV undersökte effekten av lärarfortbildningen på elevernas ordförrådsutveckling, mätt genom ordflödesuppgiften samt orddefinitions-uppgiften. Elevernas ordflödesförmåga ökade över tid, men inte som ett resultat av att deras lärare deltog i lärarfortbildningen. När det gäller orddefinitionsuppgiften tyder analyser av utvecklingskurvorna för de olika interventionsvillkorer en viss effekt av lärarfortbildningen på elevernas prestationer. Dock har vi inte tillräckligt starka bevis för att helt kunna säkerställa att detta enbart är ett resultat av att lärarna deltog i fortbildningen.

Slutsatser

Sammanfattningsvis visar studierna i avhandlingen att det är en interaktion mellan flera olika faktorer relaterade till elevers ordförrådsutveckling i de tidiga skolåren. När en elevs prestation på ordförrådsbedömningar ska tolkas måste flera olika aspekter tas i beaktande. Vidare visar studierna i avhandlingen att en lärarfortbildning av den här omfattningen, innehåll och upplägg, kan ge vissa tecken förändringar hos de deltagande lärarna, och på deras elevers orddefinitionsprestation. Det finns dock inga garantier att lärarfortbildning resulterar i tydligt förbättrade resultat hos lärare eller deras elever.

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When you embark on a journey it is often a good idea to have some, at least vague, idea of where you want to end up and what you want to experience on the way. You plan a route, gather the equipment and travel partners, and then you…take off into the unknown. But no matter how much you plan; the whole point of a journey is that you cannot foresee everything in advance. For some people, the point of a journey is reaching a destination, but for others: *är det vägen, som är mödan värd* (Boye, 1927). And what a journey the past (almost 7 years) has been! The days of doldrums have been quite scarce. Instead, the voyage has often been filled with sunny days and wind in the sails, but also storms and heavy rain, when one really had to hold on to the gunwale to prevent falling off and drowning. It took longer than anticipated, but now I have reached my destination. The journey changed me profoundly, and there is no turning back now.

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and there are many people to whom I owe much gratitude

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Now I have reached my destination on this journey. But this, however, is just a pit stop, and hopefully not the end destination.

Så länge skutan kan gå, så länge hjärtat kan slå.
Så länge solen, den glittrar på böljorna blå.
(Taube, 1960)

Bryt upp, bryt upp! Den nya dagen gryr.
Oändligt är vårt stora äventyr.
(Boye, 1927)

Kan hende jeg seiler min skute på grunn;
men så er det dog deilig å fare!
(Ibsen, 1862)

At last, to the reader: thank you for reading and an apology:

> I am sorry that I have had to leave so many problems unsolved. I always have to make this apology, but the world really is rather puzzling and I cannot help it.
>
> (Russell, 1919, p. 206)

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Vocabulary development in the early school years

This thesis presents four studies related to two overarching themes: 1. How summer vacation and formal schooling, as well as demographic factors such as level of parental education and bilingualism, are associated with vocabulary development in the early school years, and 2. The effects of a language and communication focused teacher Continuing Professional Development (CPD) program on both the participating teachers and on the vocabulary development of their students.

The studies showed that there is an interaction between several factors associated with vocabulary development, and no factor in isolation can explain the variance. When analysing performance on vocabulary assessments, several aspects must be taken into account. Furthermore, a teacher CPD program of this duration, content, and approach may result in some signs of change in teachers' knowledge and their students' vocabulary skills, but there is no guarantee that teacher CPD results in clearly improved teacher and/or student outcomes.

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