Title	Mandarin vocabulary growth, teacher qualifications and teacher talk in child heritage language learners
Author(s)	He Sun and Marjolijn Verspoor
Source	*International Journal of Bilingual Education and Bilingualism,* (2020)
Published by	Taylor & Francis (Routledge)

Mandarin Vocabulary Growth, Teacher Qualifications and Teacher Talk in Child Heritage Language Learners

He Sun

National Institute of Education, Nanyang Technological University, 1 Nanyang Walk, Singapore, 637616, email: he.sun@nie.edu.sg

Marjolijn Verspoor

Department of English Language and Culture, University of Groningen, Oude Kijk in 't Jatstraat 26, Groningen, the Netherlands, 9712 EK, email: m.h.verspoor@rug.nl

University of Pannonia, Veszprem, Hungary

Corresponding author: He Sun

Center for Research in Child Language, National Institute of Education, Nanyang Technological University, NIE5-B3-16, 1 Nanyang Walk, Singapore 637616, email: he.sun@nie.edu.sg

ABSTRACT

Teacher talk has been found to significantly affect children's early language development during shared book reading; however, the mechanism of such influence remains unclear. The current study has zoomed in on vocabulary development in Mandarin as a heritage language (HL) in Singapore kindergartens, 1) exploring the linguistic features (i.e., lexical diversity and syntactic complexity) of these teachers; and 2) investigating the mediation effects of the significant linguistic feature(s) in teachers' qualifications (i.e., degree, experience, and language proficiency) and children's Mandarin vocabulary growth. 31 Mandarin teachers and 441 English-Mandarin bilingual children (4-5 years old) were investigated during their shared book reading sessions. Teacher talk was transcribed with CHAT and two indicators of language complexity (D and Mean Length of Utterance in word) were calculated with CLAN. The mediation effects of teachers' language complexity were explored using a path model. Results showed that after controlling for the children's initial vocabulary, maternal education, nonverbal intelligence, and gender, teachers who used more complex syntax were found to be associated with children's higher growth in Mandarin receptive vocabulary over a school year. Teachers' qualifications (i.e., experience and Mandarin proficiency) had no direct influence on children's language growth, but demonstrate their impact via teachers' syntactic complexity.

Keywords: child heritage language learners, Mandarin input quality, shared book reading, receptive vocabulary, teachers' qualifications, Mean Length of Utterance

Mandarin Vocabulary Growth, Teacher Qualifications and Teacher Talk in Child Heritage

Language Learners

Although good bilingual competence has been advocated worldwide and considered an asset of postmodern citizens (UNESCO, 2013), a common outcome of bilingualism is "one language wins over the other", often resulting in the heritage language (HL) as "the weaker language of the bilingual dyad" (Polinsky & Scontras, 2020, p.4). This is the case in Singapore, where bilingualism is considered the foundation of its educational system, while the gap of language usage and proficiency between children's English and HLs (called mother tongue languages in the local documents; Mandarin, Malay, and Tamil) is substantial (Sun, Yin, Amsah, & O'Brien, 2018). English is the majority language with its social and political power in the local landscape (Ng, 2014) and is quickly replacing the range and functions of HLs (Sun, Ng, O'Brien, & Fritzhe, 2020). English has so much prestige that today's parents in Singapore deliberately cultivate their children's English language from a young age (Ng, 2014; Sun, Yin, et al., 2018) and many speak English with their children at home. Reports from the Ministry of Education in 2009 demonstrated that 59% of children from the primary one cohort were from English dominant families, and the figure has increased 10% since 2004 (Oon & Kor, 2009). According to Cavallaro and Ng (2014), the various ethnic groups in Singapore are similar in many ways to the immigrant population in the United States (Carnevale, 2009) and in Australia (Cavallaro, 2010; Clyne, 2003), where the local communities are composed of a HL dominant older generation, a largely bilingual middle-aged generation (proficient in English and the HL), and an English-dominant younger generation.

To curb this English dominance in the youngest generation, the Singapore Government has promoted the learning of the HL at home and at school, aiming at providing children with an

anchor in their ethnic and cultural traditions (Gopinathan, 2004). Therefore, most preschools, which are usually taught in English, offer additional classes to cultivate the children's HL, in our study Mandarin, and literacy skills; however, the number of instructional hours in Mandarin at these schools are quite limited. With such a limited exposure to Mandarin, the quality of the teacher in terms of degrees and experience and the type of Mandarin in terms of complexity the teacher uses might be crucial factors in the children's language development. The current study aims to explore the relation between teacher qualifications, teacher talk, and Mandarin vocabulary development in bilingual children with English as the dominant language and Mandarin as the HL attending kindergarten classes in Singapore.

Background literature

Previous studies have tended to address the "high-quality" issue by examining teachers' qualifications. Teachers' degree, experience and domain knowledge, have been suggested as key indexes for a teacher's capacity to conduct effective instruction (DOE, 2004a, 2004b; Goe & Stickler, 2008). Policymakers and program leaders sometimes prioritize qualifications as a strategy to ensure quality of teaching (Early et al., 2007). However, findings concerning the relation between teacher qualifications and child language attainment have been mixed (Connor, Son, Hindman, & Morrison, 2005; Darling-Hammond & Youngs, 2002; Falenchuk, Perlman, McMullen, Fletcher, & Shah, 2017). Early and colleagues (2007) systematically reviewed seven major studies in the US using teachers' degree to predict 4-year-old children's outcomes, controlling for children's previous vocabulary score and other demographic features, found no relation between the teacher's highest degree and the children's receptive vocabulary. Similarly, meta-analyses on the relationship between teacher experience and children's vocabulary revealed mixed findings and the positive effects of teaching experience were found to be small in general

(Goldhaber & Brewer, 2000). To directly link teachers' qualifications with children's outcome implies that the key indexes of the former, such as teaching experience and degree, would affect teachers' instructional behavior and teacher talk (i.e., teaching process), which in turn impacts children's learning outcome (Connor, Son, Hindman, & Morrison, 2005). However, the role of teacher talk has rarely been examined in relation to teachers' qualifications and children's language outcome. In those that did, teacher talk was commonly treated as "a simple set of distinct behaviors that can be quickly measured by teacher survey", as pointed out by Connor and colleagues (2005, p.345). Such a simplification of teacher talk, usually due to limited time and resources, may lead to the loss of key information as teachers may overestimate what they have accomplished in class (Dickinson & Tabors, 2001). Therefore, the key to untangling the relationship between teachers' qualifications and children's vocabulary acquisition is to use a more reliable approach to examine teachers' language practice in class.

While the direct contribution of teacher qualifications to children's language outcome remains uncertain, the benefit of using appropriate linguistic cues to promote children's vocabulary is much more evident. The role of teachers' input on children's vocabulary learning can be interpreted from the perspective of Vygotsky's zone of proximal development (1978), which stresses that learning occurs within an interactional context where expert persons (e.g., parents or teachers) scaffold children to fill in the gap between children's current capacity and what the task demands. Also recent language developmental theories, such as usage-based theory (Tomasello, 2000) and heritage language model (Polinsky & Scontras, 2020), stress the importance of input. Tomasello (2000) argued that children learn from utterances, the most fundamental psycholinguistic unit he proposed. In order to have children use more complex forms, they should be provided sufficient language exemplars to allow language entrenchment

and abstraction to happen (Behrens, 2009; Lieven, 2019). Polinsky and Scontras (2020) consider input as "the triggers of divergence between heritage speakers and the relevant baseline" (p.14) in their recently proposed HL model. They argue that HL learner's input might be qualitatively different from that of the dominant societal language, as the former has less diversity in resources, and shrinking community size and prominence. They emphasize the importance of schooling, as it would expose HL learners to certain registers (e.g., literacy language) that they might not encounter elsewhere.

Children's early oral language development is believed to be crucial in providing the foundation for children's later literacy, social skills, and academic performance (Dickinson & McCabe, 2001; Sun, Yussof, et al., 2018). Vocabulary knowledge is a fundamental aspect of oral language (Sun, Steinkrauss, Wieling, & de Bot, 2018) and has shown to significantly influence both monolingual (Dickinson & Smith, 1994) and bilingual (August, Carlo, Dressler, & Snow, 2005) children's academic performance. Dickinson and Porche (2011) also assume that high-quality preschool experience promotes early oral language development, but they argue that little is known about the specific features of the preschool classroom that contribute to language acquisition, such as the development of vocabulary.

Two types of linguistic cues that have been found to be associated with monolingual children's vocabulary development (Barnes & Dickinson, 2017) are teachers' lexical diversity (Bowers & Vasilyeva, 2011; Barnes & Dickinson, 2017) and syntactic complexity (Huttenlocher, Vasilyeva, Cymerman, & Levine, 2002; Vasilyeva, Huttenlocher, & Waterfall, 2006). The benefits of lexical diversity seem obvious: the variety of the lexicon increases the probability that a child learns more novel words. Besides, new words are presented together with children's "known words", which constrain the possible interpretation of the new word (Rowe, 2012). A

caregiver's diversified lexicon may have a better chance to overlap with the child's existing vocabulary knowledge. Pan, Rowe, Singer, and Snow (2005) proved this association with data collected in a family setting. The researchers focused on the relationship between parental talk and children's vocabulary growth in low-income families in rural New England. They found that maternal word type was a strong predictor of children's vocabulary growth. However, for bilingual children, the contribution of the teacher's diverse vocabulary might be less straightforward than for monolingual children. For instance, Bowers and Vasilyeva (2011) examined 104 four-to-five-year old English language learners in the great Boston area in the United States, and found that for the monolingual children (n=75), vocabulary growth was positively and significantly related to the teacher's lexical diversity. However, for the bilingual children in the same classes (n=29), this relation did not exist. The researchers argued that the limited vocabulary knowledge of the bilingual children constrained them from benefitting from the teacher's low-frequency word input. Other studies show a positive effect of language use in class and vocabulary growth in bilingual children. For example, Rydland, Grøver, and Lawrence (2014) found that for Turkish immigrant children growing up in Norway ($n = 26$) maternal education was the only variable that predicted children's Norwegian vocabulary growth early on, but once in school, teacher-led talk (in addition to peer talk, and neighborhood) predicted children's L2 vocabulary skills at age five, and these differences were maintained up to age ten. Also, in another study with preschoolers with Turkish as their L1 and Norwegian as their L2 ($n = 25$), Aarts, Demir-Vegter, Kurvers, and Henrichs (2016) found that vocabulary richness and discourse complexity in group conversations predicted first grade vocabulary (i.e., receptive vocabulary and word definition skills).

As far as the caregivers' syntactic complexity is concerned, there are mixed findings in terms of children's vocabulary growth (Bowers & Vasilyeva, 2011; Tardif, Shatz, & Naigles, 1997). Children's vocabulary learning may benefit from hearing well-formed sentences, where individual words are embedded in basic grammatical relations (Furrow, Nelson, & Benedict, 1979) and children could apply their syntactic knowledge to bootstrap word meaning (Gleitman, 1990). If the input is too complex to process, it is argued that children might filter out such utterances, which would not influence their language learning negatively (Hoff, 2006). Previous studies have found that the caregiver's syntactically complex utterances (i.e., longer mean length of utterance in word (MLU-w) are positively related to the vocabulary size of both monolingual children (Bornstein, Haynes, & Painter, 1998; Hoff & Naigles, 2002) and bilingual learners (Gámez & Lesaux, 2012). Gámez (2015) demonstrated that the teachers' language in terms of structural complexity and lexical diversity was positively related to language gains in young Spanish learners of English (n = 101). In the same dataset, Gámez and Levine (2013) found that there was great variation in teachers' speech across classrooms and that gains in the learners' expressive language skills were positively related to the diversity of teachers' vocabulary and teachers' syntactic complexity. Such findings suggest that the quality of teachers' language input, is important in the language learning trajectories of learners of second languages. Other researchers, however, found a negative association between teachers' syntactic complexity (i.e., MLU) and children's English vocabulary learning (e.g., Barnes & Dickinson, 2017, in the monolingual context; Bowers & Vasilyeva, 2011, in the bilingual context). Their findings suggest that children who have limited language proficiency may benefit from hearing simplified language.

The Current Study

The current study uses a data subset of The Singapore Kindergarten Impact Project (SKIP), which was designed to track Singaporean kindergarteners' development in language (English and HLs), numeracy, and other cognitive domains, exploring how kindergarten and family may influence such growth. The schools are taught mainly in English, and Mandarin as the HL is taught for a few hours per week. This study aims to explore the relationship between (1) teacher qualifications (in terms of degree, years of teaching, and Mandarin proficiency), (2) teacher talk in terms of lexical diversity and syntactic complexity, and (3) the children's Mandarin vocabulary development.

We hypothesize that 1) teachers' language complexity would significantly affect children's vocabulary development, and 2) teacher qualifications influence children's language indirectly via their language complexity. For the second hypothesis, we will relate teacher qualifications to teacher talk and to children's vocabulary development at the same time, so that we can investigate the mechanisms of teacher qualifications operating on children's language outcome. This hypothesis is tested by examining both direct (i.e., the relation between teacher qualifications and children's vocabulary) and indirect paths (i.e., the relation via teachers' language complexity) from each teacher qualification to children's vocabulary outcome. If the direct paths are significant, the results indicate that teacher qualifications exert influence on children's outcome via mechanisms other than teachers' language complexity. However, if the indirect paths are significant, the results will suggest that teacher qualifications per se do not modulate children's vocabulary outcome. They may affect teachers' instruction and exert influence via teachers' language complexity (Figure 1).

<Insert Figure 1 here>

The questions are as follows:

1. Which linguistic complexity aspect(s) of the teacher's Mandarin talk are significantly associated with the children's Mandarin vocabulary development?

2. Do the significant linguistic complexity aspect(s) of teacher's Mandarin talk function as mediator between the teacher qualifications and children's vocabulary development?

METHODS

Participants

Participants were recruited from various preschool education providers, including 24 community-based childcare centers and kindergartens, 10 Ministry of Education kindergartens, 18 non-profit kindergartens, and 2 commercial kindergartens. There were 31 Mandarin teachers who taught 505 children in total, 441 of whom are English-Mandarin bilinguals. The other 64 children, who were from various ethnic backgrounds, such as Malay, Indian, Japanese, and Spanish, were not included as they may have had significantly different input experiences outside class than the English-Mandarin bilinguals.

The 441 English-Mandarin bilingual children were aged between 48 to 60 months (M=53.95, SD=0.29), with a good gender distribution (i.e., 228 boys and 213 girls). The children came from families with differences in socioeconomic status. Most parents had a college or bachelor degree as their highest qualification (e.g., mother's education; M= 7.25, SD=2.42, range=0-11, ranging from "No qualification" to "Doctorate"). The family income (i.e., father's and mother's income combined) per month was approximately S$6500 to 6999 ($M$=13.16, SD=5.68, *range*=0-19, with an increment of S$500 for each higher level). A recent threshold for

poverty of households in the Singapore was set as S\$2500 (Donaldson, Loh, Mudaliar, Kadir, & Wu, 2013); thus the majority of the families in this study were well above the poverty line.

Data Collection and Transcription

The teachers' talk data was collected during shared book reading because it is a widely adopted activity at preschool and has been repeatedly found to be effective in promoting young children's language development (National Early Literacy Panel, 2009), vocabulary learning in particular (Barnes & Dickinson, 2017; Sun, Toh, Steinkrauss, 2020). Moreover, Dickinson, Hofer, Barnes, and Grifenhagen (2014) compared teachers' language complexity between different instructional settings at preschool, including book reading, group content instruction, and small group instruction. They found that teachers in shared book reading sessions had the richest mixture of academic language elements, with relatively high lexical diversity, more syntactic complexity, and more talk about vocabulary.

Data from three different visits to the schools were used. The child participants were tested twice on the Mandarin Chinese receptive vocabulary tests (M=12.61, SD=.94) with approximately twelve months in between. The first test was between the second and the fourth month of the first year and the second test between the second and the fourth month in the second year at kindergarten.

The Mandarin shared book reading sessions were recorded at a visit in the middle of the first year of kindergarten. Two research assistants video-recorded instructions in each classroom for three to four hours. Teachers were asked to wear a microphone clipped to their collars during the video recording. 37 Mandarin story book reading sessions from 31 teachers' observations were collected as some teachers read two books on the same day to the same group of children.

For teachers with two story book reading sessions, their average performance was used in the model analysis. Story book reading sessions lasted for 11.14 minutes on average (*SD*=5.41), yielding a decent amount of teachers' data as other studies have demonstrated that ten minutes recording on one day provides a reliable estimation (Dickinson & Porche, 2011; Dickinson et al., 2014). Teachers usually started the reading session with an announcement (e.g., "好, 小朋友, 我们来看这本书啊." Ok, let's read this storybook) and ended it with another formulaic sentences (e.g., "今天的故事讲到这里." Let's finish it now for today).

The video data were transcribed by two research assistants, majoring in psychology and linguistics respectively, who had received two days of training using the Codes for the Human Analysis of Transcripts (CHAT) conventions (MacWhinney, 2000). A consensus was reached to parse the teachers' speech into utterances based on intonation and pauses. Three videos (approximately 10% of the data) were arbitrarily chosen for reliability checks and the percentage of agreement between the raters were 93% at the transcription level. As Mandarin has no delimiter to mark word boundaries as languages such as English, we used a widely adopted Python wrapper PyNLPIR (https://pypi.org/project/PyNLPIR/) to transform the Chinese character strings of the transcriptions into words. Based on large Chinese corpuses, PyNLPIR uses a hierarchical hidden Markov model to conduct Chinese lexical analysis and segmentation (for detail, see Zhang, Liu, Cheng, Zhang, & Yu, 2003).

Measures

Teacher Qualifications. The three indexes of teacher qualification were derived from the HL teacher survey used in the larger SKIP longitudinal project. Teachers provided information such as their highest degree, teaching experience at kindergarten (in years), Mandarin language

ability, and their attitude towards bilingualism and early Mandarin education. Out of the 31

female Mandarin teachers, 26 participated in this survey. They had taught in kindergarten for

12.27 years on average (*SD*=8.67). The majority had obtained a degree in early childhood care

and education, one had a special diploma in early childhood care and education, two held a

bachelor's degree, and one held a master's degree. Teachers were specifically asked whether

they held a diploma in teaching the Chinese language, and seven of them had such a degree.

Teachers were also asked to self-evaluate their listening, speaking, reading and writing abilities

and the average scores (*M*=6.2, *SD*=.83) indicated that the majority was quite fluent and could

use Mandarin for social and academic purposes quite adequately. Teachers demonstrated a

positive attitude towards bilingualism. Twenty-four of the teachers agreed or strongly agreed that

Bilingualism is a basic need of the Singapore community. All but one teacher firmly believed

that children would learn Mandarin more easily if they start earlier and that being a bilingual is

advantageous in the job market. The majority of the teachers believed that the purpose of

teaching the Mandarin language is to develop children's Mandarin literacy skills, to promote

social and moral rules, and to appreciate Chinese culture. Approximately 70% of the teachers

agreed or strongly agreed that children did not have enough opportunities after class to use their

Mandarin.

Language Complexity. The teacher's language complexity was assessed with lexical and

syntactic complexity measures in line with the literature (Dickinson et al., 2014; Hoff, 2003). For

lexical use, the D-value was used. The D-value measures how many new words are brought into

the speech over time while controlling for the number of utterances (Durán, Malvern, Richards &

Chipere, 2004). A higher D-value indicates more diverse vocabulary, but not necessarily more

sophisticated vocabulary. For syntactic complexity, the MLU-w was used. MLU-w reveals the

average number of words per utterance and is a rough indicator of the structural complexity of speech. More complex structures, such as multiclause sentences, usually have more words than simpler once.

CHILDES (MacWhinney, 2000) was used to calculate both the D-value and the MLU-w. The results reveal a huge variation among teachers in language complexity. The average D-value of the 31 Mandarin teachers is 72.58 (*SD*=14.36) and the figure ranges from 45.01 to 100.38. Teachers' average MLU-w is 7 (*SD*=1.34), ranging from 3.99 to 9.14.

As the teachers used texts from 28 different storybooks, differences in book text complexity may have affected teacher talk. Therefore, the D-value and the MLU value for each text was calculated and compared to the teacher's language complexity. On average, each text had 197 words with 93 word types. The mean D-value is 51.52 (*SD*=28.69) and the mean MLU is 8.66 (*SD*=2.46). The correlation between the teachers' language complexity and the texts' complexity is shown in Table 1. As there is no significant correlation between text complexity and teachers' language complexity, we concluded that the teachers' language complexity was not related to text complexity.

<Insert Table 1 here>

Mandarin Vocabulary. The children's Mandarin receptive vocabulary was assessed with the Bilingual Language Assessment Battery-Mandarin version (BLAB-mandarin; Rickard-Liow, Sze & Lee, 2013), a locally developed and standardized receptive picture vocabulary task. It is similar to the Peabody Picture Vocabulary Test in format, and each trial has four choices, with 80 trials in total. Children were asked to identify the picture that matched the word they heard over the headphone. The BLAB vocabulary test was reported reliable in the bilingual Singapore

context in its original norming sample (alphas of .75 –.77) (Rickard-Liow et al. 2013). The children's Mandarin receptive vocabulary was assessed in kindergarten 1 (to be used as a control variable) and again in kindergarten 2 with approximately one year in between to measure gains. Children were able to comprehend approximately 30 Mandarin words of the BLAB test (M=29.62, SD=8.31) in kindergarten 1, and approximately 35 words one year later (M=34.52, SD=9.07) in kindergarten 2.

Consistent with previous studies (e.g., Cavallaro & Ng, 2014; Sun, 2019), the child participants in the current study were found to be exposed to an English dominant language environment. The parental questionnaire revealed that 76.4% of the children in the current study spoke primarily English at home. Approximately 80% of their multimedia exposure (e.g., TV and movies) was in English (M=79.55%, SD=20.6). Paired sample t-tests further revealed a discrepancy between children's English and Mandarin environments. Children had significantly more English books (M=4.06, SD=1.56) than Mandarin books (M=2.95, SD=1.16) at home; $t(386)$= 17.53, p<.001. They read English books (M=3.56, SD=2.16) more often than Mandarin books (M=2.09, SD=1.9) per week; $t(367)$= 13.44, p<.001. Moreover, they started to use English (M=2.02, SD=1.03) substantially earlier than they spoke Mandarin (M=2.41, SD=1.09); $t(355)$=-5.43, p<.001. Not only was the children's English language exposure greater, but their language proficiency was also better in English. For instance, the children's English vocabulary size was significantly larger than their Mandarin vocabulary size at K1 ($t(420)$= 11.24, p<.001) and K2 ($t(345)$= 15.23, p<.001).

Data Analysis

For the first research question, we conducted a linear mixed-effects model to explore the answer. A linear mixed-effects regression model (using the lme4 package in R) with scores in vocabulary test 1 as a control variable was used to explore which factors were significantly associated with children's Mandarin vocabulary size in the second year of kindergarten. Compared to traditional approaches such as ANOVA, the mixed-effects model is more appropriate to handle datasets with nested structures as in our study (Baayen, 2008), where children are nested in classes and schools.

For the second research question, we used structural equation modeling (SEM; IBM SPSS AMOS 25) to assess the postulated relationships. As a multivariate latent trait technique, it permits the exploration of multiple correlational assumptions with maximum likelihood. Four measures of fit for our models were selected based on the literature (Klem, 2000), including Chi-square, Tucker and Lewis's fit index (TLI), comparative fit index (CFI), and the root mean square error of approximation (RMSEA). A non-significant Chi-square implies that the theoretical model does not differ significantly from the data-driven model. As Chi-square is sensitive to sample size, its value in many models is significant. Therefore, the TLI and CFI values are needed, as these values are not affected by sample size, and are able to indicate the fitness of the model. Higher values of these two indicators (>=.9, closer to 1.0) suggest a good model fit (Kline, 2015). Besides, we report RMSEA, which is an absolute fit index that takes the complexity of the model into consideration. Smaller RMSEA values (<=.06) indicate a good model fit (Kenny & McCoach, 2003). The missing values in our dataset were accommodated with the *estimate means and intercepts* feature of the AMOS software.

RESULTS

Teachers' Language Complexity and Children's Mandarin Vocabulary Growth

Non-parametric Spearman correlations were conducted to examine the correlations between the independent variables (i.e., children's Mandarin vocabulary in the first year of kindergarten (K1), teachers' language complexity, children's gender, nonverbal intelligence, and maternal education). Children's class and school were taken as the random factors to address the nested data issue of the current study (ICC=0.041).

The results based on the mixed-effects model are presented in Table 2. The whole model explained 45.68% of the variance of children's Mandarin receptive vocabulary score in the second year of kindergarten (K2), out of which 44.71% was attributable to the fixed-effects only. Teachers' syntactic complexity was positively and significantly associated with children's receptive vocabulary at K2 (B=0.61, *p*<.05). Children's receptive vocabulary score at K1 was also positively related to children's receptive vocabulary score at K2 (B=0.72, *p*<.001).

<Insert Table 2 here>

Teachers' Qualifications, Syntactic Complexity, and Children's Mandarin Vocabulary

Table 3 shows the results of the second research question based on structural equation modeling. The children's vocabulary outcome in the second year in kindergarten was found to be indirectly influenced by the teacher's syntactic complexity but not directly affected by the teachers' qualification (i.e., years of experience, degree, and Mandarin proficiency). Children who had a higher vocabulary size in the first year in kindergarten maintained their advanced position one year later (*β*=0.67, *p*<.001). Teaching experience affected teachers' syntactic complexity positively. Teachers with more years of teaching experience tended to use lengthier

sentences (β=0.14, p<.01). In contrast, teachers' Mandarin language proficiency affected syntactic complexity negatively (β=-0.12, p<.05). Teachers who used longer sentences were found to be significantly related to children's better Mandarin vocabulary in the second year of kindergarten (β=0.08, p<.05).

In total, the model explained 46% of the variance in children's Mandarin Chinese vocabulary size in the second year in kindergarten, with good model-fit statistics ($X^2(13)$=21.12, p=0.071, CFI=0.97, TLI=0.91, RMSEA = 0.04).

<Insert Table 3 here>

<Insert Figure 2 here>

In order to see what the qualitative differences might be in MLU-w, we explored the complete transcriptions of two teachers, one with the highest and one with the lowest MLU-w in terms of contextualized questions. Contextualized questions refer to questions that are directly related to the books and are used to describe, enumerate, label, or sequence the illustrations; decontextualized questions refer to questions that are beyond the story, and are related to inference and reflection of the story plot. We found that the teacher with the highest MLU-w asked 4.18 contextualized questions and 1.54 decontextualized questions per minute. In contrast, the teacher who has the lowest MLU-w asked 2.43 contextualized questions and 0.22 decontextualized questions per minute.

The teacher who adopted the longer utterances tended to employ both types of questions more often (See Table 4). Specifically, she tried to paraphrase the scenario for the children, providing them with a vivid picture, and she encouraged children to think beyond the story to establish a causal relationship and to infer the character's thinking and emotions. In contrast, the

teacher who produced the shortest MLU-w in our sample (See Table 5) asked children short and simple questions, and she barely provided any elaboration or detailed description.

<Insert Table 4 here>

<Insert Table 5 here>

DISCUSSION

There is no doubt that teachers are important in children's language development, and probably even more so in an educational setting with limited time for HL instruction, in our case heritage Mandarin classes. Previous studies have addressed teachers' impact by examining the role of teacher qualifications, such as their degrees and years of experience on the children's language outcome, but they did not examine their language use in detail. In the present study, we tried to tease these teacher characteristics and language factors apart. We focused on Mandarin heritage learners in Kindergarten and their receptive vocabulary development over one year. We looked at the role of various teacher qualifications (qualifications, degree, Mandarin language proficiency) and two linguistic aspects (lexical diversity and syntactic complexity) of the language they used in storybook reading activities.

Teachers' Syntactic Complexity and Children's Mandarin Vocabulary Growth

In line with other studies such as Gámez and Levine (2013), the teachers in our study demonstrated substantial variation in lexical diversity and syntactic complexity, and such variation enabled us to examine whether differences in teachers' language complexity were associated with a differential rate in children's Mandarin vocabulary growth. Previous studies on adult's syntactic complexity and preschooler's receptive vocabulary have reported mixed results: while some findings indicate that complex speech might negatively affect children's vocabulary

development (Bowers & Vasilyeva, 2011; Barnes & Dickinson, 2017), others demonstrate a positive influence of complex speech on children's vocabulary learning (Hoff, 2006; Hoff & Naigles, 2002; Gámez, 2015). The result of the current study is in line with the latter. It was found that young Mandarin language learners' higher Mandarin vocabulary outcome is significantly related to teachers' lengthier utterances. The positive relation between the number of words per teachers' utterance (i.e., MLU) and kindergarteners' Mandarin vocabulary development addresses the significance of the structural characteristics of linguistic input.

It is worth noting that whether teachers' syntactic complexity (i.e., MLU-w) has a positive or negative influence on children's vocabulary learning might depend on whether such complexity matches children's capacity to process such lengths of utterances. For instance, English speaking children usually produce three to five words per utterance at the age of four to five years old (Rice et al., 2010). In Barnes and Dickinson's study (2017), teachers' MLU-w was 8.71, which is substantially longer than what an average preschooler could produce. Such lengthier utterances might be beyond the processing capabilities of the young children, thus resulting in a negative consequence on children's vocabulary learning. In contrast, teachers in Gámez's study (2015) produced much shorter utterances (3.14–4.66), which fell into four-five years old's language capacity, thus they could facilitate their language learning. In other words, teachers' effective syntactic length needs to fall into children's zone of proximal development. Longer utterances might be too challenging for children to process as they posit higher cognitive loads on children and would potentially constrain their meaning extraction and word learning.

In the current study, the 31 Mandarin teachers' mean length of utterance was 7 (*SD*=1.34), matching well with the local kindergartener's own utterance length (*M*=5.2, for single clause utterance; *M*=12.6, for multiple clause utterances; Goh, Liu, & Zhao, 2008). This

could explain the reason that teachers' syntactic complexity was positively and significantly related to children's Mandarin vocabulary growth in the current study.

The current study has not found a significant contribution of teachers' lexical diversity to children's Mandarin vocabulary learning, as demonstrated in some previous studies (Pan et al., 2005; Barnes & Dickinson, 2017; Gámez and Levine, 2013). Our finding is in line with what has been demonstrated in Bowers' and Vasilyeva's study (2011). Caregivers who employ a relatively small number of word types are prone to use common words, while those who produce a large variety of words tend to use more rare words (Huttenlocher, Vasilyeva, Waterfall, Vevea, & Hedges, 2007). To expose children to diverse vocabulary in class might be critical for children (e.g., monolinguals) who have already acquired a basic vocabulary, while such contribution might be much more limited if the children are still at the phase of learning common words and probably need more repetition. In the Singapore context, the English language is still very dominant in the dual language learning programs, and the children do not have a good command of Mandarin yet. Therefore, we may assume that for these beginners, cognitive processing might be overly taxed by including too many different words, which may be unfamiliar.

Teachers' Qualifications, Syntactic Complexity, and Children's Mandarin Vocabulary

As Connor and colleagues (2005) argued, "teacher qualification and effective classroom practice are conflated in much of the literature about teacher quality" (p.369). The current study made the relations between teachers' qualifications, teachers' classroom practice and teacher talk, and children's vocabulary learning more explicit with the path model. Teachers' qualifications (i.e., experience, degree, and Mandarin proficiency) were found to be related to teachers' length of utterances, which was in turn significantly associated with children's

Mandarin vocabulary at the second year of kindergarten. Specifically, those teachers who have more years of teaching experience and a lower proficiency level tended to produce lengthier utterances. In turn, the children whose teachers adopted lengthier utterances performed better in the Mandarin vocabulary tests than their peers whose teachers used shorter utterances. To sum up, teachers' qualifications did influence children's vocabulary learning, but only indirectly via teachers' syntactic complexity.

The fact that more years of teaching was positively and significantly related to the teachers' longer utterances may be tentatively explained by the idea that teaching experience may have given teachers more practice in tailoring their speech to their children's developmental needs. With years of practice, teachers may feel more at ease in interacting with the children and providing them with a sufficient amount of exposure in a meaningful context. And as one of the reviewers pointed out, children who are in the class with more complex input also responded in Mandarin more than those who received less complex input, which seems to indicate that teachers adjusted their input complexity to their students' Mandarin proficiency level.

In contrast, the fact that teachers' proficiency level and their length of utterances do not positively correlate may be explained as follows: the average Mandarin language proficiency of the 31 teachers was high. All of them were able to carry out a conversation and could use Mandarin flexibly for social, academic, and professional purposes. This seems to suggest that once the proficiency level is above a certain threshold, language complexity is not determined by proficiency; instead, we feel that the longer utterances reflected the teachers' own speaking and teaching styles more. This finding also suggests that language proficiency per se might not be a good criterion to judge whether a candidate teacher has the necessary language skills to conduct good language lessons. In many bilingual and foreign language teaching contexts, teachers who

have a higher language proficiency (native speakers in particular) are preferred, as they are

trusted to provide authentic language tailored for children's needs (but see Unsworth, Persson,

Prins, & de Bot, 2015). However, the current study demonstrates that a teacher's higher language

proficiency alone does not guarantee that the teacher's language use is tailored to the children's

needs; instead, proper and sufficient training in meaningful interaction in class may be more

useful for effective pedagogy.

To summarize, the results of this study demonstrate that teachers who lack certain

qualifications (e.g., a degree in Chinese language teaching or the highest proficiency level in the

Mandarin language) may still be quite effective in Mandarin language teaching. Of course,

general teacher qualifications are necessary to maintain the quality of teaching, but the teachers'

day-by-day language practice in class is more important in maximizing the children's HL

learning. Research efforts should be devoted to scrutinize teachers' practice in class and provide

teachers necessary professional development with the findings. Such effort would in turn help

teachers improve their classroom practices and eventually facilitate children's learning.

LIMITATIONS AND IMPLICATIONS

This study has several limitations. Firstly, the data are correlational in nature; therefore,

no causal relationship can be derived based on the findings. A future study might consider

experimental conditions in which teachers' language complexity is above/within/below

children's language complexity to directly compare the contribution of teachers' language

complexity on children's learning outcomes. Secondly, each class has only been recorded once;

therefore, the data might not have been able to demonstrate each teacher's language use in detail.

More videos are recommended to be recorded over one academic year. Thirdly, the current study

has tested only children's receptive vocabulary in Mandarin language and future study might consider measuring children's productive language ability as well, with tasks like expressive vocabulary and storytelling. Such multidimensional assessment might reveal whether teachers' language complexity exerts a similar influence on different language domains. Fourth, due to the "no intrusion" rule we followed with the observed classes, we were unable to select books for teachers to read to the children. Teachers' language complexity might be affected by the plot, organization, and characters of the chosen books. Future studies might conduct an experiment to control for teacher variation in language complexity due to using different books. Last but not least, the current study revealed substantial individual differences in teachers' language complexity; nevertheless, it is not possible to interpret the variation in a well-grounded manner due to a lack of the teachers' own reflections on their language practice. Future studies might consider including an interview or questionnaire to invite teachers to evaluate their own teaching behaviors and provide reasons for their language choice. To better understand teachers' intentions would be critical, as the accuracy of interpreting their behaviors would promote the quality and effectiveness of the professional development courses on language teachers' pedagogy.

Despite the limitations, the current study serves in "a potentially productive direction for future research" (Bowers & Vasilyeva, 2011). The simultaneous examination of teachers' qualifications, teachers' language complexity, and children's vocabulary learning enabled us to identify the direct and indirect influence on children's early HL development. The significant predictors we identified may be useful for the design of a more effective curriculum at kindergarten for children's better vocabulary learning, which would affect their long-term academic outcomes in the long run.

CONCLUSION

The current study expanded our knowledge about the impact of teachers' qualifications versus teacher talk on children's language growth, allowing us to highlight the importance of teachers' experience in conducting effective instruction in Mandarin language classes at kindergartens. It confirmed previous observations about the substantial variation in teachers' language use and delineated a significant component—longer utterances--in the Mandarin language teachers' speech in the Singapore bilingual context. The finding is in line with previous studies that if teachers' syntactic complexity falls in the zone of proximal development of children's syntactic complexity, it might facilitate children's receptive vocabulary learning. However, the same children could not significantly benefit from the teachers' diverse vocabulary, probably due to their limited vocabulary size.

ACHKNOLWEDGEMENTS

DECLARATION OF INTEREST STATEMENT

No potential conflict of interest was reported by the authors.

NOTES ON CONTRIBUTORS

He Sun is a research scientist at National Institute of Education, Nanyang Technological University, Singapore. Her major interests are 1) effective early English and Mandarin teaching and learning with shared paper book/eBook reading, and 2) individual differences in early bilingualism from the perspective of cognitive and environmental factors. Her publications have appeared in various journals, such as Bilingualism: Language and Cognition, Applied Psycholinguistics, and Journal of Child Language. She is the associate editor of Asian Pacific Journal of Education.

Marjolijn Verspoor is a professor of English language and English as a second language at the University of Groningen, Netherlands. She is known for her work on second language development and Complex Dynamic Systems Theory. Her publications have appeared in various edited books and journals.

ORCID

He Sun https://orcid.org/0000-0001-5729-8002

Marjolijn Verspoor https://orcid.org/0000-0001-8828-8405

REFERENCES

Aarts, R., Demir-Vegter, S., Kurvers, J., & Henrichs, L. (2016). Academic language in shared book reading: Parent and teacher input to mono- and bilingual preschoolers. *Language Learning, 66,* 263–295. doi:10.1111/lang.12152

August, D., Carlo, M., Dressler, C., & Snow, C. (2005). The Critical Role of Vocabulary Development for English Language Learners. *Learning Disabilities Research & Practice, 20*(1), 50-57. doi:10.1111/j.1540-5826.2005.00120.x

Baayen, R. H., Davidson, D. J., & Bates, D. M. (2008). Mixed-effects modeling with crossed random effects for subjects and items. *Journal of Memory and Language, 59* (4), 390-412. doi: 10.1016/j.jml.2007.12.005

Barnes, E. M., & Dickinson, D. K. (2017). The Relationship of Head Start Teachers' Academic Language Use and Children's Receptive Vocabulary. *Early Education and Development, 28*(7), 794-809. doi:10.1080/10409289.2017.1340069

Behrens, H. (2009). Usage-based and emergentist approaches to language acquisition. *Linguistics, 47*(2), pp. 383-411. doi:10.1515/LING.2009.014

Bornstein, M. H., Haynes, O. M., & Painter, K. M. (1998). Sources of child vocabulary competence: A multivariate model. *Journal of Child Language, 25,* 367–394.

Bowers, E., & Vasilyeva, M. (2011). The relation between teacher input and lexical growth of preschoolers. *Applied Psycholinguistics, 32,* 221–241.

Carnevale, N. C. A. (2009). *New Language: A new world: Italian immigrants in the United States, 1890-1945.* Chicago: University of Illinois Press.

Cavallaro, F. (2010). *Transgenerational Language Shift: From Sicilian and Italian to Australian English.* Melbourne: The Italian Australian Institute.

Cavallaro, F., & Ng, B. C. (2014). Language in Singapore: from multilingualism to English plus. John Hajek & Yvette Slaughter (Eds.), *Challenging the Monolingual Mindset* (pp.33-48). Bristol: Multilingual Matters.

Clyne, M. (2003). *Dynamics of Language Contact.* Cambridge: Cambridge University Press.

Connor, C., Son, S.-H., Hindman, A. H., & Morrison, F. J. (2005). Teacher qualifications, classroom practices, family characteristics, and preschool experience: Complex effects on first graders' vocabulary and early reading outcomes. *Journal of school psychology, 43*(4), 343-375. doi:https://doi.org/10.1016/j.jsp.2005.06.001

Darling-Hammond, L., & Youngs, P. (2002). Defining "highly qualified teachers": What does "scientifically-based research" actually tell us? *Educational Researcher, 31*(9), 13– 25.

Dickinson, D. K., & Smith, M. W. (1994). Long-term effects of preschool teachers book readings on low-income children's vocabulary and story comprehension. *Reading Research Quarterly, 29,* 104–122.

Dickinson, D. K., & Tabors, P. O. (Eds.). (2001). *Beginning literacy with language: Young children learning at home and school.* Baltimore, MD: Brookes.

Dickinson, D. K., Hofer, K. G., Barnes, E. M., & Grifenhagen, J. F. (2014). Examining teachers' language in Head Start classrooms from a Systemic Linguistics Approach. *Early Childhood Research Quarterly, 29*(3), 231-244. doi:https://doi.org/10.1016/j.ecresq.2014.02.006

Dickinson, D., & Porche, M. (2011). Relation between language experiences in preschool classrooms and children's kindergarten and fourth-grade language and reading abilities. *Child Development, 82*(3), 870–886. doi:10.1111/j.1467-8624.2011.01576.x

DOE. (2004a). *Meeting the highly qualified teachers challenge: The secretary's third annual report on teacher quality.* Washington DC7 U.S. Department of Education, Office of Postsecondary Education.

DOE. (2004b). *No child left behind: A toolkit for teachers.* Washington DC: US Department of Education, Office of the Deputy Secretary.

Donaldson, J. A., Loh, J., Mudaliar, S., Md. Kadir, M., & Wu, B. (2013). Measuring poverty in Singapore: frameworks for consideration. Social Space, 58–66.

Durán, P., Malvern, D., Richards, B., & Chipere, N. (2004). Developmental trends in lexical diversity. *Applied Linguistics, 25,* 220-242.

Early, D. M., Maxwell, K. L., Burchinal, M., Alva, S., Bender, R. H., Bryant, D.,...Zill, N. (2007). Teachers' education, classroom quality, and young children's academic skills: Results from seven studies of preschool programs. *Child Development, 78,* 558-580.

Falenchuk, O., Perlman, M., McMullen, E., Fletcher, B., & Shah, P. S. (2017). Education of staff in preschool aged classrooms in child care centers and child outcomes: A meta-analysis and systematic review. *PLoS ONE, 12*(8), e0183673. doi.org/10.1371/journal.pone.0183673

Field, A. (2018). *Discovering statistics using IBM SPSS statistics (5th ed.).* London: Sage.

Furrow, D., Nelson, K.,&Benedict, H. (1979).Mothers' speech to children and syntactic development: Some simple relationships. *Journal of Child Language, 6,* 423–442.

Gámez, P. B., & Lesaux, N. K. (2012). The Relation between exposure to sophisticated and complex language and early-adolescent English-only and language minority learners' vocabulary. *Child Development, 83*(4), 1316-1331. doi:10.1111/j.1467-8624.2012.01776.x

Gámez, P.B. (2015). Classroom-based English exposure and English language learners'

expressive language skills. *Early Childhood Research Quarterly, 31*(2), 135–146

doi:10.1016/j.ecresq.2015.01.007

Gámez, P. B., & Levine, S. C. (2013). Oral language skills of Spanish-speaking English

language learners: The impact of high-quality native language exposure. Applied

Psycholinguistics, 34, 673-696. https://doi.org/10.1017/S0142716411000919

Gleitman, L. (1990). The structural sources of verb meanings. *Language Acquisition, 1,* 3–55.

Goe, L. & Stickler, L. (2008). *Teacher quality and student achievement: Making the most of*

recent research. Washington, DC: National comprehensive Centre for Teacher Quality.

Available: https://files.eric.ed.gov/fulltext/ED520769.pdf

Goh, H. H., Liu, Y., & Zhao, C. (2008). *Spoken Mandarin competence of Chinese children from*

different language-speaking homes: Implications for Mandarin education. Paper presented at

the Annual Meeting of the American Educational Research Association, March 23–26, 2008.

New York, NY.

Goldhaber, D. D., & Brewer, D. J. (2000). Does teacher certification matter? High school teacher

certification status and student achievement. *Educational Evaluation and Policy Analysis,*

22(2), 129– 146.

Goodfellow, J. (2003). Practical Wisdom in Professional Practice: The Person in the Process.

Contemporary Issues in Early Childhood, 4(1), 48–63. https://doi.org/10.2304/ciec.2003.4.1.6

Gopinathan, S. (2004). Language planning in education in Singapore: History, transitions,

futures. *Review, 12*(2), 14–23.

Hoff, E. (2006). How social contexts support and shape language development. *Developmental Review, 26,* 55–88.

Hoff, E., & Naigles, L. (2002). How children use input to acquire a lexicon. *Child Development, 73,* 418–433.

Huttenlocher, J., Vasilyeva, M., Cymerman, E., & Levine, S. (2002). Language input and child syntax. *Cognitive Psychology, 45,* 337–374.

Huttenlocher, J., Vasilyeva, M., Waterfall, H., Vevea, J., & Hedges, L. (2007). The varieties of speech to young children. *Developmental Psychology, 43,* 1062–1083. doi:10.1037/0012-1649.43.5.1062

Kenny, D. A., & McCoach, D. B. (2003). Effect of the number of variables on measures of fit in structural equation modeling. *Structural Equation Modeling, 10,* 333–3511.

Klem, L. (2000). Structural equation modeling. In L. G. Grimm, & P. R. Yarnold (Eds.), *Reading and understanding MORE multivariate statistics* (pp.227-260). Washington, DC, US: American Psychological Association.

Kline, R. B. (2015). *Principles and practice of structural equation modeling* (fourth edition). New York: The Guilford Press.

Lieven, E. (2019). Input, interaction and learning in early language development. In. Grover, V., Uccelli, P., Rowe, M., Lieven, E. (Eds.) *Learning through Language: Towards an Educationally informed Theory of Language Learning* (pp. 19-30). Cambridge: Cambridge University Press.

MacWhinney, B. (2000). *The CHILDES project: Tools for analyzing talk. (3rd ed.).* Mahwah, NJ: Lawrence Erlbaum Associates.

National Early Literacy Panel. (2009). *Developing early literacy: Report of the National Early Literacy Panel.* Jessup, MD: National Institute for Literacy.

Ng, C. L. P. (2014). Mother tongue education in Singapore: concerns, issues and controversies. *Current Issues in Language Planning, 15*(4), 361-375. doi:10.1080/14664208.2014.927093

OECD. (2006). *Starting Strong II. Early Childhood Education and Care.* Paris: OECD.

Oon, C, & Kor, K. K. (2009, November 29). Was Chinese wrongly taught for thirty years? The Straits Times. Retrieved from http://www.news.asiaone.com/News/.

Pan, B. A., Rowe, L. M., Singer, J. D., & Snow, C. E. (2005). Maternal correlates of growth in toddler vocabulary production in low-income families. *Child Development, 76,* 763–782.

Polinsky, M., & Scontras, G. (2020). Understanding heritage languages. *Bilingualism: Language and Cognition, 23*(1), 4-20. doi:10.1017/S1366728919000245

Ramey, S. L., & Ramey, C. T. (2006). Early educational interventions: Principles of effective and sustained benefits from targeted early education programs. In D. K. Dickinson & S. B. Neuman (Eds.), *Handbook of early literacy research* (Vol. 2, pp. 445-459). New York: Guilford Press.

Rice, M. L., Smolik, F., Perpich, D., Thompson, T., Rytting, N., & Blossom, M. (2010). Mean length of utterance levels in 6-month intervals for children 3 to 9 years with and without language impairments. *Journal of Speech Language and Hearing Research, 53,* 333–349. doi:10.1044/1092-4388(2009/08-0183

Rickard-Liow, S. J., Sze, W. P and Lee L.C. (2013). *Bilingual Language Assessment Battery (BLAB) Manual (Unpublished measure).* Singapore: National University of Singapore, Department of Psychology and Division of Graduate Medical Studies.

Rowe, M. L. (2012). A longitudinal investigation of the role of quantity and quality of child-directed speech in vocabulary development. *Child Development, 83*(5), 1762-1774.

Rydland, V., Grøver, V., & Lawrence, J. (2014). The second-language vocabulary trajectories of Turkish immigrant children in Norway from ages five to ten: The role of preschool talk exposure, maternal education, and co-ethnic concentration in the neighborhood. Journal of Child Language, 41, 352-381. https://doi.org/10.1017/S0305000912000712

Sun, H. (2019). Home Environment, Bilingual Preschooler's Receptive Mother Tongue Language Outcomes, and Social-Emotional and Behavioral Skills: One Stone for Two Birds? Frontier in Psychology, 16, 1-13. DOI: 10.3389/fpsyg.2019.01640.

Sun, H., Steinkrauss, R., Wieling, M., & de Bot, K. (2018). Individual differences in very young Chinese children's English vocabulary breadth and semantic depth: Internal and external factors. *International Journal of Bilingual Education and Bilingualism, 21*(4), 405-425. https://doi:10.1080/13670050.2016.1178706

Sun, H., Yin, B., Amsah, F., & O'Brien, B. A. (2018). Differential effects of internal and external factors in early bilingual vocabulary learning: the case of Singapore. *Applied Psycholinguistics, 39*(2), 383-411. https://doi.org/10.1017/S014271641700039X

Sun, H., Yussof, N., Mohamed, M., Rahim, A., Cheung, W. L., Cheong, S. A., & Bull, R. (2018). Bilingual language experience and social-emotional wellbeing: A cross-sectional

study of Singapore pre-schoolers. *International Journal of Bilingual Education and Bilingualism.* Advance online publication. https://doi.org/10.1080/13670050.2018.1461802

Sun, H., Ng, S. C., O'Brien, B.A., & Fritzsche, T. (2020). Child, Family, and School Factors in Bilingual Preschoolers' Vocabulary Development in Heritage Languages. *Journal of Child Language,* 1-27. https://doi:10.1017/S0305000919000904

Sun, H., Toh, W. M., & Steinkrauss, R. (2020). Instructional strategies and linguistic features of kindergarten teachers' shared book reading: the case of Singapore. *Applied Psycholinguistics, 41*(2), 427-456. https://doi.org/10.1017/S0142716420000053

Tardif, T., Shatz, M., & Naigles, L. (1997). Caregiver speech and children's use of nouns versus verbs: A comparison of English, Italian and Mandarin. *Journal of Child Language, 24,* 535–565.

Tomasello, M. (2000). First steps toward a usage-based theory of language acquisition. *Cognitive Linguistics, 11*(1-2), 61–82. https://doi.org/10.1515/cogl.2001.012

Unsworth, S., Persson, L., Prins, T. & de Bot, K. (2015). An investigation of factors affecting early foreign language learning in the Netherlands. *Applied Linguistics, 36,* 527-548. http://dx.doi.org/10.1093/applin/amt052.

Vasilyeva, M., Huttenlocher, J., & Waterfall, H. (2006). Effects of language intervention on syntactic skill levels in preschoolers. *Developmental Psychology, 42*(1), 164-174. doi:10.1037/0012-1649.42.1.164

Vygotsky, L. S. (1978). *Mind in society: The development of higher mental psychological processes.* Cambridge, MA: Harvard University Press.

Zhang, H. P., Liu, Q., Cheng, X. Q., Zhang, H., & Yu, H. K. (2003). Chinese Lexical Analysis

Using Hierarchical Hidden Markov Model. *Proceedings of the Second SIGHAN Workshop on*

Chinese Language Processing, 7, 63–70. 10.3115/1119250.1119259

TABLES

Table 1
The Pearson correlation between teachers' language complexity and that of book texts

	Teacher.D	Teacher.MLU	Book.D	Book.MLU-w
Teacher.D	1			
Teacher.MLU-w	0.31	1		
Book.D	0.02	0.22	1	
Book.MLU	0.01	0.14	0.24	1

Note. D value refers to lexical diversity and MLU refers to syntactic complexity

Table 2

Fixed effects part of the mixed effects model for Mandarin vocabulary at K2

Fixed effects	Estimate	SE	t	p
Intercept	10.39	3.04	3.42	
Vocabulary (Child score in K1)	0.72	0.05	15.57	<0.001
MLU-w (Teacher Syntax)	0.61	0.30	2.05	0.04
D (Teacher Lexicon)	-0.01	0.03	-0.27	0.78
Maternal Education	-0.10	0.16	-0.66	0.51
Gender	0.85	0.73	1.16	0.25

Note. ***$p < 0.001$, **$p<0.01$, *$p<0.05$. Teacher Syntax=teachers' MLU-w, Teacher Lexicon=teachers' D value

Table 3

The results of structural equation modeling on Mandarin vocabulary

Structural Model		Path		Standardized Coefficient	SE	p
Focused variables	Teacher Experience	>	MLU-w	0.14	0.01	0.01
	Teacher Degree	>	MLU-w	-0.05	0.15	0.30
	Teacher Proficiency	>	MLU-w	-0.12	0.07	0.02
	Teacher Experience	>	Vocabulary.K2	-0.01	0.06	0.89
	Teacher Degree	>	Vocabulary.K2	0.01	0.84	0.86
	Teacher Proficiency	>	Vocabulary.K2	0.02	0.39	0.70
	MLU-w	>	Vocabulary.K2	0.08	0.28	0.04
Control variables	Maternal Education	>	Vocabulary.K2	-0.02	0.15	0.61
	Vocabulary.K1	>	Vocabulary.K2	0.67	0.04	<0.001
	Gender	>	Vocabulary.K2	0.05	0.71	0.22

Note. ***$p < 0.001$, **$p<0.01$, *$p<0.05$. $X^2(13)=21.12$, $p=0.071$, CFI=0.97, TLI=0.91, RMSEA = 0.04. Teacher Experience=years of experience teaching in kindergartens; Teacher Degree=whether the teacher possessed a degree in teaching Chinese language; Teacher Proficiency=teachers' overall Mandarin proficiency score based on their self-evaluated listening, speaking, reading and writing skills.

Table 4

Excerpt of the teacher with the highest MLU-w

Chinese Utterances	English translations
*TEA: 他想起刚才在树上, 在小鸟的家, 遇上了黑乌鸦, 在那个大海里又遇上了可怕的大鲨鱼.	He (The frog) thinks of, at the little bird's home on the tree, he ran into the black crow, and in the sea, he met with the scary big shark.
*TEA: 这时候, 他说他要搬家太危险了, 真危险, 好害怕, 我要回家, 对吧?	At this time, he says, "it would be very dangerous to move, very dangerous, too scary, I want to go home", right?
*TEA: 他说他说我要回家.	He (The frog) says, he says, "I want to go home".
*TEA: 于是呢他整理自己的背包, 背好, 朝自己的家走去.	So he packs up, puts on his bag, and walks back to home.
*TEA: 心里想还是我自己的家好, 我还是不要搬家了, 我要回自己的家, 我自己的家比较安全, 对吧?	(The frog) thinks "my home is the best, and I will not move, I will go back to my home, my home is safer", right?
*TEA: 说着, 背着书包回家了.	While speaking to himself, (the frog) goes back with his school bag.
*TEA: 回到自己的家以后, 小青蛙累了, 怕了.	After going back to home, the little frog feels tired and scared.
*TEA: 他在休息, 回到家放下背包, 打开他们家的太阳花电视, 一边听着歌曲, 一边喝着果汁.	He wants to take some rest, and puts down his bag after arriving at home, turns on his sunflower TV, and listens to the music while drinking juice.
*TEA: 一边吃着丸子面包, 哇好幸福, 好开心啊.	(He) eats the ball bread, wow, (he feels) so satisfied, so happy.
*CHI: 他有面包, 他有面包啊.	He has bread, he has bread.
*TEA: 小小青蛙说什么?	What does the little frog say?
*TEA: 还是我家最好.	My home is the best.
*TEA: 想一想, 以后小青蛙还要不要再搬家呢?	Think, would the little frog move again in the future?
*CHI: 不要.	No.
*TEA: 为什么不要了?	Why not?
*CHI: 因为家里很安全.	Because his home is safe.
*TEA: 因为他家比较安全.	Because his home is safe.
*TEA: 别人的家不够安全, 对吧?	Others' homes are not safe enough, right?
*TEA: 因为小青蛙认为还是自己的家最好, 从此小青蛙再也不搬家了.	Since the little frog believes his home is the best, he would not move again in the future.

Table 5

The excerpt of the teacher with the lowest MLU-w

Chinese Utterances	English translations
*TEA: 这是什么？	What's this?
*CHI: But he is not smiling @s.	But he is not smiling.
*TEA: 没有啊，你看第一页.	No, look at the first page.
*TEA: 我们要翻，你看, bear, 熊@s.	Let's turn to page one, look, bear, bear.
*TEA: 你看, 他的脸是什么样子的?	Look, what does his face look like?
*TEA: 看 bear，第一页.	Look at the bear, in the first page.
*TEA: 然后再看这里的熊.	Then look at the bear here.
*TEA: 是不是生气了啊?	Is he angry?
*CHI: 是，bear @s.	Yes, bear.
*TEA: 是，very good @s.	Yes, very good.
*TEA: Ok，下一题@s.	Ok, next one.
*TEA: 谁藏起来了?	Who has hided?
*CHI: 猫.	Cat.
*TEA: 猫，猴子，猴子在这里，没有藏起来，猫.	Cat, monkey, monkey is here, not hiding, cat.
*CHI: Spider @s.	Spider.
*TEA: 嗯，这是什么?	Um, What's this?
*TEA: 犀牛，讲犀牛.	Hippo, say "hippo".
*TEA: 还有猫，还有呢?	And cat, what else?
*CHI: 还有，giraffe，kangaroo@s.	And giraffe，kangaroo.
*TEA: 对，还有长颈鹿，还有长颈鹿也藏起来了.	Yes, there is giraffe, the giraffe is hiding.

FIGURES

Figure 1

The mediation effect of teacher's linguistic complexity on teacher qualifications and children's vocabulary development

```
┌──────────────────┐     Direct path      ┌──────────────────────┐
│     Teacher      │ ───────────────────> │ Children's vocabulary │
│  qualifications  │                      │     development       │
└──────────────────┘                      └──────────────────────┘
          ╲                 Indirect path              ╱
           ╲       ┌──────────────────────┐          ╱
            ╲ ───> │ Teacher's linguistic │ ─────────
                   │      complexity      │
                   └──────────────────────┘
```
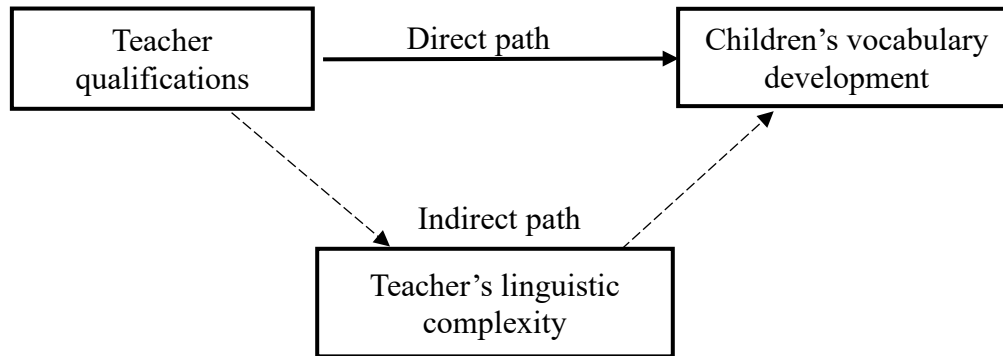
Figure 2

The structural equation modeling on Mandarin receptive vocabulary