

Multimodal Literacies at Home: A Survey Study of Chinese–Norwegian Bilingual Children

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Introduction

“I think the app is more effective than a language course.”

One Chinese parent in Norway shared this sentiment when talking about children’s literacy learning. In this regard, evolving technologies continuously offer new pathways for learning. Children today use technologies and multimodal literacies for learning and meaning-making (Jewitt & Kress, 2003). This shift towards multimodal literacies has been extensively studied in school settings (Brown & Allmond, 2020; Park et al., 2013; Zheng et al., 2015) and increasingly studied in home settings (for review, see Kumpulainen & Gillen, 2020). Some bilingual studies also shed light on these changes by examining technology’s pedagogical opportunities in language learning (Little, 2019; Smith & Li, 2020; Zhao & Flewitt, 2019). For example, Zhao and Flewitt (2019) observed children’s use of social media and discovered the multimodal nature of their language use, concluding that digital tools offer more opportunities for home language practices. Smith and Li (2020) studied immigrant children’s reading activities in the digital environment and found a positive correlation with learning motivation. Nevertheless, compared with studies that address emergent bilingual children’s use of print resources, less is known about their digital environment and how they connect with children’s individual differences.

Moreover, there is also an overrepresentation of studies that examine English as one of the pair languages (Proctor & Zhang-Wu, 2019). Given that English has a unique place in the global marketplace of languages, it is not clear how findings from these studies may or may not generalize to families that navigate other language dyads and triads. In this chapter, we centered upon a less-studied population, Chinese-Norwegian emergent bilingual children. According to Statistics Norway (2020), over 13000 Chinese people are living in Norway. Many of them are in Norway for career opportunities or advancing their education (Statistics Norway, 2008). Even if this population is not large, hundreds of bilingual children speak Chinese at home while learning Norwegian in kindergarten/school. In Norway, children have access to kindergarten when they are one year old. They enter school at the age of six and start learning English as a subject in grade 1. In Norwegian kindergartens, free play is the foundation for learning, while digital practices serve as tools for enriching the learning environment (Norwegian Ministry of Education and Research, 2017). In the primary and secondary schools, digital skills are identified as one of the five necessary skills for all children, along with orals skills, reading, writing, and numeracy (The Norwegian Directorate for Education

and Training, 2006). Therefore, it would be of interest to determine how children experience the digital environment at home and transition from kindergarten to primary school.

In this chapter, we focused on Chinese-Norwegian emergent bilingual children from three to eight years old, and examined how they learn languages using multimodal literacies at home. Our expansive definition of literacy includes a broader range of sources than are usually examined, including books, audio recordings, videos, games, and other tools that are available at home. To understand the details of children's multimodal literacy resources, we adopted content analysis to study their favorite books and applications (hereafter, apps). Content analysis is a systematic way to examine and summarize texts of various formats (Cohen et al., 2017), which matches the data and purpose of the study. The analysis highlighted the textual and visual structure of the resources through the language, genre, and format of the books and the educational features of the app. Furthermore, we sought to contrast their multimodal literacies experience across families and determine what individual differences connect with their use of multimodal literacies at home. The primary research questions of this study are:

1. What multimodal literacy resources and practices do Chinese-Norwegian emergent bilingual children have at home?
2. Does their multimodal literacy resources and practices differ across age and language dominance?

Methods

Participants

The sample is comprised of 86 Chinese parents (71 mothers and 15 fathers) who have a three- to eight-year-old child (mean = 64 months, SD = 17 months). The families are scattered all over Norway, with around half living in the larger Oslo area. Eighty-five percent of the parents have been living in Norway for more than five years. Most children were born in Norway, and their average age for attending kindergarten was 22 months (SD = 14 months). The sample represented a relatively highly educated group, with only 13% not having a university bachelor's degree.

Procedure and Questionnaire

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We approached targeted parents through social media and personal contact. Parents answered the self-administered questionnaire online in Chinese. For those parents who have over one child, we asked them to consider the youngest child from three to eight years old. The survey asked parents about children's print- and screen-based resources and practices at home and parental judgment of children's language skills.

Print-based

Parents reported the number of children's books at home in three languages: Chinese, Norwegian, and English. They also reported if their child likes to read. Parents who reported that their children like to read were then asked to list three of their child's favorite books, regardless of language.

Screen-based

Parents reflected on multimodal literacy resources their child could access at home, such as smartphones and tablets, PC, TV, e-books, and learning machines (a product designed for children with education purpose, which is used for language learning). They also reported in detail about children's use of apps (i.e., types, languages, time spent, with or without parent participation).

Language dominance

We translated and altered items from the Alberta Language and Development Questionnaire (ALDeQ; Paradis et al., 2010) to solicit information about children's language skills. Parents were asked to compare their child's speaking, listening, vocabulary, narratives, and pragmatics in Chinese and Norwegian with same-age children in Norway. We summed the total score of parental judgment to differentiate children's language dominance. Children whose parents reported higher scores for them on Chinese language skills were coded as Chinese dominant ($n = 43$), and children who whose parents reported higher scores for them on Norwegian skill dimensions were coded as Norwegian dominant ($n = 43$).

Analysis

We used both qualitative and quantitative approaches in the analyses. We conducted a content analysis with a qualitative approach to study children's favorite books and a language-learning app. In the analysis of books, we

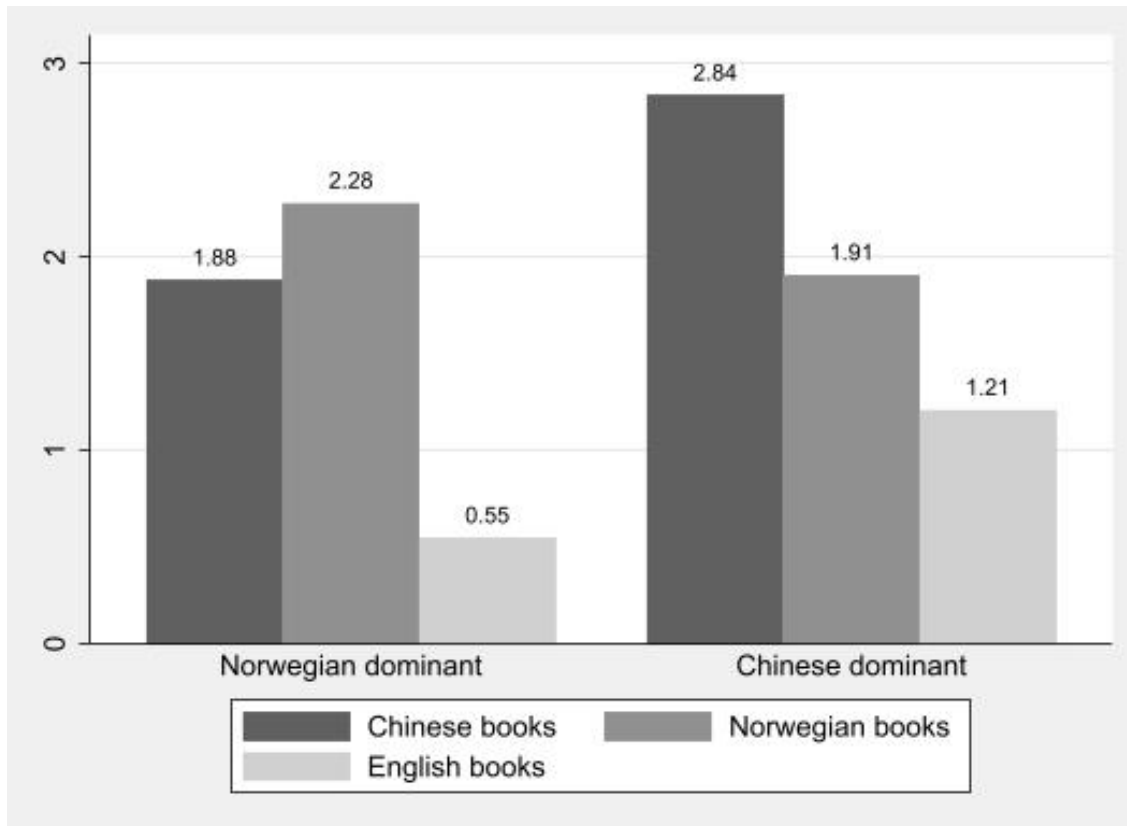
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coded and analyzed language, genre, and format dimensions. The language code was established with reference to the reported book title. For example, if parents wrote *Peppa pig*, then we assumed their children read it in English. As such, we labeled 小猪佩奇 (*Xiaozhu Peiqi*) as in Chinese, and *Peppa gris* as in Norwegian. We used an existing genre and format coding scheme (Anderson (2013), which classified the books into early childhood books, fiction, traditional literature, autobiography and biography, informational books, and poetry categories. We also coded format features related to the textual and non-textual supports available in each text. For instance, we identified books where the narrative was driven by illustrations or the text was adapted to young readers. Apps were coded according to the scheme developed by Callaghan and Reich (2018), which aimed at examining the educational features, including codes associated with the following dimensions: clarity and simplicity of goals, quality of feedback and rewards, the structure of challenge, and motion-based interactions. Our quantitative analysis included testing differences in children's experience with multimodal literacy across age group and language dominance. We explored Spearman correlation matrices to understand the relationships between and within children's print- and screen-based literacies at home. All quantitative analyses were conducted in Stata 16 (StataCorp, 2019).

Results

Print-based

Figure 1. Norwegian- and Chinese- dominant children's books at home (on average)



Note. 0 = less than 5 books; 1 = 6-10 books; 2 = 11-20 books; 3 = 21-50 books; 4 = more than 50 books.

Most families (85%) had more than 10 children's books at home, 55% of which had over 50 children's books. Figure 1 displays the average number of children's books at home. The left-hand bars indicate that families of Norwegian-dominant children had more Norwegian books ($M = 2.3$) than families of Chinese-dominant children did ($M = 1.9$), but the difference was not significant, $t(84) = 1.39$, $p = 0.16$. The right-hand bars show that there were more Chinese books in Chinese-dominant homes ($M = 2.8$) than in Norwegian-dominant homes ($M = 1.9$), and the difference is significant, $t(83) = 3.17$, $p < 0.01$. Interestingly, Chinese-dominant children also had significantly more English books ($M = 1.2$), $t(83) = 2.29$, $p < 0.05$, and older children had more Norwegian books, $t(84) = 2.44$, $p < 0.05$.

Forty-nine parents reported that their child liked to read and noted the title of their child's favorite books. We obtained 126 book titles entries, of which 70 entries referenced unique books, and 56 entries were duplicates of 16 popular books. Books such as *Detektivbyrå nr. 2* (Horst, 2019), *Peppa Pig* (Astley & Baker, 2018), and some classic fairy tales were popular among Chinese-Norwegian bilingual children. The favorite books were reported in

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different languages; the majority were in Chinese (67%), then in Norwegian (22%), and a smaller proportion in English (11%).

Our categorical analysis indicated that books covered various topics and some books spanned genres (as has been seen in previous studies, such as Andersen (2013)). Often the main characters were children or animals that personified humans, engage in everyday activities, tackle various tasks, or embark on mysterious journeys. To separate early childhood books from fiction and informational books, we used word count as the criterion. Early childhood books are defined as books written for young children containing only short or no texts (Anderson, 2013). According to this criterion, the books fell into six genres, early childhood books (47%), fiction (33%), traditional literature (14%), informational books (4%), biography (1%), and poetry (1%).

The format evaluation was straightforward. The great majority of early childhood books (92%) are picture storybooks where the story is conveyed by pictures, some with a brief text. Meanwhile, a few books (8%) were from series such as “I Can Read” and “World of Reading” and were formatted as easy-to-read books. This type of book targets beginner readers and provides graded easy-to-read texts for their independent reading. We found most early childhood books, namely, picture books and easy-to-read books, were in Chinese (77%) and favored by children aged three to five (81%).

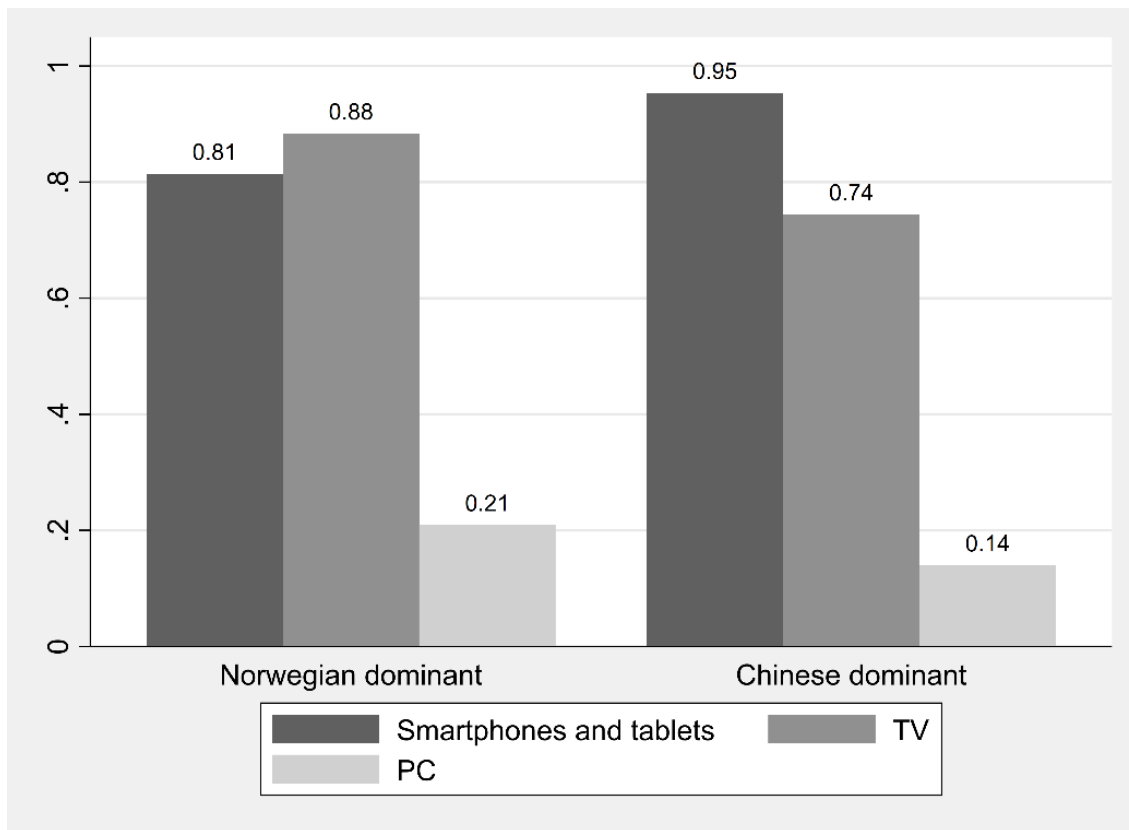
On the other hand, fiction books were favored by older children. Fiction books in the sample had two discernable subgenres: fantasy and detective. The fiction books were all illustrated books where texts carry out the storyline while pictures serve as a visual aid. Compared with early childhood books, fiction books had longer texts, more characters, and more complex plots. We also explored the relationship between the language of the books and children's age, and found that older children preferred to read in Norwegian (28%) and English (14%) than younger children (respectively, 15% and 8%).

We found many examples of traditional works of literature in our sample, including fairy tales, fables, folktales, and myths. Over half of them (61%) had been commercialized and were well known and available across languages; others had Norwegian (17%) or Chinese (22%) heritage and were only available in one language. Interestingly, we found that traditional literature was represented in homes with children at every age band and across language groups. Lastly, a few children had informational books (4%), biography (1%), and poetry (1%) as their favorite books, which are all in Chinese.

Screen-based

Most children in our sample had access to smartphones and tablets (88%) and TV (81%). Figure 3 displays children’s access to different literacy resources by language dominance. The left-hand bars indicate that households with Norwegian-dominant children tended to watch more TV (88%), but the difference was not significant, $t(84) = 1.67, p = 0.10$. The right-hand bars indicate that more Chinese-dominant children used smartphones and tablets (95%) than their Norwegian-dominant counterparts (81%) did, $t(84) = 2.04, p < 0.05$. Other resources such as PC (17%), e-books (5%), learning machine (6%), and smart speaker (1%) were available in some families, but in general, they had less exposure to these bilingual children.

Figure 2. Norwegian- and Chinese- dominant children’s access to literacy resources (as a proportion)

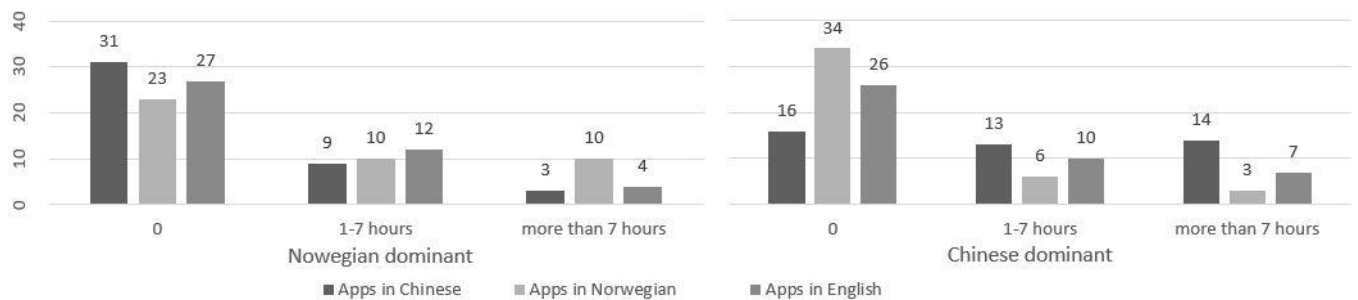


In the questionnaire, we focused on children’s usage of smartphones and tablets. Parents reported on children’s apps usage. The most frequent usage was for watching videos; most of these bilingual children (92%) spent some time watching videos but less than 7 hours per week. The following uses were playing games (44%),

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learning Chinese (24%), listening to audio (14%), and reading (7%). We summed up all the time spent on apps in different languages and presented it across children's language dominance. The majority used apps in one language (77%). A small group of children used apps in two languages (15%) and three languages (3%). Figure 4 depicts the children's total time spent in apps in different languages. For apps in Chinese (the dark bars), one can see that 31 Norwegian-dominant children spent no time while 27 Chinese-dominant children spent at least one hour per week. The t-test demonstrated that Chinese-dominant children spent significantly more time than Norwegian-dominant children did, $t(84) = 3.80, p < 0.001$. For apps in Norwegian (the light bars), 34 Chinese-dominant children spent no time while 20 Norwegian-dominant children spent at least one hour per week. The difference was also significant, $t(84) = 2.69, p < 0.001$. It is noteworthy that 33 children spent at least one hour in English apps, regardless of language dominance. Moreover, we found that older children tend to spend more time in Norwegian apps than younger children did, $t(84) = 3.05, p < 0.01$.

Figure 3. Norwegian- and Chinese-dominant children's language use and time spent on apps



For app usage style, parental participation varies across different app types. With audio apps, 58% of parents used them with their children; this is followed by learning apps (43%), video apps (34%), and reading apps (33%). Game apps had the least parental participation, with only 21% of parents taking part. Overall, 62% of parents reported that their child plays with smartphones and tablets by themselves, while 38% of parents used apps together with their child. Nonetheless, parental participation did not differ by children's age or language dominance.

To explore children's learning with screen-based literacy, we looked into a Chinese learning app that is popular among Chinese-Norwegian bilingual children, 洪恩识字 (*Hongen Shizi*) (iHuman-Chinese, 2020). The app targets children aged two- to eight-years old, and develops Chinese-characters reading and writing skills. It contains over 1200 Chinese characters. For each Chinese character, the learning consists of four sections: play, recognize,

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practice, and write (see Figure 5). First, users play a game while being exposed to the new character (see top left). The games, such as cooking, racing, bowling, jigsaw puzzle, and dressing-up, are diverse but straightforward. Second, users learn to recognize the character using a word phrase and a sentence (see top right). They hear the sound while the ball jumping on the character accordingly. Then, users drill and practice recognizing the new character with a game-like exercise where they listen to the instruction and choose the right answer (see bottom left). Fourth, users practice writing by tracing the new character three times (see bottom right). After completing the four sections, users can move on to the next character.

The app learning surface defines clear goals. All instructions are verbal, taking into account that the users are beginner readers. Some sections provide modeling goals. For example, in the writing section (see figure5, bottom right), there is a hand demonstrating the tracing direction. In-play guidance is also available: when the user pauses for over a specific time, the verbal prompts will repeat, and there will be visual prompts. Positive feedback is in various forms: verbal (e.g., "Very good!"), visual (e.g., fireworks) and sound effects (e.g., cheering music). It also has reward systems. By finishing the tasks in each section, users collect stars and character cards. For every five new characters, children need to take the assessment to unlock new characters. The characters are placed in the order of complexity, guaranteeing the scaffolded challenge. Users mostly use dragging and tapping to interact with the touchscreen. The app also provides paid services, such as supplementary exercise and leveled reading. Overall, the app covers a variety of educational features.

Figure 4. The four learning sections of character for 'one', 一 (yi) in a Chinese learning app



Print-based vs Screen-based

Using Spearman correlation (see table 1), we explored the relationship between children's print-based and screen-based literacy at home. There is no connection between the total number of children's books and digital devices at home. Nevertheless, we found that children tend to use language consistently across print- and screen-based resources. Namely, children who have more Chinese books at home also spent more time in Chinese apps, $r = 0.39, p < 0.001$. The same pattern was observed with Norwegian, $r = 0.23, p < 0.001$, and English, $r = 0.33, p < 0.01$.

Table 1. Zero-order spearman correlation between print-based and screen-based literacy at home

	Screen-based ^b	Apps in Chinese	Apps in Norwegian	Apps in English
Print-based ^a	- 0.08	0.23	- 0.01	0.03
Books in Chinese	- 0.14	0.39***	- 0.09	- 0.06
Books in Norwegian	- 0.04	- 0.06	0.23*	- 0.13
Books in English	0.02	0.14	- 0.21	0.33**

*Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Print-based^a refers to the total number of children's book at home, Screen-based^b refers to the total type of screen-based resources (smartphone and tables, TV, PC, etc.) children have access at home.*

Discussion

This chapter explored how Chinese-Norwegian emergent bilingual children engage in meaning making across multiple modalities to learn languages at home. We drew on a parent-reported survey and an analysis of books and apps referenced in those surveys to provide an overview of their home multimodal literacies. The results revealed robust connections between children's language dominance and their multimodal literacy experience. Namely, children with better Chinese skills are inclined to have more children's books in Chinese and spend more time with Chinese apps. Similarly, Norwegian-dominant children tend to have more Norwegian books and engage with more Norwegian apps. Books often serve as an indicator of a thriving home literacy environment in many studies (for example, Friedlander, 2020; Sénéchal & LeFevre, 2002), so it is not surprising that the books in the home link to children's language dominance. Additionally, we found that a correlation between app use (i.e. watching videos and playing games) and children's language dominance, which is less documented in the literature but not unexpected (van Daal et al., 2019).

Our results are consistent with previous studies that show that bilingual children tend to shift to the majority language when they enter school (Lyutykh & Shumow, 2013; Zhang, 2010). This language shift is reflected in changes of literacy resources: more books in Norwegian, more favorite books are in Norwegian, and more time spent in Norwegian apps. Furthermore, Norwegian-dominant children have more access to TV, while Chinese-dominant children use more smartphones and tablets. This finding underlines an important point. As TV programs in Norway (especially for children) are in Norwegian, parents who want to expose their children with more Chinese have to seek for resources. Therefore, they turn to smartphones and tablets. The same trend was observed with books at home. Norwegian books are accessible for all families, either in libraries or in bookstores. However, parents need to work harder to source Chinese books by carrying them from China, or paying for international postage. Thus, Chinese literacy resources in some part also probably index parents' determination to support their child's Chinese development.

English as the third language plays a role in Chinese-Norwegian bilingual children's multimodal literacy environment. More than one-third of the children in our sample reported spending time using English apps and consuming English media. Several related explanations suggest themselves. First, English dominates our media landscape, from print to digital media; it is natural for children to be exposed to English. Second, English is a popular language in Norwegian society, and most Chinese parents can speak English. Exposure and familiarity could also contribute to children's consumption. Furthermore, we found that the Chinese-dominant children have more English books than their Norwegian-dominant counterparts do. This may indicate that our sample includes "ambitious parents" (Curdts-Christiansen, 2009), who want their child to master Chinese and other languages, especially English.

This chapter used a parent-report questionnaire to learn children's multimodal literacies practices and language dominance. This method has limitations. First, even though parents are intimate caregivers, they may not be up-to-date with children's online activities all the time (Kumpulainen & Gillen, 2020). We assume parents report represented plausible estimates of online activity but they do not provide a nuanced and precise description of this activity. To learn more about children's attitudes and practices, observations and think aloud would be optimal. Second, conducting standardized measures for both Chinese and Norwegian language skills is practically demanding, so we used parental judgment. It is considered as a reliable source for children's language measure (Pua et al., 2017; Schwartz & Moin, 2012). The instrument we referred to, ALDeQ, is found valid in multiple studies across languages (Hansen et al., 2019; Sorenson Duncan & Paradis, 2020). We believe it is sufficient to determine a binary category of language dominance but our ongoing work makes greater use of standardized language assessments.

Implications

Technology is rapidly changing, affecting children's home literacy experience. Ten years ago, TV and PC used to be the most popular resources at home (Hill, 2010), while now we found smartphones and tablets have replaced PC to create opportunities for children's meaning-making. This chapter provides implications for understanding the challenges faced by Chinese bilingual families in Norway, and for understanding the kinds of support that language learners are turning to in an increasingly connected literacy and media landscape. The implications could be relevant for all kindergarten/schools and teachers. First, with the great majority of children having access to and being

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familiar with the digital environment at home, teachers can take advantage of digital literacy resources and activities to extend learning from school to home. Second, bilingual children tend to use their dominant language in reading books and using apps at home. Correspondingly, for improving a particular language, access to more books and apps in their favorite genre in the particular language would be of use. Third, children's preference for book genres varies across age: younger children prefer picture storybooks, older children prefer fantasy and detective fiction, and traditional literature has audiences across all ages. Kindergartens/schools can facilitate children with suitable books to promote language and literacy learning. In summary, by knowing children's preferences and parents' supports and behaviors at home, educators can better understand and further facilitate children's language and literacy learning.

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