Exploring Teachers' Experiences in Bilingual Education for Young Learners: Implications for Dual-language Learning Apps Design

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A B S T R A C T

The increasing popularity of mobile dual-language learning applications (apps) in the education industry has led to a growing interest in investigating their effectiveness. However, there is a paucity of research investigating mobile apps specifically designed for speakers learning dual languages. Accordingly, this study utilised a qualitative research method to explore the perceptions and design of such apps for bilingual teaching and learning. A cohort of 30 in-service teachers participated in individual interviews, serving as the primary source of data collection and analysis. Thematic analysis was employed to identify patterns within the transcripts and detailed field notes. The results revealed nine themes and twenty-four subthemes related to mobile dual-language learning apps. These findings provide insights into the potential benefits and challenges of using mobile apps for language learning, as well as implications for the design of dual-language learning apps. The implications of this study extend beyond the education industry and have practical implications for language educators and app designers alike. The study contributes to the current body of knowledge in the field of education by shedding light on the effectiveness of mobile dual-language learning apps for bilingual teaching and learning.

Keywords: bilingual education; mobile applications; young learner; dual language; learning platform

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Introduction

Mobile phones equipped with Wi-Fi access have evolved from being just communication devices to smart devices that can be employed for learning purposes. One group that can gain advantages from mobile learning are young dual language learners (DLLs). DLLs are children who are learning two or more languages, and many experts believe that bilingualism is beneficial for both DLLs and all children in general (Genesee, 2015). Language learning applications (apps) offer the combination of language and technology and enable learners and teachers to learn beyond traditional classrooms. By providing DLLs with lifelong learning opportunities without being limited to formal learning environments, mobile apps offer 24/7 access to support language learning, irrespective of their location (Jamaldeen et al., 2018). These apps also merge formal and informal learning environments, allowing learners to internalise correct forms more easily and providing immediate feedback at the end of each exercise (Kukulska-Hulme, 2012).

While previous studies have established the effectiveness of mobile language learning apps in improving learners' motivation, engagement, and academic performance (Basal et al., 2016; Hwang & Fu, 2019; Mihaylova, et al., 2022), there exists a notable research gap necessitating exploration of the specific factors influencing their efficacy. This lacuna is particularly pronounced in the context of bilingual education, where the focus is on developing proficiency in both Thai and English. The educational curriculum is thoughtfully structured to cultivate bilingualism, equipping students with the ability to proficiently communicate in both languages. To bridge this knowledge gap, the present study utilised a qualitative research design to examine the perceptions and design considerations of mobile dual-language learning apps tailored for bilingual teaching and learning. The overarching aim of this study is to offer valuable insights into the potential benefits and challenges associated with the deployment of mobile apps for language learning, ultimately yielding implications for the enhancement of dual-language learning apps.

Literature review

Bilingual teaching and learning

In the mobile era, the potential of bilingual teaching and learning to enhance language acquisition and promote cultural awareness has made it an important topic for educators. With the proliferation of mobile devices, teachers have the opportunity to incorporate technology into their bilingual teaching practices. This literature review aims to explore the current state of research on bilingual teaching and learning in the mobile era, and its implications for young DLLs.

Mobile technology has been identified as a potential tool to enhance language learning by providing learners with increased access to language learning materials and opportunities for language practice (Bachore, 2015; Stockwell, 2021). Furthermore, mobile devices can offer DLLs the opportunity to engage with authentic materials and language input, which may lead to more meaningful language acquisition (Lai & Gu, 2011). Pellerin (2012) conducted a study which demonstrated that mobile devices could provide young learners with more opportunities to engage in authentic language learning activities, such as watching videos, recording their voice while reading, and communicating with peers. These activities were perceived to be more enjoyable and motivating for learners, leading to higher levels of engagement in the language learning process.

However, the integration of mobile technology into bilingual teaching and learning is not without its challenges. Kim et al. (2013) acknowledge the potential for mobile devices to enrich learning experiences by providing access to multimedia content within authentic contexts. Yet, they also

note the potential for learner frustration when encountering user-unfriendly interfaces during pedagogical tasks. Furthermore, Lai and Gu (2011) highlight the lack of necessary skills and resources among some educators, impeding effective integration of mobile technology into their practices. These findings highlight the need for comprehensive teacher training programs and ongoing support to facilitate successful implementation of mobile technology in bilingual education.

Despite the challenges posed by the mobile era, recent research suggests that bilingual teaching and learning can have a positive impact on language acquisition and cultural awareness. For instance, a study conducted by Wu and Miller (2021) found that the use of mobile technology increased learners' exposure to diverse cultural environments and perspectives, thereby enhancing their cultural awareness and sensitivity. Furthermore, bilingual education has been shown to facilitate the development of cognitive skills, such as non-verbal executive control and theory of mind abilities, as DLLs learn to navigate diverse linguistic and cultural contexts (Barac et al., 2014).

In terms of teacher perceptions of bilingual teaching and learning in the mobile era, there is some evidence to suggest that teachers are generally positive about the potential benefits of mobile technology in language learning. In a study conducted by Wang et al. (2021), mobile technology provided learners with increased opportunities for language practice. They also gained valuable exposure to authentic materials, enriching their learning experience. However, some teachers also expressed concerns about the potential distractions associated with mobile devices, as well as the need for effective teacher training and support to integrate mobile technology into their teaching practices.

Overall, the literature suggests that bilingual teaching and learning in the mobile era has the potential to enhance language acquisition and promote cultural awareness. However, there are also potential challenges associated with the integration of mobile technology in bilingual teaching and learning. To effectively integrate mobile technology into bilingual teaching and learning practices, there is a need for teacher training and support, as well as further research on the impact of mobile technology on language acquisition and cultural awareness.

Mobile learning applications for language learning

In recent years, mobile learning has gained considerable popularity as an effective tool for language learning. Mobile learning apps provide an innovative and engaging approach for DLLs to access language learning materials at any time and from anywhere. Mobile learning apps have become increasingly popular among primary school students, as they offer a wide range of features and functionalities that cater to the learning needs and preferences of these learners. This literature review presented in this section aims to explore the different design features of mobile learning apps that are most effective in enhancing the dual-language proficiency of primary school students.

Design features of mobile learning apps

Mobile learning apps for language learning come in different forms, ranging from flashcard apps to interactive games and social media-based platforms. However, some design features are considered to be more effective in enhancing the dual-language proficiency of primary school students. These design features are discussed below.

Gamification

Gamification is a design feature that incorporates game elements into learning activities to make them more engaging and fun. According to research findings, gamification has a positive impact on student motivation and engagement in language learning (Loewen et al., 2019). Gamification can be achieved through the use of leaderboards, badges, rewards, and progress bars. For example, the Duolingo app (https://www.duolingo.com) incorporates gamification elements such as progress bars and achievement badges, stimulating learners to persist with their app usage by crafting a game-like interface that renders language learning an enjoyable and immersive experience.

Personalisation

Another compelling design feature that fosters improved language acquisition is personalisation. This involves adapting the learning journey to match the unique needs and preferences of individual learners. Personalisation is effectively achieved through the deployment of adaptive learning algorithms, which dynamically calibrate the difficulty of the learning materials based on each learner's performance. The Babbel app (https://uk.babbel.com) stands as an exemplar in this regard, harnessing adaptive learning algorithms to personalise the learning experience for each user. The app also grants learners autonomy by allowing them to select the language they wish to acquire and to hone in on specific areas of interest.

Interactivity

Interactivity, a pivotal design attribute, affords learners a diverse array of avenues to engage with learning materials. These avenues encompass audio, video, images, and animations. Established research affirms the positive impact of interacitivity on language learning outcomes (Teng, in press). For instance, the Memrise app (https://www.memrise.com) expertly incorporates interactive flashcards enhanced with multimedia elements, including images, audio, and video to facilitate the memorisation of new vocabulary. This approach proves to be profoundly effective in sustaining learner engagement and bolstering retention.

Collaboration

Collaboration serves as a design feature that kindles interactive dynamics among learners themselves and between learners and teachers. The realisation of this collaborative dimension is facilitated through the integration of social media-based platforms and online forums. Research underscores the affirmative impact of such collaboration on language learning outcomes (Garrison & Kanuka, 2004). An exemplar in this domain, the Busuu app (https://www.busuu.com), adroitly incorporates a social media-based platform that allows learners to connect with native speakers of the language they are learning. This unique dimension affords learners the opportunity to hone their language skills through interaction with native speakers, thereby receiving invaluable feedback on their language use.

Research questions

The current study aims to address the following research questions, derived from the existing literature:

> 1. What are the perceptions of teachers regarding bilingual teaching and learning for young DLLs in the mobile era?

> 2. What design features of mobile learning apps are most effective in enhancing the dual-language proficiency of primary school students?

> Through the exploration of these research questions, the study aspires to make a substantial contribution to the existing knowledge base in this field and to provide guidance for future research endeavours.

Method

This study employed a qualitative research design to gather and analyse data through individual interviews with teachers. The use of individual interviews enabled the in-depth analysis of specific topics and potential exploration of minority viewpoints, thereby enriching the data obtained (Patton, 2002). The data used in this study were drawn from a larger project entitled "Research and Development of the Scenario-Based Mobile Learning Application to Develop Dual Language Proficiency for Digital Young Learners," and ethical clearance for the study was obtained from the committee for research ethics (Social Sciences) of the first author's institution.

Participants

The study employed purposive sampling to recruit a total of 30 in-service teachers who met the eligibility criteria. As shown in Table 1, the participants' ages ranged from 27 to 49 years old, with an average age of 36. Their educational background varied, with 2 participants holding doctoral degrees, 7 holding master's degrees, and 21 holding bachelor's degrees. On average, participants had 11 years of primary teaching experience. The majority of participants were from Bangkok ($n = 6$) and the northeastern region ($n = 6$) of Thailand, followed by the central region ($n = 5$), the eastern region ($n = 5$), the south ($n = 5$), and the north ($n = 3$). The selection criteria were based on participants' prior experience and familiarity with dual language teaching and learning, as well as their use of mobile apps in the classroom. To ensure comprehensive data collection in response to the research questions, a diverse group of participants was selected. Data collection was terminated upon reaching data saturation.

Employing a purposive sampling approach for the individual interviewee selection, participants were chosen based on their demonstrated prior experience and proficiency in dual language teaching and learning, coupled with their adeptness in using mobile app within the classroom. Furthermore, a snowball sampling technique was employed to increase the sample size by asking participating teachers for referrals of colleagues who met the selection criteria. This approach led to the recruitment of a diverse array of teachers with varying degrees of experience in deploying mobile apps for language learning.

Table 1
Participants' Demographic Information

No	Gender	Age	Education	Experience	Region
1	F	37	Doctoral	13	Bangkok
2	F	42	Doctoral	16	Central
3	F	33	Master	10	Bangkok
4	M	38	Master	8	Bangkok
5	F	47	Bachelor	21	Bangkok
6	F	36	Bachelor	9	Bangkok
7	M	32	Bachelor	3	Bangkok
8	M	38	Master	19	Central
9	F	37	Bachelor	14	Northeastern
10	M	31	Bachelor	7	Central
11	F	37	Bachelor	12	Eastern
12	F	49	Master	25	Northeastern
13	F	44	Bachelor	20	South
14	F	29	Bachelor	5	Eastern
15	F	33	Bachelor	10	Northeastern
16	M	32	Master	7	Central
17	M	30	Bachelor	7	South
18	F	45	Bachelor	11	Central
19	F	37	Bachelor	14	Eastern
20	M	27	Bachelor	4	Eastern
21	M	27	Bachelor	5	South
22	F	42	Master	18	Northeastern
23	F	33	Bachelor	6	Northeastern
24	F	38	Master	14	North
25	F	31	Bachelor	9	North
26	F	36	Bachelor	13	Northeastern
27	F	31	Bachelor	6	South
28	M	32	Bachelor	7	South
29	F	48	Bachelor	17	North
30	M	30	Bachelor	8	Eastern

Semi-structured interview

The semi-structured interviews, cataloged in Appendix A. were meticulously crafted based on insights drawn from the literature review (e.g., Callaghan & Reich, 2021; Singh, 2019) and the collective expertise of the research team. This carefully constructed set of 15 questions comprised eight open-ended questions, designed to delve into the nuances of bilingual teaching and learning for young DLLs in the mobile era. In addition, seven questions were dedicated to the comprehensive examination of the design aspects inherent in mobile learning apps.

Data collection and analysis

Following a rigorous two-month period spanning from September to October 2021, a select group of teachers participated in semi-structured interviews aimed at providing in-depth insights into the design of mobile apps for dual-language learning. To gather comprehensive data on the participants' perceptions regarding the use of mobile apps in language learning, online in-person interviews were conducted using the Zoom platform. All interviews were recorded digitally and transcribed to facilitate data analysis. The interviews were conducted via video conferencing software and lasted between 25-40 minutes. Upon completion, transcriptions of the interviews were provided to all participants, who were given the opportunity to review and approve or amend them.

Thematic analysis, a well-established qualitative method, was chosen to identify, analyse, and elucidate the underlying patterns within the transcripts and detailed field notes. This methodical approach involves the systematic identification, analysis, and interpretation of patterns of significance within a set of qualitative data. Employing an inductive approach, the examination of transcriptions and field notes aimed to identify emergent themes and patterns within the data. The study adhered to the six-step thematic analysis process, as described by Braun and Clarke (2006), which includes the following phases: Step 1 - Familiarisation with the data, Step 2 - Generation of initial codes, Step 3 – Identification of themes, Step 4 - Review and refinement of themes, Step 5 - Definition of themes, and Step 6 – Compilation and presentation of findings. This process entailed a manual and thorough analysis and coding of the data to ensure a robust and rigorous exploration of the collected information.

To ascertain the dependability of data analysis, a number of procedures were undertaken. Initial uncertainties within the transcripts were clarified through consultation with all researchers involved in data collection. Additionally, to ensure the consistency and reliability of the data coding process, all researchers independently coded the same transcripts from interviews with the 30 participating teachers. Such consistency tests are deemed suitable mechanisms for verifying the reliability and consistency of qualitative studies (Guest et al., 2011). Any inconsistencies identified were subjected to discussions among the research team, ultimately culminating in consensus on the codes. Finally, all project researchers collectively evaluated the allocation of codes to respective themes.

The coding process began by reading the transcripts to ensure familiarity with the data set. Next, codes were given to data units, with data not related to mobile technology perceptions, use, or features being excluded from the coding process. The third step involved categorising the codes into higher levels of meaning, known as themes. The final steps refined the codes and themes, provided specific names for each theme, and discussed how the themes related to the research aim and literature. Additionally, data from answers to closed questions about the mobile app features allowed for frequency counting. Although frequency counts are more common in quantitative or content analysis approaches, they can also be used in thematic analysis (Braun & Clarke, 2006).

It is imperative to note that this study followed ethical guidelines and received clearance from the pertinent research ethics committee. The first author meticulously adhered to all requisite protocols governing ethical research practices.

Findings

The subsequent section portrays the findings derived from our analysis that encompass data garnered from all individual interviews. The outcomes are structured based on our thematic analysis methodology that highlights emergent themes.

Bilingual Education for Young Learners in the Mobile Era

Table 2 presents the results of the analysis of teachers' experiences with bilingual teaching and learning for young DLLs obtained from individual interviews. Each theme and subtheme is accompanied by a citation example.

Table 2

Teachers′ Experiences of Bilingual Education for Young Learners

Theme and subthemes	Frequency	Quotation examples
Theme 1: Importance of Vocabulary and Grammar in Bilingual Teaching and Learning		
1.1 Focus on Simple Words and Sentences	15	"In elementary school language classes, it is recommended to focus on conversational vocabulary and simple sentence structures, especially for first graders who require greater emphasis on reading and writing skills. Lessons should include a limited number of key concepts, messages, and words, which will be consistently reinforced throughout the course." "In language classes, various teaching arrangements related to grammar, vocabulary, and dictation exercises can enhance student learning. For instance, dictation exercises may be conducted before class activities to reinforce language comprehension and encourage active participation among students." "The utilisation of basic language terms, such as those in English, can facilitate early language learning by providing a more accessible and less academic approach. For young learners, memorisation plays a crucial role in learning language, and a simplified approach using basic language terms can be beneficial for long-term language acquisition."
1.2 Emphasis on Vocabulary and Definition	13	"If feasible, it would be beneficial to provide a clear definition of the term to serve as a consistent guide for students, as at times other teachers may offer differing explanations."
1.3 Importance of Basic Grammar	6	"When organising bilingual activities for elementary school children, it is generally believed by teachers that the focus should be on simple vocabulary, sentences for general conversation, and basic grammar. This is particularly important in Grade 1 where the focus should be on developing reading and writing skills, rather than listening and speaking skills."
Theme 2: Focus on Speaking and Listening Skills		
2.1 Listening is the Most Important Skill	16	"A child's listening ability is of paramount importance as it is a foundation for correct pronunciation, speaking, and reading skills. Subsequently, reading and writing skills should be developed through continuous practice." "In the initial level of instruction, the emphasis is placed on developing listening and speaking skills, followed by reading and writing. The curriculum centers on enhancing listening and speaking skills, whereas writing focuses on simple sentence construction and reading on short texts." "The development of a variety of language skills is important. However, particular emphasis should be placed on fostering listening and speaking proficiency. The teacher serves as the central figure, providing children with opportunities to practice speaking and refine their pronunciation skills." "Listening comprehension is paramount in a child's language acquisition process, as it serves as a foundation for accurate speaking and reading. Subsequently, reading and writing proficiency should also be practiced."
2.2 Emphasis on Conversation and Simple Words	10	"The majority of the teachers shared the view that priority should be given to basic vocabulary, simple sentence structures for daily communication, and basic grammar in organising bilingual activities for elementary school children."
Theme 3: Tailor-Made Bilingual Lesson Content		
3.1 Advantages of tailor-made content for young DLLs	6	"The content of the lessons in both Thai and English may deviate from the indicators specified in the Basic Education Core Curriculum BE 2551, as the curriculum has been newly designed."
3.2 Focus on daily life usage of language	4	"The students should be taught various basic words and sentences that are commonly used in everyday life."
3.3 Departure from formal curriculum indicators	4	"It is not advisable to integrate the teaching of Thai language and English language based solely on their respective elementary school indicators, particularly with respect to the learning of vowels, consonants, and word combinations. Due to the mismatch between their curricular contents, a more feasible approach should be adopted to avoid any detrimental effects on the learning outcomes of the students."
3.4 Challenges in creating tailor-made content	3	"The use of Thai characters may be prevalent in English language learning materials to facilitate engaging activities, but the content should remain focused on the target language. The teacher's expertise can be utilised to supplement the learning materials. It is recommended to prioritise language principles in the learning materials."

Theme and subthemes	Frequency	Quotation examples
Theme 4: Use of Technology in Bilingual Teaching and Learning		
4.1 Technology as a Motivator	18	"Technology can serve as a motivator for learners to cultivate a positive attitude toward bilingual teaching and learning." "Apps and technology are highly crucial for children's education. By enabling direct learning through apps, children will be able to grasp and retain information more effectively."
4.2 Suitability of Technology for Different Schools	14	"It may be suitable to implement these technologies in demonstration schools or urban schools that are better equipped to handle them." "For rural schools, access to technology such as telephones and computers is scarce, and the screen sizes are almost non-existent. Thus, developing apps for such regions is challenging." "The limitations of computer and TV screen sizes render the development of apps challenging, especially considering the current ground reality of pronounced inequality in society."
4.3 Importance of Access to Technology	13	"Direct learning through apps has the potential to facilitate greater knowledge acquisition among children." "In my school, children start using iPads from kindergarten, and by grades 1 to 3, they can use it fluently. I also use Google Classroom to post work, making it more accessible for students."
4.4 Technology as an Integral Part of Learning	8	"Various apps, including games and interactive media, can stimulate children's interest and foster a positive attitude towards both Thai and English subjects." "Measuring and evaluating student progress through one app is beneficial. Additionally, students can study the content in the app and complete worksheets." "I will utilise Google Classroom to distribute my educational materials conveniently."

The results outline several themes and subthemes related to bilingual teaching and learning, including the importance of vocabulary and grammar, the focus on speaking and listening skills, the need for tailor-made lesson content, and the use of technology in bilingual education.

The first theme emphasises the importance of using simple vocabulary and sentence structures in bilingual teaching, especially for young DLLs in elementary school. The subthemes in this category suggest the need for clear definitions and a focus on basic grammar. The second theme highlights the importance of developing listening and speaking skills, with an emphasis on conversation and simple words. The third theme discusses the advantages and challenges of creating tailor-made lesson content, with a focus on using language in daily life situations. Finally, the fourth theme emphasises the use of technology in bilingual teaching and learning, including its potential as a motivator and integral part of the learning process.

Overall, the information suggests that bilingual teaching and learning can be most effective when it is tailored to the needs of the DLLs and utilises a range of approaches, including technology. Effective bilingual education requires a focus on vocabulary, grammar, speaking, and listening skills, as well as the use of real-life situations and materials to engage learners.

Design of Effective Features in Mobile Learning Apps

The outcomes concerning the design of mobile learning apps are summerised in Table 3.

Table 3

Effective Features in Mobile Dual-Language Learning Apps

Theme and subthemes	Frequency	Quotation examples
Theme 1: Use of games as learning tools		
1.1 Integration of games in mobile Apps	24	"I desire a multifaceted app with integrated games, rather than a unidirectional game for children's entertainment." "Various educational games must be employed to teach in this app."
1.2 Appeal of games to children	17	"To create an app, it should capture the attention of children, possibly by using cartoon characters." "Children are likely to become more interested in an app if it contains scoring mechanisms."
Theme 2: Use of cartoon characters as learning tools		
2.1: Use of colourful cartoon characters in mobile Apps	19	"Employing colourful cartoon characters as a medium to present educational content can enhance learners' engagement and facilitate their comprehension." "The use of cartoon characters as a means to capture children's attention is a feasible strategy to foster their interest in learning. Hence, incorporating such characters into educational apps may prove effective."
2.2: Appeal of cartoon characters to children	18	"Young learners tend to be drawn to media that features cartoon characters. Therefore, utilising such characters in educational materials can stimulate their curiosity and enhance their learning experience."
Theme 3: Interactivity in mobile Apps		
3.1 Teacher-Student Interaction in Mobile Apps	15	"Emphasis is placed on the interaction between teachers and students and use pictures of colourful cartoon characters as a medium to present the content." "We sought an app that promotes interaction among all children."
3.2 Child-App Interaction in Mobile Apps	10	"Children should not be able to simply press buttons without engaging with the educational content." "The use of animations and sound effects that resonate with the learner can enhance their engagement and retention of knowledge."
Theme 4: Mobile Apps for Bilingual Learning		
4.1 Classroom Activities	15	"The potential overuse of screen time in promoting an educational app for children may raise concerns. However, the app can be beneficial to non-major teachers in a classroom setting, emphasising the importance of its role as a tool for educators."
4.2 Self-Study at Home	8	"The value of an educational app lies in its ability to enhance the teaching and learning process in the classroom, as teachers play a significant role in the educational experience." "Considering that young children do not typically have their own phones or computers and require adult supervision, promoting an app solely for individual use may not be practical. This is particularly relevant for children living in rural areas who may not have easy access to technology."
4.3 School Readiness and Internet Connectivity	5	"The preparedness of educational institutions is reflected in their budget allocation for supporting educational media, which is often found to be inadequate. Therefore, we are compelled to seek alternative means to procure these resources."
Theme 5: Balancing the Use of Thai and English in Mobile Application		
5.1 Catering to Students with Varied English Proficiency	11	"The incorporation of Thai language alongside English in educational presentations would facilitate and benefit students."
5.2 Incorporating Thai for Non-English-Speaking Students	6	"Thai language should be included for children who play independently and may not understand solely English. It can foster a sense of pride and accomplishment as they learn to spell in their native language." "Although an English-only approach may be favoured by some English language teachers, it is important to include Thai language for children who play independently and may not understand English. It can enhance their learning experience and foster a greater sense of inclusion."

The analysis yielded five primary themes concerning the design of effective features in mobile learning apps for bilingual education: the use of games and cartoon characters as learning tools, interactivity, bilingual learning, and balancing the use of Thai and English. These themes suggest

that integrating games, colourful characters, and interactive features in mobile apps are effective ways to enhance primary school students' proficiency in both languages. The participants highlighted the importance of using both languages in mobile apps to accommodate different levels of English proficiency among students and facilitate learning for both students and teachers. However, they also acknowledged the need to balance the use of Thai and English in the app to cater to different student needs.

It is noteworthy that some interviewees expressed opinions that overlapped with multiple themes, particularly those related to the content of bilingual lessons and the use of mobile apps. Additionally, concerns regarding school readiness and internet connectivity could be considered a subtheme under the mobile apps theme, although they were addressed separately due to their distinct nature.

Discussion

Bilingual education, defined as the instruction of academic subjects in two languages, plays a pivotal role in addressing the educational needs of young DLLs, particularly in a rapidly globalising world. This study aimed to explore the experiences of educators in the field of bilingual teaching and learning for young learners and its implications for the design of dual-language learning apps. To this end, a thematic analysis methodology was employed to collect data from individual interviews with teachers. The emerging findings were categorised into nine themes, each of which is discussed in detail below.

The educators highlighted the importance of prioritising conversational vocabulary and simple sentence structures for bilingual teaching and learning with young students, particularly emphasising this need for first-graders requiring additional focus on reading and writing skills. This emphasis on simplicity aligns with previous studies indicating the usefulness of explicit grammar and vocabulary instruction for language learners (Hanan, 2015; Lichtman, 2021; Longhurst, 2013). Moreover, the teachers recommended various instructional practices related to grammar, vocabulary, and dictation exercises that could enhance student learning. For instance, the integration of dictation exercises before class activities to reinforce language comprehension and encourage active participation aligns with previous research demonstrating that dictation exercises can improve student spelling, grammar, and reading comprehension (Graham et al., 2000).

Furthermore, the utilisation of basic language terms, especially in English, can facilitate early language learning by providing a more accessible and less academic approach. For young DLLs, memorisation plays a crucial role in learning language, and a simplified approach using basic language terms can be beneficial for long-term language acquisition. This finding aligns with prior research indicating that children's acquisition of second language vocabulary is facilitated by frequent exposure to and repetition of target vocabulary words in context (Albaladejo et al., 2018; Gu, 2003; Wesche & Paribakht, 1996). Additionally, the teachers emphasised the importance of basic grammar and suggested a focus on developing listening and speaking skills, rather than reading and writing skills, particularly in Grade 1. While a variety of language skills are important, a particular emphasis on fostering listening and speaking proficiency was encouraged, with the teacher assuming a central role in providing children with opportunities to practice speaking and refine their pronunciation skills.

Customised bilingual lesson content unlocks significant advantages, particularly in boosting student motivation and engagement. A key benefit lies in its focus on everyday language use, with this study's findings underlining the importance of prioritising basic words and sentences relevant

to daily life. However, crafting such content also presents challenges, mainly the need to sometimes deviate from formal curriculum indicators. For instance, the Thai BE 2551 may not cater to all students' needs. While scholars like Bartlett and Garcia (2012) emphasise tailoring curriculum development to individual learners, directly aligning with both Thai and English elementary school indicators can be tricky as content may not overlap, potentially leading to confusion and hindering learning outcomes. Therefore, a more flexible approach is necessary to ensure a seamless learning experience and preserve student achievement, as advocated by Freeman and Freeman (2014).

In addressing this challenge, teachers must carefully balance the teaching of both languages while considering the DLLs' linguistic and cultural backgrounds. This approach is in line with the research of Freeman and Freeman (2014), who contend that the most effective bilingual education programmes are those that carefully balance the two languages being taught and the ones which take account of learners' linguistic and cultural backgrounds. By adopting this approach, teachers can develop customised content that appeals to students' interests and needs, ensuring that the curriculum aligns with their linguistic and cultural backgrounds.

Another challenge in creating tailor-made bilingual lesson content is the appropriate use of Thai characters in English language learning materials. While Thai characters can facilitate engaging activities, it is vital that the content remain primarily focused on the target language. Therefore, the use of Thai characters should be limited to an extent that they do not interfere with the learning of English. Teachers' expertise can be leveraged to supplement the learning materials and create a bilingual and bicultural learning environment, as they play a critical role in the success of bilingual education programmes (Cenoz & Gorter, 2015).

The findings also suggest that technology can serve as a motivating factor for DLLs which can cultivate a positive attitude towards bilingual teaching and learning. The use of apps and technology in education can be highly beneficial to children's learning, enabling direct engagement with apps that enhance their grasp of information and knowledge retention. A study by Kamasak et al. (2020) found that the use of mobile-assisted language learning apps improved learners' speaking, listening, reading, and writing skills. Technology can facilitate a more interactive and dynamic learning experience, which, in turn, leads to more effective learning outcomes.

However, the suitability of technology in different educational settings may vary. The findings demonstrate that the implementation of these technologies may be more suitable in university-affiliated schools or urban schools that possess better infrastructure to support them. In contrast, rural schools often lack access to technology, such as telephones and computers, with limited access to screens. UNESCO (2020) reports that over 72 million children of primary education age do not have access to education due to a lack of resources, facilities, or teachers. Therefore, ensuring equitable access to technology is crucial, irrespective of geographic location, to bridge the digital divide and promote fairness in educational access.

Access to technology is paramount in the present digital age, with mobile apps providing a direct approach to learning that can help children acquire knowledge more efficiently. Additionally, technology can help bridge the digital divide and provide equal opportunities for learning. Recent research suggests that technological integration within the classroom has already begun, with devices like iPads being introduced in kindergarten settings. This introduction facilitates access to a diverse range of learning resources, enhancing their accessibility for students. In a relevant study, Minicozzi (2018) demonstrates that the integration of iPad technology into lesson plans can positively impact student learning outcomes.

Various apps, including games and interactive media, can stimulate children's interest and foster a positive attitude towards both Thai and English subjects. The use of apps can also provide a personalised learning experience tailored to the individual needs of each student. The findings suggest that using a single app to measure and evaluate student progress can be advantageous. Furthermore, students can study the app's content and complete worksheets. Technology can also provide a platform for collaboration and communication among students, teachers, and parents. Several studies (Panagiotidis et al., 2023; Su & Cheng, 2014) have found that technology-enhanced language learning can improve student motivation, engagement, and learning outcomes, leading to a more interactive and immersive learning experience.

The integration of games in mobile learning apps can be an effective strategy to enhance learners' engagement and facilitate comprehension. The study participants highlighted the importance of employing various educational games to teach in mobile learning apps, rather than using unidirectional games for children's entertainment. The use of games as learning tools has been found to promote active learning, motivation, and problem-solving skills among DLLs (Kebritchi et al., 2010). Furthermore, the participants emphasised the appeal of games to children and suggested that incorporating scoring mechanisms in mobile learning apps can increase children's interest in learning. The use of gamification elements, such as points, badges, and leaderboards, has been found to enhance learners' motivation, engagement, and learning outcomes in various educational contexts (Dicheva et al., 2015).

The use of colourful cartoon characters within educational mobile learning apps was highlighted as a popular and engaging theme. The findings suggest that incorporating such characters into educational apps can enhance learners' engagement and facilitate their comprehension. Participants highlighted that utilising cartoon characters as a medium to present educational content can effectively promote engagement and comprehension. Previous research has shown that incorporating cartoon characters in educational materials can promote learners' interest and facilitate learning outcomes (Hsu et al., 2013; Liu & Elms, 2019). Therefore, the inclusion of cartoon characters in educational apps may prove effective.

A subtheme that emerged from the findings pertains to the appeal of cartoon characters to children. Young DLLs tend to be attracted to media featuring such characters. Utilising them in educational materials can stimulate their curiosity and enhance their learning experience. One participant stated that incorporating cartoon characters in educational materials can enhance young learners' curiosity and learning experience. These findings are consistent with previous studies that have highlighted the effectiveness of using cartoon characters as learning tools in educational materials for children (Egounleti et al, 2018; Kocak & Goktas, 2021; Özer & Avcı, 2015). The use of cartoon characters can enhance children's interest and motivation to learn, presenting complex concepts in a simplified and engaging manner. Therefore, mobile learning app designers should consider incorporating colourful cartoon characters into their educational apps to enhance learners' engagement and facilitate their comprehension.

The significance of interactivity in mobile apps was emphasised as a critical factor in effective design. Participants stressed the importance of interactive elements, including teacher-student and child-app interaction, to promote engagement and facilitate knowledge retention. Incorporating animations and sound effects that appeal to the learner was also recommended as a means to enhance engagement and learning outcomes. Prior research has demonstrated that interactive learning tools have the potential to boost learners' engagement and promote their learning outcomes (Abykanova et al., 2016; Liu & Moeller, 2019).

Moreover, the study suggests that the incorporation of the Thai language alongside English in educational presentations can be beneficial for students with varying English proficiency levels.

This is consistent with prior research demonstrating the importance of using students' first language to support their learning and comprehension of new concepts (Cummins, 1981). Furthermore, the study highlights the need to cater to non-English-speaking students by including the Thai language in educational mobile apps. This is critical as it can encourage a sense of pride and achievement among children as they learn to spell in their native language.

The study also suggests that an English-only approach may not be suitable for all students, especially those who engage in independent play and may not understand English exclusively. Incorporating the Thai language into mobile apps can enhance their learning experience and promote a greater sense of inclusion. This aligns with the notion of using a bilingual approach in education, which has been found to be effective in improving academic outcomes for students (Genesee et al., 2006).

Implication

The rapid adoption of mobile technology has revolutionised education, particularly in bilingual programmes. Mobile learning apps have the potential to go beyond being mere tools and reshape the very core principles of language acquisition and student engagement.

At the heart of effective bilingual education lies a robust foundation in core language skills. Mobile apps, with their dynamic and interactive features, provide an ideal platform for targeted practice and feedback in these critical areas. Gamified exercises, adaptive algorithms, and real-time feedback loops can transform app-based learning into personalised and engaging journeys, ensuring the steady development of solid language skills.

Learning a language is not a linear journey. It unfolds through a diverse landscape shaped by interests, cultural backgrounds, and learning styles. To cater to these individual needs, apps should offer adaptive algorithms, interactive quizzes, and rich content libraries, customizing the journey for each learner's unique path.

Bilingual education often grapples with the challenge of balancing formal curriculum requirements with the immediate needs and interests of students. Mobile apps can bridge this gap by offering flexible, engaging content that aligns with learning goals. Gamified experiences, culturally relevant storylines, and seamless language integration can make learning fun and rewarding, boosting engagement and knowledge retention.

Mobile learning apps have the potential to revolutionise bilingual education by providing personalised learning journeys, catering to individual needs, and bridging the gap between curriculum and engagement. As the field continues to develop, it is important for researchers and educators to explore the full potential of these technologies to create effective and engaging learning experiences for all bilingual learners.

Conclusion, limitation, and future research

This study aimed to analyse the experiences of bilingual teachers who teach young DLLs in the mobile era. The research highlights that the acquisition of vocabulary and grammar, speaking and listening skills, tailor-made bilingual lesson content, the use of technology, games and cartoon characters as learning tools, interactivity, bilingual learning, and balancing the use of Thai and English are all critical factors for effective bilingual teaching and learning through mobile learning

apps. Moreover, for young learners' long-term language acquisition, a simplified approach that emphasises conversational vocabulary, basic grammar, and simple sentence structures has been found to be advantageous. The study highlights the significance of customising bilingual lesson content to engage students and improve their learning outcomes. However, creating content that is more relevant to students' interests and needs can be challenging while adhering to formal curriculum indicators. To overcome this obstacle, teachers must balance the teaching of both languages and consider students' linguistic and cultural backgrounds. This study also highlights the potential benefits of mobile learning apps in bilingual education, particularly in promoting engagement, improving learning outcomes, and increasing access to educational materials. It suggests that integrating games, colourful cartoon characters, and interactive elements can facilitate engagement and enhance knowledge retention. Additionally, the findings underscore the importance of adult supervision when using mobile apps for self-study at home.

One limitation of the current study is its contextual restriction to Thailand's Basic Education Core Curriculum BE 2551, which may hinder generalisation of its findings to other countries or regions with distinct curricula and educational systems. Moreover, the study did not incorporate the perspectives of students or parents, which could have offered valuable insights into the effectiveness of bilingual education for young DLLs. Therefore, caution should be exercised when interpreting the results of this study, as they are limited to a specific context.

Future research endeavours should delve into the effectiveness of mobile learning apps within a variety of educational contexts and among a broader demographic spectrum. In addition, forthcoming studies should investigate the potential adverse consequences stemming from the excessive use of mobile learning apps and prolonged screen exposure, with a specific focus on their impact on learners' motivation and engagement. These investigations aim to provide valuable insights for mobile learning apps to identify the features that are most effective in promoting engagement and facilitating learning outcomes across different settings and populations. Such investigations would contribute to the refinement and optimisation of mobile learning approaches in education.

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Acknowledgement

Appendix A

Interview Questions

Q1: How do you typically structure daily language instruction for young learners?

Q2: What strategies do you believe are most effective in promoting and supporting language learning among young learners?

Q3: What are the primary challenges and obstacles you have faced in providing language instruction to young learners? Please provide examples.

Q4: How have you addressed, or do you recommend addressing the challenges and obstacles identified above?

Q5: What is your opinion regarding the use of mobile apps to improve Thai and English language proficiency among young learners?

Q6: Do you believe that Thai and English content in language learning apps should be integrated or presented separately? Please explain your reasoning.

Q7: Do you believe language learning apps should be designed primarily for classroom instruction or for self-directed learning outside of the classroom? Please explain your reasoning.

Q8: Are there any additional comments or insights you would like to share regarding bilingual teaching management?

Q9: Do you believe that technology is a suitable tool for language learning among young learners? Please provide your reasoning.

Q10: In your opinion, could a language learning app help to foster bilingual partnerships among digital young learners? Please explain your reasoning.

Q11: How do you think the use of a mobile learning app could contribute to the development of bilingual competence among digital young learners?

Q12: In your opinion, what are the essential features of an effective mobile learning app for language learning?

Q13: How do you think visualisations could be used to enhance learning in mobile language learning apps?

Q14: How could a mobile learning app be utilised to promote the development of bilingual empathy among young learners?

Q15: What methods do you believe would be effective in measuring the effectiveness of mobile learning apps for language learning among young learners? Please provide your reasoning.

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