

Connecting Digital Environments to Additional Language Learning in Schools

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## **Abstract**

Despite digital environments' proven effectiveness in supporting additional language acquisition, there is a gap in knowledge about how technology is integrated in Kindergarten–Grade 12 (K–12) additional language classrooms. This study examined situations in which additional language learning classes integrated digital environments in elementary and secondary language classrooms and sought to highlight how young learners interact with such environments for additional language learning purposes. A review of the literature revealed that digital learning environments offer corrective feedback for additional language learners who have traditionally been a focus of computer-assisted language learning (CALL); however, more recently computer-mediated communication (CMC) has taken hold. Importantly, digital environments that offer multimodality provide comprehensible input that supports the language learning process. The utilization of digital environments with traditional additional language resources is discussed. This study has significant implications for additional language learning and teaching strategies while applying digital learning theories into the additional language classroom.

*Keywords:* additional language learning, CALL, connectivism, digital environments

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In remembrance of my mother, Andrea, who encouraged me to write.

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## CHAPTER 1: INTRODUCTION

In this chapter I discuss terminology used in the study. Since my topic is additional language learning, I felt some terminology needed to be explained as there are so many terms that carry political and social weight. Also in this chapter, I provide my personal story and how I became interested in the intersection of technology and additional language learning.

### **Personal Ground**

Exploring technology's impact on Kindergarten–Grade 12 (K–12) language classrooms in schools is a promising venture because of the ongoing debate about how young learners acquire additional languages. More young learners are spending time connected to digital environments in other subjects such as mathematics and social studies. Exploration into digital environments' effects on the language learning process is beneficial. Undoubtedly, technology is changing the way we think and learn, and it may be accelerating the language learning process. In many cases the use of technology can act as both the reinforcement and the method of instruction. However, computer-assisted language learning (CALL) research that involves young additional language learners (ages 6-17) in schools with digital environments is lacking.

This study is personally significant because of my own language learning and teaching journeys I experienced both as an English language teacher in Taiwan and as a mainstream Primary/Junior (K–6) teacher in Canada. During my first year in Taiwan, I had an important realization that we were learning languages in an ever-growing digital world that enabled us to use technology for language learning and socialization. Mandarin Chinese is the official language taught in schools. Mandarin Chinese is

comprised of thousands of ideographs. Many students spend hours each day repetitively writing characters to commit them to memory. As a language learner of Mandarin Chinese, the use of a smartphone in 2006 accelerated my learning of reading and writing much faster than traditional, repetitive writing practices. My smartphone also became a device through which I could monitor, track progress, and document new Chinese characters I stumbled upon. I found that the ease and convenience that the smartphone afforded me accelerated my learning in ways not available through pencil and paper techniques. While in Taiwan, I could carry a mobile device that enabled me to input phonetic pinyin. Pinyin is the official Romanization system for traditional Chinese in Taiwan and Simplified Chinese in mainland China. I could phonetically decode Chinese words I had learned to recognize and input them into my phone using the roman alphabet. I could then choose familiar characters that appeared in a text suggestion box based on my input.

With this new tool for learning, I made it my goal to try to communicate with as many new Taiwanese friends as possible through text messages and social media. My new Taiwanese friends were thankfully willing to help by making revisions either in face-to-face conversations or over text message chats. The combination of willing intercultural partners, opportunities to test out language hypotheses, and the convenience of technology inspired me to continue learning a new additional language. The assistance of technology marked the beginning of my learning journey that continues today.

During my time as an English language teacher in Taiwan, I was responsible for teaching multiple classes of learners, 4 to 15 years old. Many of these young learners frequently asked me about learning strategies that would assist them in becoming

proficient speakers of the English language. I was impressed with my young learners' drive to seek out language learning strategies. Although there are no shortcuts to learning an additional language, I do believe in finding innovative ways to increase my young learners' motivation to practice and accelerate their learning.

Strategies may be a vital part of the language learning process for many learners, but language learning does not occur in social isolation with strategies alone. Learners need examples of cultural cues, context, and the functional use of an additional language. In dealing with the affective domain, language learners need to take risks and be presented with opportunities to explore the additional language regardless of their knowledge level for grammar, vocabulary, or cultural context. Therefore, additional language learners require willing language partners who may share similar interests, dialogic spaces, or an invested interest in the learners' progress. Presently, technology and networked computing is bringing learners together in useful ways for language learning.

When I was a young French language learner in elementary school, I found it discouraging that there was a lack of French native speakers with whom to practice in my community; so, I chose to learn Cantonese from the boy next door instead! Although the digital landscape has changed over the last decade, learning an additional language remains an important asset for most people. Language is a socially mediated activity—the connectedness to culture and authentic communicative practice should continue to be a driving force behind additional language classrooms. I am a firm believer that educators need to capitalize on the relationship between the digital and physical. Furthermore, schools need to make informed choices about how to integrate digital environments

seamlessly into the additional language classroom.

With purpose, this research strives to help educators understand how to leverage technology in the learning of additional languages for school aged (K–12) learners. Whether it is the struggling French immersion student new to Canada or the high school student wishing to regain ties with her or his native tongue, I conducted this research to shine some light on areas where language learning and digital environments are intersecting in exciting and fresh new ways. The reason I chose this integrated article format is to hopefully publish it and reach more additional language educators wishing to learn how to integrate technology or digital environments in pedagogically sound ways.

### **Terminology**

Terms that label learners are rarely neutral and carry with them implications and underlying messages (Webster & Lu, 2012). For example, the term English language learner (ELL) is perceived as individuals who have not yet achieved fluency in the English language. ELL has been criticized for labelling learners as lacking in communicative aspect. Instead, the capability for learners to challenge themselves and take on the daunting task of learning a new language should be seen as an additional asset to existing skills.

The word foreign has connotations of other, unfamiliar, or separate. In recognizing that there are many instances where the term foreign may not be applicable—for instance, when a learner wishes to regain a connection with a lost heritage language—the word foreign is not adequate for all situations. Foreign language learning also has counterproductive connotations as the term foreign may further separate the learner from the learning goal that they are trying to achieve. Furthermore, if

foreignness is equated with unfamiliarity, then at what point does the language stop being foreign to the learner? Additional language learning is a more encompassing term that leaves room for learners who are learning multiple languages. Therefore, additional language learners can refer to both language learners whose primary language is not the language of instruction, and learners who are learning a language in what has been traditionally referred to as a foreign language program.

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## **CHAPTER 2: RESULTS—CONNECTING DIGITAL ENVIRONMENTS TO ADDITIONAL LANGUAGE LEARNING IN SCHOOLS**

Traditionally, most CALL research has taken place within postsecondary education contexts in which language learners have been young adults. Recently, there has been a growing interest in exploring technology's impact on Kindergarten–Grade 12 (K–12) language classrooms in schools (Ware & Hellmich, 2014).

As digital environments become increasingly integrated into K–12 classrooms, the effects they may be having on the way learners perceive knowledge and language learning experience are subtle and complex. Technology is rewiring our brains—tools that learners use are defining and shaping our thinking (Siemens, 2005). Young learners are sensitive to new ways of learning and have been influenced by digital environments in other learning contexts (Schlaug et al., 2009). However, CALL research that involves this crucial stage (K–12) in additional language learning with digital environments requires more exploration (Ware & Hellmich, 2014).

Educators need to better understand how digital environments are changing the way young learners think and acquire knowledge in additional language learning contexts. Young learners who were born in the digital-knowledge era think about and approach language learning in a different manner from what the traditional language classroom affords (Kelly, McCain, & Jukes, 2009).

Understanding the way digital environments impact additional language learning could be a key to understanding how learning additional languages could be accelerated using digital environments for young learners. More specifically, this study asks two research questions:

1. How do young learners learn additional languages in the digital-knowledge era?
2. How are digital environments being integrated into K-12 additional language classrooms?

The purpose of this study is to investigate innovative ways in which digital environments are being leveraged in K–12 education contexts for the purposes of additional language learning. The goal would be for educators to use this research as a starting point for gaining a broad perspective on how digital environments are affecting the language learning process for K–12 young learners in schools. This study is necessary to inform language teaching and learning practices, and to prepare educators for potential technological advancements that may influence the way young learners utilize digital environments for language learning purposes.

### **Review of Literature**

The literature review provides a contextual understanding for this theoretical study on how K–12 learners learn additional languages in the digital age. To respond to the research questions, four themes are reviewed: (a) connectivism as a learning theory, (b) computer-assisted language learning (CALL) research in relation to K1–2 school environments, (c) computer-mediated communication (CMC) and additional language learning, and (d) how multimodality has been shown to support understanding of additional language input (reading and listening).

### **Connectivism and Additional Language Learning**

The framework for this theoretical paper is based on the need to determine the benefits of digital environments on language learning and how language learners learn in the digital age. Connectivism (Siemens, 2005) serves as a foundation for the exploration

and interpretation of how digital learners are utilizing digital environments to learn additional languages. According to Siemens (2005), learning occurs on three levels: neural, conceptual, and external. Siemens has proposed eight principles of connectivism:

1. Learning and knowledge rest in diversity of opinions.
2. Learning is a process of connecting specialized nodes or information sources.
3. Learning may reside in nonhuman appliances.
4. Capacity to know more is more critical than what is currently known.
5. Nurturing and maintaining connections is needed to facilitate continual learning.
6. Ability to see connections between fields, ideas, and concepts is a core skill.
7. Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities.
8. Decision-making is itself a learning process. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality.

While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision. (Siemens, 2005, p. 5)

The above principles serve as a foundational framework to describe the language learning process in the digital knowledge era. It would be a disservice to connectivism to simply reduce it to a theory that explains learning with digital tools (Veselá, 2013). Instead, some explanation and examination of the literature is needed to apply these principles to instances of additional language learning in schools.

Connectivism can offer insight in how to instruct additional language learners who have frequently accessed digital environments. Learners who have grown up with frequent access to digital environments view the learning process differently from the

generations who may be new to learning with digital environments (Collins & Halverson, 2009; Starkey, 2012). A connectivist learner understands that learning and knowledge rest in diversity of opinions and contexts (Siemens, 2005).

The concept of knowledge in additional language learning is complex as second language acquisition theories centre around two competing ideas concerning knowledge—implicit and explicit knowledge. Explicit knowledge mainly concerns what to say and how to say it and is cognitively similar to other types of learning (Ellis, 2005). Implicit language learning could refer to Chomsky's (2005) theory of Universal Grammar (UG) in that humans have an engrained knowledge about languages. Language learning in the digital knowledge era requires learners to access both implicit and explicit types of additional language knowledge. Young additional language learners need to be engaged in learning opportunities that call upon explicit knowledge of a language as well as test any potential implicit knowledge they may have.

According to connectivism, learning is based on connecting knowledge, whether these nodes are explicit or implicit. Learners connect nodes, much like a graphic representation of a mind map (Siemens, 2005). A node is a general term for any resource that a language learner is drawn to. These nodes can be books, speakers of the target language, videos, social media websites, or the classroom teacher. "In foreign language education, it is important to decode, understand, and connect a new node with the old ones" (Veselá, 2013, p. 7). In other words, digital environments (new nodes) are not a replacement for traditional language learning practices (old ones) but should be additional opportunities for learners to construct and anchor language learning knowledge to their existing knowledge network.

The term “network” may need some clarification when it is applied to additional language learning. Arguably, Siemens (2005) intentionally left the term network vague as it can apply to many different contexts in which learning is involved. Here are a few examples of the word “network” and some brief examples of how additional language learners might be building them. A social network encompasses the communities and individuals who speak the additional language. In this case nodes would be communities or individuals who can provide authentic opportunities to communicate or provide authentic examples of the additional language. The additional language teacher and classmates would be a fundamental part of a learner’s social network. Another example is the semantic network for additional language learning; here nodes might be represented by clusters of words. Language learners can build a semantic network based on reading materials or vocabulary they encounter in their additional language. Lastly, another network that is viable to additional language learning is a language resource network. A language resource network is a combination of digital and traditional resources that contain knowledge either written in the additional language or that provide procedural knowledge in how to speak or write it. A language learning resource network for young additional language learners may contain important information of where to go to access this knowledge. This type of network takes precedence—as the act of knowing where to go is more important than the act of knowing (Siemens, 2005). For the purposes of this paper, I will be discussing networks of knowledge and the various ways they apply to additional language learning.

### **An Extensive CALL Background, but Not Much for the K–12 Learners**

Much of CALL research involved adult participants in higher education (e.g., Chinnery, 2006; Hansen, Shneiderman, & Smith, 2010; O’Brien & Hegelheimer, 2007).

Burston's (2015) research provided a thorough meta-analysis of over 20 years of Mobile-assisted language learning (MALL) research with a clear majority of the papers analyzed involving adult participants and almost none in elementary or secondary school contexts. Despite the fact that few studies involved young additional language learners, Burston's meta-analysis shows significant promise for additional language learning in K–12 contexts. Mobile devices allowed learners to increase the time they engage in both task-based language activities as well collaborative interactions in additional languages (Burston, 2015). One notable study (Hwang & Chen, 2013) examined the additional language learning outcomes of elementary students after using a mobile program which included vocabulary, phrases, and sentence patterns in English. The results showed that 28 Taiwanese elementary school children showed a significant improvement in pre-test/post-test performance compared to the 31 who did not use the mobile learning platform (Hwang & Chen, 2013). As promising as this may be, a single study based on 20 years of MALL research is not statistically significant enough to make assumptions about mobile devices for additional language learning purposes in K–12 classrooms.

Although there is a lack of research that involved K–12 language learners, Ware and Hellmich (2014) have provided an in-depth literature review on how technology was implemented for language learning in schools. In the latter literature review, CALL research involved K–12 learners and was divided into two areas: first, computer-assisted research that focussed on language learning outcomes, and second, technology that provided learning opportunities (Ware & Hellmich, 2014). On one hand, literature concerning learning opportunities provided a fundamental perspective for educators in how technology may be shifting school-culture—particularly in how digital environments provide opportunities for young learners to merge formal and informal learning (Ware &

Hellmich, 2014). According to Ware and Hellmich (2014), informal learning while accessing digital environments required flexible and creative additional language use. On the other hand, Ware and Hellmich (2014) found that literature concerning learning outcomes provides educators with practical examples of how specific digital environments are influencing discrete language learning processes for K–12 learners. However, a gap in the literature is revealed, especially pertaining to how underlying theoretical perspectives of language learning are changed as a result of technology use in K-12 contexts (Ware & Hellmich, 2014).

### **Computer-Mediated Communication in Additional Language Learning**

Computer-mediated communication (CMC) is an umbrella term used to define any interaction that takes place between people using electronic devices—either synchronously or asynchronously, especially the former (McQuail, 2010). CMC has provided spaces for authentic additional language learning practice. Several qualitative studies have explored the benefits of young learners interacting with intercultural partners for additional language learning purposes (Chun, 2011; Evans, 2009; Ware & Kessler, 2014). Traditional language classrooms have been concerned with listening, reading, and writing (Starkey, 2012). The limits of language learning activities were predominately due to the lack of opportunities in additional language speaking practice and largely depended on interaction with one teacher as the language expert for speaking. Digital environments have been utilized to facilitate contexts where peer tutoring in additional languages can occur (Evans, 2009; Starkey, 2012; Warschauer, 2006). CMC enabled young learners to have more contact and practice with intercultural partners (Starkey, 2012). Recognizing that authentic conversation practice was difficult in traditional language classrooms, Starkey (2012) advocated regular interaction online with native

speakers so that young learners can develop authentic conversation strategies in speaking an additional language.

CMC allows for authenticity for learners to test additional language strategies. Speaking and writing have been linked to additional language learning strategies such as circumlocution and paraphrasing (Oxford, 2013). Another common strategy among language learners is code-switching. Code-switching has been defined as the intentional mixing of languages for communicative purposes (Arias & Lakshmanan, 2005). Sundqvist and Sylvén (2014) found that the frequent gaming access of young Swedish learners affected use of additional language strategies. Swedish students accessed digital environments in English for a more prolonged period than their formal additional language instruction in schools. The young learners who regularly played video-games in English relied less on code-switching to Swedish (L1) than their peers who spent less time gaming (Sundqvist & Sylvén, 2014). Sundqvist and Sylvén equate the lack of code-switching used by students as a measure of their communicative competence in their additional language.

In other contexts requiring CMC, young additional language learners established that code-switching was a necessary part of the additional language learning process. Evans (2009) examined the participation of secondary students' use of a digital bulletin board forum, Tik Talk. Both anglophone and francophone secondary students interacted in their additional languages about cultural differences. Evans discovered that when students were having difficulty describing or explaining a concept in their additional language, they defaulted to their first language (L1) or code-switched. This opportunity allowed additional language learners to establish a precedent that it was socially

acceptable to use this strategy (Evans, 2009). “Collaboration essentially puts learners into a semi-autonomous situation in which they are faced with a task, question or problem and must use discourse to negotiate each participant’s separate learning strategies and make joint decisions about what is (and is not) worth investigating and learning” (Beatty, 2010, p. 110). Furthermore, young learners involved in Evans’s (2009) study turned to the teacher for clarification and looked for help from their peer-tutors. Despite the opposing views on whether code-switching is beneficial or detrimental to additional language learning, CMC nevertheless allowed for learners to use additional languages in creative and flexible ways. The mirroring of speaking strategies was an essential learning opportunity afforded by the digital environments that the young learners were using. Young learners who experienced learning opportunities with CMC were more apt to use language learning strategies when using technology.

The term dialogic spaces has been used to define learning opportunities that arise out of interaction with people (Wegerif, 2007). Social networking has been leveraged by teachers of the Turkish language wishing to connect dialogic spaces to formal classroom learning. Young learners were able to connect informal learning about grammar from chats and applied their learning in a formal classroom setting (Karal, Kokoc, & Cakir, 2015). Relationships, faces, and events provide excellent neural circuits for meaningful learning (Brown, 2014). Social networking and teleconferencing have shown promise for meaningful language learning as learners are able to apply additional language learning to dialogic spaces in either physical or digital environments.

### **Multimodality as the New Comprehensible Input**

Additional language learners contain knowledge about a language and require

extralinguistic cues when they encounter unfamiliar input (Krashen, 1985). Language acquisition occurs when input is made comprehensible through external means (Krashen, 1985). Multimodality is defined as messages that combine sounds, images, video, or text and meaning. Various digital environments that contain multimodal functions can also provide comprehensible input for additional language learning (Beatty, 2010).

Digital environments that have multimodal functionality have been reported to enhance both additional language learning (L2) (Chen, Tan, & Lo, 2016; Choi & Yi, 2015; Elola & Oskoz, 2010) and literacy development (L1) (Kress & Jewitt, 2003). Multimodality provided extralinguistic clues that presented themselves as additions of sound, image, animation, or video (Beatty, 2010). Examples of how multimodality have been explored in the literature are text-to-speech in reading, the presence of body-language in video, or speech-to-text for transcription in writing. Furthermore, accessing and comprehending multimodal texts have been equated to providing authentic additional language models aligned with 21st century learning objectives (Chun, Smith, & Kern, 2016).

The use of iPads in one-to-one contexts support early literacy skills in K–12 education contexts (Beschorner & Hutchison, 2013; Saine, 2012). Young learners can navigate the iPads with ease and the digital environments included in iPad apps provide novel ways for young learners to explore reading, writing, speaking, and listening (Beschorner & Hutchison, 2013). The multimodal functions of iPads have also been used in teaching the demanding aspects Chinese as an additional language (Wu, Yuan, Zhou, & Cai, 2013).

The effects of three-dimensional virtual environments (3DVE) on the additional

language learning of Irish young learners in elementary school reinforced the benefits of multimodality in the comprehension of additional languages (Dalton & Devitt, 2016).

When young learners were engaged in game-based, goal-oriented learning they exhibited a desire to have multimodal ways to communicate with one another; hearing the spoken language was not enough—seeing the language aided in their comprehension of it.

Multimodality is not unique to additional language input. In one additional language learning context, learners were given the choice of multiple modes of output to avoid anxiety while speaking an additional language (Choi & Yi, 2015). Research has given some attention to the creation of multimodal texts to support language learning (Chun et al., 2016; Ware & Hellmich, 2014; Ware & Warschauer, 2005). Digital storytelling using the creation of multimodal texts has been found to support additional language learning and promote diversity of identities through the inclusion of reflexive identity markers such as family pictures, young learners' voices, and topics surrounding young learners' interests (Castañeda, 2013; Hwang & Chen, 2013; Tsou, Wang, & Tzeng, 2006). This creation of hybrid texts actively involves language learners in creating new knowledge and teachers can encourage them to build a positive identity that aligns with their additional language community (Ware & Warschauer, 2005). An afterschool literacy program comprised of language learners from various parts of the world and a one-to-one laptop program situated in a California school produced student-created work (Ware & Warschauer, 2005). The creation of hybrid texts shows that young learners could use additional languages in novel and new ways that traditional high-stakes assessments fail to capture.

Multilingualism is made possible through digital environments that possess

multiple language supports. In the past decade, multilingual practices within the classroom have begun to gather steam as an effective way for learners to promote their identity and support higher-order thinking skills while learning an additional language. Studies support that learning opportunities which include multilingual texts support less proficient additional language learners. The presence of captions in both English and Chinese has benefits for high school additional language learners' vocabulary acquisition (Lwo & Lin, 2012). Although no significant differences in English vocabulary acquisition were found, upon closer examination the young learners who benefitted the most were young learners who were less proficient in their additional language (Ware & Hellmich, 2014). The young learners who needed more support benefitted only slightly more by the presence of their first language (Chinese) and their additional language (English).

### **Summary**

Although CALL research has traditionally concerned itself with adult participants, some key studies allow us to see the benefits that digital environments may provide when integrated into schools in meaningful ways. Computer-mediated communication allows for direct contact with learners of the same age group whereby additional language learners can practice dialoguing and applying their language learning hypotheses. Multimodality could be a potential way to provide comprehensible input that allows the learner to understand difficult texts. Connectivism (Siemens, 2005) provides a foundation to understand how young learners build diverse networks for the purposes of additional language learning.

## **Strategies to Connect Additional Language Learning to Digital Environments**

Based on a review of the literature, teaching experiences, and discussion with professionals in the fields of technology and education, four distinctive strategies are proposed to help enhance additional language learning practices aligned with digital environments. It is no surprise that since digital environments offer much potential for additional language learning that the results are various and complex.

### **Utilizing Digital Environments in Additional Language Learning**

Although traditional language resources are an integral part of young learners' language resource networks, digital environments should also be considered because they provide authentic learning opportunities. Digital environments not only significantly expand the networks of knowledge that learners have access to but also require new skills and practices that need to be modelled and considered. This section provides possibilities for how digital environments can be utilized in K–12 classrooms and the considerations that go along with them.

Additional language learners must be allowed to make choices regarding the relevance of resources and as a result are engaged in the construction of a personalized network for their own language learning purposes (Veselá, 2013). Learners who know where to go for explicit knowledge about the additional language are more independent, autonomous, and motivated to learn an additional language (Ramamurthy & Rao, 2015). In traditional additional language learning contexts, emphasis tends to be on the skills rather than knowledge (Richards, 2006). These skills might be pronunciation in speaking, form in writing, or the ability to understand contextual clues of the additional language. Instruction of what to say (content) or how to say it (metalinguistic knowledge,

procedural knowledge) is vital to learning an additional language (Chapelle, 2009).

However, decision-making is a crucial part of the language practice and for learners who are faced with challenges that digital environments offer. Ware and Kessler (2014) argue that students who participate in intercultural exchanges using telecollaboration are actively engaged in the decision-making process. Telecollaboration offers unique opportunities for students to make choices of how to communicate in their additional language. These choices are a fundamental part of the additional language learning process.

Another aspect of decision-making promoted by digital environments can be initiated by encouraging young learners to select topics based on interest and relevance to the interactions that they are involved in. These interactions can occur in synchronous or asynchronous webchats or teleconferencing sessions with native-speaking intercultural partners in authentic contexts—such as teleconferencing that can test out their language hypotheses in contexts that require interaction (Chapelle, 2009). During language chats the computer screen can support intercultural partners and shared images can clarify and resolve any misunderstandings (Wegerif, 2007). Context is important as intercultural partners using teleconferencing technologies will surely need to understand how smaller language chunks can be applied to the bigger picture. Digital environments and CALL offer great promise for students to actively test out assumptions about additional language and investigate grammatical patterns (Chapelle, 2009). Digital environments such as social media websites, learning management systems, and teleconferencing sessions are not the only options for contact with the target language community but are convenient, accessible, and essential and they promote digital literacies needed for the 21st century

(Bozkurt & Ataizi, 2015).

Providing opportunities to communicate in both traditional and digital contexts provide impetus in two ways: young learners want to know how (procedural) and about what (content) to communicate. Since every interaction is different, young learners need to practice the negotiation of which knowledge is relevant to the dialogic space they are participating in (Ravenscroft, 2011). Memorizing a prescribed list of grammar rules and vocabulary may not have the same effect as student-chosen topics that are relevant and anchored to novel dialogic spaces. Successful additional language learning happens when the content is relevant to the participants engaged in the act of communication.

### **Building Networks of Diverse Language Resources**

Connectivism (Siemens, 2005) advocates that the learner is actively involved in constructing networks of diverse nodes. Diversity in language learning can be measured using many different criteria. Contextual diversity allows for a higher frequency of language practice and communicative strategies. For example, mobile device use in Taiwanese elementary schools allow for interaction in English as an additional language across different contexts and are found to be more effective than paper-based materials alone (Hwang & Chen, 2013). Social diversity is paramount as learning an additional language requires contact with multiple groups of people who have different interests and perspectives on the additional language.

Digital environments also afford young learners diversity in the contexts where additional languages are used and explored (e.g., social networks, news forums, email, SMS). Nodes are not only resources that are formally published (as in language textbooks and dictionaries) but also can be communities that share languages, interests, or beliefs.

Intercultural exchanges offer learning opportunities about intercultural partners and their diverse social activities (Chun, 2011). Therefore, digital environments provide cultural and social context for additional language learning. On one hand, Chun (2011) admits that there are pragmatic barriers involved with intercultural exchanges. On the other hand, these rich learning opportunities can provide translingual and transcultural competence when interacting with intercultural communities. In response to this belief, classroom teachers can act as a bridge for young learners to interact with additional language communities. This advice is reflective of the idea that young learners value both their intercultural partners and their additional language teachers, as seen in Evans's (2009) study regarding high school students interacting online. This is reminiscent of connectivism (Siemens, 2005) and reaffirms that value can be seen in diverse sources of knowledge in that they all serve different purposes for learning.

Social diversity can bring up some interesting conversations with learners regarding authenticity. Using diverse samples of the target additional language makes the language learning experience authentic. Social bookmarking refers to organizing and classifying grammar sources from social media and eventually creating a personal grammar reference book full of authentic additional language linked to intercultural speakers (Bozkurt & Ataizi, 2015). Digital environments enable young learners to see and hear important clues regarding where and how the language is used, as well as who is using the language.

Language needs a context and a purpose. Young learners benefit from the convenience of accessible digital texts along with other traditional resources such as guest speakers from the community or family members who speak the additional

language. Young learners can recognize language patterns and how they are similar and differ according to the context (e.g., chat applet, email, teleconferencing, classroom setting). Young learners understand that the way a native speaker may use the target language in web chats (e.g., webspeak, emojis, hashtags) may differ from spoken examples of the language or even in emails. Chats make it possible to rewind spontaneous active discourse which allows young language learners more processing time compared with speaking (Chun et al., 2016). Furthermore, text chats provide new ways for languages to be represented and allows young learners to think about context and purpose. Digital environments afford young learners an infinite supply of diverse contexts for both practice and observation of the additional language and some researchers must argue the anonymity and ability to construct identities may alleviate stress and anxiety in ways that face-to-face language practice may not permit.

In the case of modal diversity, learning is enriched when the target language represents itself in multiple modes of input. Multimodality is widely advocated for supporting language learning and literacy (Choi & Yi, 2015). Sound, video, pictures, and hypertexts all help to support comprehensible learning input. Since Web 2.0 technologies often incorporate multimodal support, young learners may also be given the choice to select a mode of input more suitable to their learning style which has implications for autonomy, individualization, and engagement. The conscious choice of whether to access multimodal supports is also seen as a strategy among additional language learners (Guichon & McLornan, 2008).

A diverse network of nodes is important for additional language learners as they provide various contexts for young learners to explore additional languages. In the

additional language classroom, knowledge about the target language traditionally came from the teacher (who often may be the only fluent speaker in the class) and the course textbook (Starkey, 2012). With digital environments, young learners can access a wide array of diverse materials to access authentic samples of the additional language (Chun et al., 2016). This is not to say that the language teacher and textbook are not considered valuable resources of knowledge for young learners; on the contrary, their network of additional language knowledge is expanded significantly when digital environments are accessed along with traditional materials and resources.

### **Maintaining Lifelong Connections for Additional Language Learning**

Interesting parallels can be drawn between additional language learning theories and the principles of connectivism (Siemens, 2005). Learning happens on neural, conceptual, and external levels (Siemens, 2005). An example of maintaining neural connections might be the spaced repetition of vocabulary to consolidate learning of additional languages. On an internal level, maintenance of nodes might be connecting additional language to personal experience, feelings, or interests. On an external level, language learners maintain dialogues with intercultural partners on a social network. This section attempts to look at what it means to maintain information sources and how can young learners maintain them.

The maintenance of nodes, when applied to additional language learning, is the active revisiting of valuable information sources or old nodes that benefit young learners' pursuit in learning an additional language (Veselá, 2015). Siemens (2005) suggests that both informal and formal information sources offer diverse ways to obtain and apply knowledge. Young learners may decide to maintain and nourish these connections

between nodes based on relevance to their own learning goals. These connections could potentially be strengthened by connections to other areas of language learning that share similarities in content, medium, or the functions they serve.

This conscious decision to connect a node or information source to others is an indication of how a young learner perceives the node's value or relevance to the young learner's personal learning context. Nodes are deemed valuable or irrelevant depending on a multitude of factors such as learning style, preference, personal experience, and the number of times a node is revisited. Therefore, the knowledge landscape is forever changing shape as the nodes of additional language networks are shaped by relevance for individual learners. Naturally, if language learners are interested in discussing and describing board games, then they will seek out and continually revisit dictionaries and sites that explain board games in the young learners' additional language. When applying their new acquired knowledge (in this case, knowledge about board games) to other contexts, such as sharing what they have learned in a language chat, young learners learn by teaching others what is relevant to them and new knowledge is created.

Young learners make sense of the world by connecting new knowledge to previously learned schemas. This is especially important in additional language learning as when young learners hear foreign sounds; they do not stick to any existing neuronal networks to become new knowledge (Ben-Yosef & Pinhasi-Vittorio, 2012). When a young learner participates in the active connection between newly acquired vocabulary to the application of it in a computer-mediated conversation, subsumption is taking place. A young learner can anchor the existing information to a new context and therefore have a greater chance for retrieval in other contexts, whereas rote memorization of the

vocabulary may not be as accessible and easily retrieved because of its lack of connection to context. Encouraging young learners to create personalized dictionaries and documenting learned phrases may have more impact on the young learners' additional language learning process because it is relevant to their own experience.

Applying the nurturing and maintenance of connections to facilitate ongoing learning is exhibited by young learners when social networking opportunities provide additional language practice. A learner must not only seek out people who are willing to collaborate in the learning process but also commit to “maintaining up-to-date and responsive dialogues” (Ravenscroft, 2011, p. 141). The act of dialoguing is a valuable learning process for additional language learners because they can practice the application of newly acquired language and dialoguing also enables them to model language use of their intercultural partners. When young learners interact with peers in an additional language they can benefit from the knowledge they share (Warschauer, 2006). Similarly, learning relationships with intercultural partners can be maintained through dialogue (Ravenscroft, 2011). Relevance and currency is negotiated through collaboratively choosing what to talk about, clarifying, and returning to these topics in future discussion. However, Ravenscroft (2011) claims that dialogic spaces are maintained by meaningful dialoguing which could be difficult for K–12 as young learners often struggle with metacognition required to assess the value of a topic presented by their intercultural partners. Again, for the purposes of K–12 additional language learning the teacher reemerges as critical for teaching thinking skills that lead to maintaining and nourishing connections during intercultural exchanges. While some resources for learning may continually be referred to, others may naturally grow redundant or obsolete, which is

part of the process of choosing which resource has value. Building a language network and maintaining those nodes are beneficial to language learning and should be ongoing as they offer continual practice and access points to both virtual and physical additional language speaking communities.

### **Learning alongside Nonhuman Appliances**

Recently, technological advancements in mobile devices and computers have shaped the way young learners think and work (Kelly et al., 2009; Starkey, 2012). For example, the advent of Web 2.0 technologies marked a point in history where knowledge began to shift from more definitive to constructivist in nature (Bozkurt et al., 2015). Web 2.0 technologies allow for collaborative contexts where knowledge is created, mediated, and updated continually. Young learners can now collaborate on a multilingual document with other language learners regardless of geographical location. Another factor that may be shaping learning in additional language learning is digital environments that incorporate multimodal and multilingual supports. This has implications for K–12 learners as they can navigate digital environments with multimodal functionality (Kress & Jewitt, 2003; Saine, 2012).

The growing ubiquity of digital environments in K–12 learning contexts is due to their accessibility and mobility. Learners are now able to capitalize on this mobility by quickly referencing knowledge for language learning contexts. Mobile technologies also allow learners to engage in lifelong learning opportunities that are not easily obtainable with traditional tools (Figg & Burson, 2005). These lifelong learning opportunities can start earlier in their additional language learning journeys as mobile technologies have made some learning practices more convenient. For example, mobile devices have

allowed young learners to document learning through taking pictures of unfamiliar vocabulary, take screenshots of troublesome phrases in their additional language, and bookmark websites that offer particularly useful resources for language practices. With mobile devices, young learners can create personalized networks that can be relevant to their lives and to the areas of language practice they are interested in (Estellés, Del Moral, & González, 2010).

Machine learning is becoming more sophisticated. Since Siemens (2005) establishes that learning can reside in nonhuman appliances, machine learning refers to how electronic devices change when introduced to new data. In the case of additional language learning, data can be input from additional language learners. Technologies can record, track, and suggest learning pathways based on the data collected by young learners' input. A recent review of machine learning in additional language learning summarized key findings that have influenced language learning practices (Slavuj, Meštrović, & Kovačić, 2017). First, computers can manage the process of learning by pinpointing additional language learners' characteristics and adapting accordingly. Second, Slavuj et al. (2017) found that electronic devices can analyze linguistic production and provide the learner with feedback that is tailored to learning preferences and proficiency level.

Bozkurt and Ataizi (2015) have studied the Web 3.0 technologies that are on the horizon and coined the term: the semantic web. As machine learning becomes more sophisticated, digital environments will continue to shape additional language practices. Software such as NodeXL can visually represent data in a mind map obtained from social networks (Hansen et al., 2010). The capability for machines to monitor young learners'

interactions and create comprehensible visual representations could help teachers and learners understand some important learning habits when using networked computers. Data not only can be collected to provide a visual road map of where they have been but also may guide young learners of where to go to fill gaps in additional language learning. This sophistication in machine learning will inevitably create changes in additional language learning practices of the future. Adaptive learning is possible with digital environments and will continue to have powerful implications for learning an additional language. Therefore, machines that young learners interact with will continue to develop and machines' abilities to learn from these interactions will influence ways in which additional language learners practice languages with these technologies.

### **Conclusion**

Language learning is a complex process that often involves an active construction of knowledge on both a cognitive and social level, and these construction sites exist in both the traditional physical classroom as well as the digital environments. However, the frequent use of digital environments is inevitably shaping the way elementary and secondary school young learners learn additional languages that have had consequences beyond the designated screen time. Yet, most literature that concerns computer-assisted language learning focuses on adult participants. Young learners' additional language practices are defined by their ability to connect digital environments to traditional resources. These connections can help them understand the additional language they are striving to learn because it reinforces language learning to a variety of contexts.

Teleconferencing and Web 2.0 technologies have allowed additional language learners to collaborate and construct knowledge by creating additional language output.

As well, these digital environments promote modal diversity which combines the use of sound, visuals, and text. Multimodal support allows young language learners to comprehend additional input, and digital environments that incorporate multimodality appeal to a wider variety of learning preferences. Mobile technologies that incorporate multimodal additional language input allow young learners to navigate digital additional language texts with relative ease. Furthermore, when young learners create multimodal texts, additional language learning is reinforced because young learners apply additional languages to rich performative tasks. Young learners' frequent use of digital environments at home (video gaming, movies, etc.) has imparted an expectation for multimodal presence to aid in the comprehension of additional languages as can be seen in language learning studies that involve 3DVE worlds.

Digital learning environments and tools provide a variety of contexts for additional language practice, and accelerate the additional language learning process for young learners. Different contexts can be both digital and traditional, as learning that occurs in digital environments should be reinforced and consolidated through lessons that allow for student or teacher-led discussion and consolidation that concerns learning with digital environments. Additional language teachers in the digital-knowledge era can provide another diverse context for language practice, while coaching and facilitating young learners who are learning using CMC tools (Evans, 2009). In short, young learners make sense of additional languages by applying learning from a diverse network of resources to authentic opportunities that allow them to test out their language hypotheses.

As young learners' spheres of relevance and interests are constantly shifting, so is the knowledge landscape that appeals to them. As a result, their additional language

learning network is constantly undergoing additions, revisions, and updates. The maintenance and nourishing of nodes for additional language learning involve both the discovery of new nodes and the revisiting and or pruning of irrelevant ones. Encouraging learners to create personalized learning artefacts that document their additional language learning pathway is part of the process of anchoring new nodes of knowledge to existing ones. Furthermore, as machine learning grows more sophisticated, nonhuman appliances will soon be able to gather data from the young learners and recommend pathways that appeal to both their additional language level of proficiency as well as their interests.

As machine learning becomes sophisticated, research predicts further change in additional language learning practices. Digital environments that can recommend learning pathways based on young learners' interactions with digital environments are exciting. Nevertheless, Web 3.0 tools will continue to shape additional language learning practices and will require more professional development for the language teacher wishing to integrate digital environments positively in K–12 education contexts.

### **Implications for Practice**

Digital environments such as teleconferencing and social media platforms provide young learners with opportunities for social interaction and collaboration with native speaking peers. It is noted that learners need to build a critical literacy and awareness to how social interactions and usage of the additional language are affected by the context in which the interaction takes place. When engaged in communicative tasks that appeal to both the interests of the learners and the relevance of the dialogue, young learners find novel ways to connect traditional and digital resources for communication in the additional language. Allowing young learners the opportunity to test hypotheses

and strategize effectively rarely happens with one language teacher in the room.

Digital environments can and should be utilized for both consumption and the creation of multimodal and multilingual texts that increase engagement and teach additional language learners how to communicate in the target additional language. However, some careful consideration is needed on the part of teachers for how young learners critically interpret multimodal texts. Young learners should be encouraged to communicate about multimodal texts in academically appropriate ways. Young learners who use digital environments regularly expect multimodality—pictures, videos, sounds, L1 text—to assist in comprehension.

There are also practical implications on the horizon as technologies grow more adaptive and machine learning becomes more commonplace in K–12 school environments. In the future, language learning has the potential to be enhanced by technology through automated suggestion of resources based on young learners' interests or language proficiency or learning pathways. This may help young learners keep track of where they have been and where they need to go. This theoretical paper could also help better instructional approaches that take into consideration the learners' construction of a language learning network.

### **Implications for Research**

Connectivism (Siemens, 2005) provides an important starting point for providing insights into how young learners perceive, evaluate, and gather knowledge using networks of resources. However, more in-depth research is needed to examine whether young learners consciously or subconsciously demonstrate the behaviours associated with connectivist learning. Siemens (2005) has provided the foundation for a new

constructivism that involves additional language learning and digital environments, but each principle and its application in an additional language learning context needs to be scrutinized and elaborated further.

Further research into how young learners utilize digital environments, especially in building communicative proficiency, is needed. Research should investigate implementation of digital environments that provide authentic and relevant connections with the additional language for more wholistic language practices. Presently, the research in CMC offers some insight into how educators can facilitate online discussions for the purposes of language learning but long-term studies that measure the effect of these interactions on young learners' communicative proficiency may be helpful for educators. Research in CALL on the long-term use of social networking and teleconferencing for language learning purposes in schools would provide beneficial insights into how effective these digital learning environments are for young learners.

### **Final Word**

On one hand, building diverse additional language learning networks is cognitively beneficial for young learners; on the other hand, young learners need support planning their learning, facilitating and organizing teleconferencing sessions, and assisting in speaking and listening. Digital environments alone cannot provide all the support a young learner needs. Based on the research of this study, digital environments that provide authentic and diverse contexts require choices about how and what to communicate using an additional language. Clearly, more intensive research is needed that explores young learners' long-term usage of digital environments to learn an additional language. Digital environments offer multiple avenues for language practice

while making the learning process more visible and audible as presented by research in multimodality. Future studies can use the findings of this study to understand how young learners learn additional languages with digital environments.

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### CHAPTER 3: PERSONAL REFLECTION

Digital environments are not a cure-all for learning an additional language. However, it is not surprising that in the context of digital environments and additional language learning, building networks can be approached in a multitude of ways. When young learners learn additional languages constructively and collaboratively, young learners gravitate towards their interests and learn additional language that is meaningful to their own lives. In connecting this research to my own language learning practices, I realize now that my humble success in learning may have been accredited to the relationship between the digital (e.g., smartphones, social media) and the physical (e.g., social events with friends, my Mandarin Chinese classrooms).

Young learners require a variety of resources that provide authentic samples of the additional language. Understanding how teachers and young learners can leverage digital environments for the purposes of additional language learning will enable them to construct diverse and rich networks for exploring additional language content that appeals to the young learners' interests and meet their needs. Learning additional languages in this way become less transactional and more exploratory as young learners construct their own knowledge and make connections to various learning experiences.

More research is needed to highlight school-aged children's behaviours while using digital environments to learn additional languages. The role of additional language teachers in schools has shifted in the digital age from expert additional language model to a facilitator and coach of exploration who challenges young learners to seek out new resources and connect with nodes that are meaningful to them. Thus, a more collaborative and constructive approach to learning an additional language is being employed as

opposed to the traditional transmission models of language learning. With multimodality, digital environments offer various modes of language input while making the learning process more visible and audible and perhaps more comprehensible to young learners who are learning an additional language. As young learners spend more time in networked digital environments and populations grow more culturally diverse, additional language teachers need to adapt a more constructive and collaborative approach to learning an additional language in schools.

As broad as the scope of learning additional languages with technology may be, it is surprising that more work has not been done in the field of K–12 additional language learning with digital environments. Many colleagues still advocate Critical Period Hypothesis (CPH) even though this theory has been criticized (Lakshmanan, 2009; Singleton & Ryan, 2004). CPH is based on the theory that young learners acquire additional languages faster. This hypothesis is usually associated with the belief that the earlier a student is exposed to an additional language, the faster they can successfully learn it. In my experience, many additional language teachers believe in the idea that young learners can learn languages at a faster rate than older young learners. However, it is surprising that there is not much research concerning the effects of technology on language learning in elementary and secondary contexts and thus the topic needs to be explored further. There is also a concern that young learners engage in too much screen time, and as a father of two bilingual children (one of whom is enrolled in a French immersion program), I can relate to the trepidation of having too much contact with digital environments.

During this research process, I informally began to implement some of the

practices from the literature into my own teaching and learning. From a teaching perspective, I often had the fortunate opportunity to teach in a French immersion environment in schools. Since young learners sensed that I was not a French language expert, some of them confided in me and could share strategies they may be cautiously sharing with their French teachers. Young learners preferred to collaborate in English although they were using collaborative documents to produce additional language texts in French. When utilizing Chromebooks, some young learners preferred to ask the teacher for direct translations of unknown words because of their lack of trust with online translation tools.

As an additional language learner of French, I hired a private teacher to use teleconferencing software and suggested many strategies described in the literature to the instructor. Although I could not formally discuss them in my study, I often reflected on how young learners naturally used technology to substitute for more traditional methods. I consistently create electronic vocabulary lists, practice fill-in-the-blank grammar exercises, and translate excerpts of texts, not because they were effective but because I was able to hide behind them. In other words, the way in which I used digital language learning materials was low on both Bloom's revised taxonomy and Puentedura's (2009) SAMR model of technology integration—a model designed to help educators understand how to design and develop learning experiences with digital environments. Substitution is when the technology or digital environment is a substitute (like overhead transparencies to instruct a photocopied worksheet) with no change in the function.

I was fearful of the unstructured conversation in the additional language. Although this is not a formal research observation, I felt it may act as a cautionary tale for

additional language teachers to understand that digital environments may not be integrated in a way that accelerates learning and could potentially act as a distractor if not implemented properly. Effective pedagogy and teaching practices supported by additional language acquisition research should take precedence over the novelty and conveniences that digital environments afford.

As schools grow more diverse in Canada and in many countries around the world, young learners bring a wealth of cultural and linguistic backgrounds with them. It is with certainty that teachers will need to support and assist additional language learners. Young learners are continually spending more time accessing digital environments either for personal or educational uses and this undoubtedly is affecting their perceptions of knowledge and the learning process. Teachers of additional languages or those who teach additional language learners (language learners whose primary language is not the language of instruction) should consider the opportunities digital environments may bring forth and model 21st-century learning practices for additional language learning to help young learners reach their full potential in an increasingly globalized world.

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