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Belinda Louie,
University of Washington Tacoma,
United States

*CORRESPONDENCE

Ching-Chiu Lin
✉ ching-chiu_lin@sfu.ca

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Exploring the intersections of immigrant seniors' digital literacies and social connectedness: a Canadian study

Ching-Chiu Lin^{1*}, Nathan J. Li² and Ena Lee¹

¹Faculty of Education, Simon Fraser University, Burnaby, BC, Canada, ²School of Kinesiology, University of British Columbia, Vancouver, BC, Canada

Seniors' adoption of emerging technologies is crucial to their social connectedness, well-being, and digital participation in society. This article presents a Canadian study on how immigrant seniors established and sustained social connections through their engagement with digital technologies during the COVID-19 pandemic. Specifically, we aim to (1) deepen understandings of how immigrant seniors' learning through and about technologies can shed light on our conceptualization of seniors' digital literacies and (2) suggest programs and pedagogies that could foster lifelong learning for seniors. Data were collected through interviews, observations, and digital artifacts from a sample of immigrant seniors (N:16). Through narrative, we stitch together the personal and sociocultural perspectives from four seniors' stories for holistic insights into their learning and engagement with technologies. Their stories also emphasize possibilities for dynamic and interconnected digital engagement and the inseparable link between community support and developing seniors' digital literacy. Social interaction plays a pivotal role in facilitating, fostering, promoting, and enhancing seniors' digital literacies. Our findings challenge preconceived notions about how seniors navigate digital technologies and offer strategies for supporting community service agencies in designing and implementing senior-friendly digital literacy programs.

KEYWORDS

seniors' digital literacies, digital literacies, social connectedness, Covid-19, lifelong learning, seniors' digital engagement

Introduction

As we navigate an increasingly digital society, the adoption of emerging technologies has become crucial to seniors' social connectedness and participation. Digital engagement can significantly enhance seniors' health, well-being, and sense of belonging, given the profound influence of social connectivity on these aspects. The COVID-19 pandemic has underscored the importance of connectivity, propelling many seniors into self-taught digital activities that sustained social inclusion and connectedness in these challenging times. However, this rapid digital transition presents a dichotomy. As the UN's Department of Economic and Social Affairs observes, the crisis is a "double-edged sword for social inclusion efforts" (DISD/DPIDG, 2021, p. 2). On the one hand, seniors' growing engagement with digital technologies becomes a means of fostering social inclusion. On the other, the long-existing inequality between technologically engaged seniors and those who do not have access to such technologies, or who aren't digitally

literate, can be exacerbated. This inequality amplifies the risk of mental health issues. Such a concern points to an urgent need for community service agencies to build and increase their capacity for resources and programming that support seniors' digital literacies—not only during the pandemic, but more importantly, during post-pandemic recovery. To guide the direction of community services, there is scant empirical evidence showing how seniors create and maintain social connectedness through navigation and engagement with emerging digital technologies. Thus, our study provides empirical evidence to address this lack, showcasing how seniors—particularly immigrant seniors—navigate and engage with emerging digital technologies to foster their own well-being and social connectedness.

In this article, we first delve into the relevant literature concerning the digital divide, the unique challenges immigrant seniors face, and the importance of digital literacy for seniors. We then introduce our study as well as four seniors' stories, showcasing rich accounts of their experiences navigating digital participation and engagement as their responses to COVID-19. Our findings highlight the intricacies of digital experiences, the significance of community support and social interaction, and the empowering potential of construction-focused activities and self-expression. We conclude by considering the implications of our findings for the development of digital literacy programs for immigrant seniors. Considering our subjects' lived experiences, we suggest strategies based on John Dewey's four natural impulses—communication, construction, expression, and inquiry—to improve the design and implementation of such programs. Our study is structured to provide a systematic and in-depth exploration of immigrant seniors' digital literacy, with a strong focus on translating our findings into actionable recommendations.

Engaging with digital technology: challenges seniors face

Emerging technologies—especially mobile communication—play a critical role in supporting seniors' learning aspirations and independence, assisting with age-related challenges and fostering their well-being (Khosravi and Ghapanchi, 2016). The past decade has seen a notable surge of seniors adopting and utilizing mobile technologies (Berenguer et al., 2017), indicating their readiness to engage with the myriad opportunities these tools offer (Lai, 2020). In discourse about seniors' adoption of technology related to impacts of COVID-19, seniors have been identified as a population who may be particularly vulnerable (Sin et al., 2021). Most recently, research has highlighted how seniors' insufficient access to and lack of proficiency in leveraging technologies to meet their needs made them particularly vulnerable to the impacts of isolation during the pandemic (Seifert, 2020). Lack of technological access could have far-reaching implications for seniors, in terms of both their emotional well-being and their ability to participate in society (Sen et al., 2022). For seniors unable to afford or access necessary digital technologies, the resultant lack of connectivity may significantly amplify feelings of isolation and estrangement. As they see their peers and younger generations engage with the world through digital means (Hunsaker and Hargittai, 2018), their inability to do the same could foster a sense of being left behind, deepening their feelings of loneliness (Vaportzis et al., 2017).

The challenges seniors face in adopting technology are further complicated by the digital literacy gap among senior citizens

(Schreurs et al., 2017; Tsai et al., 2017). According to Schreurs et al. (2017), developing seniors' digital literacy is not merely a matter of owning the appropriate digital devices but having the skills and knowledge to use these devices effectively. Research has shown that seniors who lack digital literacy are at a significant disadvantage, struggling to perform essential tasks such as online banking, health management, or even socializing via digital platforms (Kravchenko et al., 2019; Johnson et al., 2021). This limitation creates a barrier to full participation in an increasingly digital society, impeding seniors' ability to stay connected with loved ones, engage in lifelong learning, or access essential services (Seifert, 2020).

Moreover, any physical or cognitive impairments seniors may have can exacerbate these challenges (Seifert et al., 2021). For example, seniors with visual or motor impairments may find it difficult to navigate small screens or use touch interfaces (Schulz et al., 2015). Cognitive impairments, such as those related to memory or attention, may affect their ability to learn new technologies or remember how to use them (Schulz et al., 2015). As Seifert et al. (2021) mention, these challenges—exacerbated by the pandemic—may contribute to the double burden seniors face concerning physical and digital exclusion. Physical isolation due to measures like lockdowns and social distancing significantly reduced in-person interactions, especially for seniors in long-term care facilities (Seifert et al., 2021). Additionally, as Xie et al. (2020) corroborate, adherence to physical distancing measures and lack of digital participation further contributed to seniors' sense of social exclusion. In a society increasingly dependent on digital technology, limited opportunities and access for seniors to employ these technologies could negatively perpetuate ageism (Barrie et al., 2021; Seifert et al., 2021). For example, being unable to access important information and services that are primarily online may increase feelings of social exclusion and disconnectedness from society (Seifert et al., 2021).

Beyond deficit discourses: illuminating complexity in immigrant seniors' digital engagement

Although the current body of literature highlights the challenges faced by seniors, it lacks a focus on the complexity of seniors' engagement with technology. Schreurs et al. (2017) provide a critical response to this topic through surveys and interviews about barriers to seniors' participation with technology. The researchers illuminate the complexities involved in older adults' use of information and communication technologies (ICT), highlighting not just the challenges they face but also their potential for self-determined, active engagement. Further, Schreurs et al. (2017) problematize the idea of the "digital literacy paradox," emphasizing that even if older adults are keen to engage with ICT, they often encounter systematic and individual barriers such as accessibility, affordability, design of technology, and cognitive or physical limitations. Moreover, a lack of skills and limited social and institutional systems make it difficult for older adults to gain experience and engage with technology (Schreurs et al., 2017).

In this article, we argue that support systems such as family and peers can play a significant role in reducing barriers and limitations to seniors' use of technology, enabling them to engage

existing skills, motivation, and creative abilities to maintain social connections.

While current research has highlighted common challenges seniors face with digital technology, further investigation is needed into the unique experiences of immigrant seniors. Their interaction with technology is often influenced by additional factors such as barriers created by language, social networks, and cultural nuances, necessitating a more tailored approach to technological engagement and digital literacy (Johnson et al., 2021). This nuanced understanding could drive the development of more inclusive and effective strategies for improving digital engagement and literacy among this demographic (Wang and Wu, 2022). As our understanding of these issues deepens, it becomes apparent that the pandemic might have exacerbated these challenges, indicating an unmet need for research attending to the dynamics of digital literacy for immigrant seniors.

More rigorous inquiry is urgently needed to conceptualize the notion of digital literacy through the intricacies of seniors' social relations, particularly those of immigrant seniors, to help us better understand the complexities of seniors' digital literacies. This calls for rethinking the notion of agency for seniors, especially as it relates to their digital engagement. Moving beyond the simplistic narrative of older adults as merely passive recipients of digital technological change, it becomes necessary to explore their self-directed actions and strategies aimed at personal and collective ways of navigating the digital world. In other words, exploring seniors' digital literacy allows us to imagine agency as an "ongoing reconfiguring of the world" (Barad, 2003, p. 818) rather than as a pre-determined human quality. This critical approach enables us to explore and address the diverse and complex experiences of immigrant seniors in the digital age, ultimately contributing to more inclusive and effective strategies for supporting seniors' lifelong learning.

Toward a holistic understanding of seniors' digital literacies

Conceptualizing seniors' digital literacy necessitates a multifaceted and nuanced approach. As noted by Carenzio et al. (2021), digital literacy goes beyond mere technical proficiency in using digital tools. It encompasses a broader range of abilities, including understanding digital content, critically analyzing online information, and creating and sharing digital content in a responsible and ethical manner.

Digital literacy is characterized by significant variability, influenced by an array of factors such as individual cognitive abilities, educational background, socio-economic status, cultural factors, and personal attitudes toward technology. The heterogeneity of seniors' digital literacy reflects its complicated nature and points to the inadequacy of any single definition. However, our focus is not on searching for a definition to frame our thinking about the experience of seniors' digital engagement; rather, we participate in seniors' digital literacy discourses to explore how immigrant seniors are embracing and engaging with technology and building their digital literacy potential as a conduit for social connectedness. By developing their digital competencies, seniors can forge new social ties, maintain existing relationships, and engage more meaningfully with their communities, thereby enhancing their well-being and promoting a holistic journey of lifelong learning.

In synthesizing the above perspectives, we recognize the complexity and variability inherent in seniors' digital literacy and aim to unpack the intricate interplay of individual, sociocultural, and technological factors that shape seniors' digital engagements. Through this comprehensive lens, we hope to re-envision our understanding of immigrant seniors' digital literacies and thereby offer more effective strategies for promoting lifelong learning among this population group in digitalized societies.

The study

Situating the inquiry

This research was situated in a dynamic senior community associated with the MOSAIC (Multi-lingual Orientation Service Association for Immigrant Communities) Seniors Club in Metro Vancouver, British Columbia, Canada. MOSAIC is one of the largest non-profit settlement organizations in Canada, servicing immigrant, refugee, migrant, and non-mainstream communities in Metro Vancouver and throughout BC. MOSAIC's Seniors Club is a specialized program tailored to immigrant seniors from a variety of ethnic backgrounds and includes newcomers, refugees, or individuals aged 55 and above. The club's mission is to support these seniors by fostering opportunities for social interaction and connection as well as enabling access to educational programs, community-related information, and other resources. The club offers a wide range of activities such as English-language practice, Tai Chi and yoga sessions, knitting, field trips, and even participation in a seniors' choir. By participating in these programs and activities, immigrant seniors have opportunities to improve their overall well-being and cultivate meaningful social connections.

Methodology and research design

We embraced a hybrid approach that intersects arts-based and qualitative methods through a reflective inquiry lens (see Baker and Lin, 2022, 2023). Specifically, we used narrative to stitch together the personal, sociocultural, and historical perspectives of the seniors' stories to gain a more holistic understanding of older people's digital literacies and their encounters with digital services. We consider narrative inquiry as an expanded genre of arts-based research that values stories both as data and outputs (Mulvihill and Swaminathan, 2019). Building on the last two decades of scholarship in narrative research (see Elliot, 2005; Andrews et al., 2008; Garnet et al., 2018; Gravett, 2019), we embraced how story affords a reflective platform from which to gain insights into seniors' unique experiences and identify the social dynamics embedded in seniors' interplay with their situated learning community. Such stories are intended to reveal, inform, and inspire many other seniors as they navigate aging in the digital era. This approach views the research through a lens of community members as knowledge holders where subjectivities are produced, thus allowing us to explore the richness of intersecting processes, events, and relationships within social and cultural diversities in the context of the pandemic.

In 2021 over the course of 6 months, we worked with a group of 16 immigrant seniors, all members of the MOSAIC Seniors Club, to

explore their views and experiences of engaging with digital technologies during the COVID-19 pandemic. Among the 16 participants, two had immigrated from Korea, one from India, one from Iran, one from Mexico, and 11 from Mainland China. We collected three kinds of data: (1) individual semi-structured, 60-min interviews via the Zoom video conferencing system or phone calls; (2) observation of four online Zoom social events; and (3) document collection of seniors' digital artifacts (e-copies of event recordings, videos, artworks, online chat records) produced during the course of the pandemic. Data analysis consisted of ongoing data summarization, transcript coding, and document analysis. The research team regularly discussed themes that emerged before beginning to write the stories. The technique of respondent validation played a significant role in our data analysis stage as the stories were returned to the seniors for their feedback and to check for accuracy. Stories were subsequently revised, informed by the layers of feedback received from the seniors.

One challenge we faced when working with immigrant seniors was the process of language translation. While most of our participants could speak conversational or fluent English, six preferred speaking Mandarin for their interviews. Team members fluent in both English and Mandarin worked with those six seniors closely throughout the research process, communicating with them and translating interview transcripts and stories between the two languages. Through our study, we discovered that the community program attracted numerous volunteers who spoke languages other than English, including dialects distinct from Mandarin.

We are aware of the role of language in negotiating power relations between participants and researchers, and we tried to ensure the research processes and outcomes were clearly communicated, especially with those who were not confident in their English language abilities.

Stories

<story 1>

Xun Hu Liu, 78 years old, is a retired vice-principal of a secondary school in the Northern region of China. He completed his university education with a major in mathematics. In 2014, Xun immigrated to Canada with his wife, reuniting with their only son who had already settled in the country. Upon arrival, he became a member of MOSAIC's Multicultural Centre Chinese group (MMCC), a Chinese Canadian immigrant social group. Currently he resides in Vancouver and has obtained permanent residency.

An active learner, Xun taught himself to use Photoshop at age 60. Subsequently, he acquired skills in AutoCAD and assisted his son, who owned a construction company, with creating blueprints. After joining MMCC, Xun became the photographer for group events, capturing moments and transforming them into animated videos. Such events included social gatherings that celebrated Chinese holidays and English language workshops. As mementos, Xun would share the event videos with the group through WeChat, a messaging and social media app popular among the Chinese population.

When the pandemic struck, Xun exercised caution by strictly adhering to social distancing measures. He and his wife avoided using public transportation and relied on their son for transportation whenever necessary. Despite this, he did not

succumb to excessive worry. As he expressed it, "We have limited interactions with others, so we do not feel overly afraid of the pandemic".

Xun liked to watch Youtube videos to learn editing tips and news broadcasts about emerging technologies. He said, "I want to learn what's new, so I can catch up with what's going on in this world." Xun reflected that this learning motivation made him "stay energized and feel more alive." Additionally, Xun paid attention to maintaining his physical health by incorporating regular walks into his routine.

During COVID-19, the group gradually moved from in-person events to holding online events on Zoom, with MOSAIC's support. This group, "Talking Mountains" (a name that implies chatting about mountains of possibilities), was a weekly Zoom chat about random topics, including Covid information and tips for coping with social isolation. Not being able to take photos, Xun continued making videos of the group's online events. As he put it, "I want to continue documenting this memory of learning." While participating in the events, he captured highlights on his smartphone to collect still footage. Screenshots included moments of laughing, pondering, and listening, as well as presentation slides or photos shared during the Zoom conversation. He then uploaded the screenshot photos to his desktop computer. Each video took Xun around three to 5 days to produce since he handled everything from photo selection to video creation. As Xun described it, "each event I usually produce three to 500 photos. I need to select from these photos and then...I use Photoshop to organize the photos... and tweak them a little. Then I would use Corel VideoStudio to animate them and add background music." He compared making a video on "Talking Mountains" to writing a novel, emphasizing "you need to have a plotline to keep the audience engaged".

Creating the videos has brought Xun much joy and fulfillment. He did not mind how much time he had to spend on post-production. He enjoyed receiving positive feedback and gratitude from his friends. As a humble person, he said, "the work [of making videos] is not much; it's more important to see my friends enjoying the videos during the isolation." As he further reflected, "making the videos makes me busy so I do not think about Covid too much...and I like to be busy so I may be able to stay away from Dementia".

Xun was also grateful that MOSAIC fulfilled other needs during the pandemic: from resources and help for immigrant seniors to offering seminars and opportunities to learn from successful immigrants across different fields such a doctor, an accountant, and an artist. He found these online seminars fascinating. Xun commented, "I think I should keep learning as I grow older, and it's inspirational to learn from those experts who shared similar cultural backgrounds like mine." He added, "I cannot say that I understand all of it, but I should at least know what it's about".

<story 2>

Celia Deng, 82 years old, was formerly a lab technician in a college in China. She immigrated to Canada in 2003 and currently resides in Vancouver with her son's family. Celia enjoyed her life in Canada as a retiree and being in an area close to stores and transit. For Celia, MOSAIC's office was only a 10-min walk away, which motivated her to be active and try a variety of programs offered by MOSAIC. She joined MOSAIC's ballroom dancing enthusiast group in 2018. However, during the pandemic, she was afraid to go out. Her son bought groceries for her, and she recalls him saying, "you have a

weaker immune system, stay at home and we'll handle everything for you." She accepted her son's perception of limitations but missed doing her own shopping. "I used to buy whatever I wanted to eat, but now I eat whatever they buy." Celia also kept herself active by gardening and growing vegetables while singing along.

But even so, Celia admitted the pandemic "is a challenge for seniors, especially for me struggling with health." So when she heard that MOSAIC's singing and dancing events would be continued through Zoom, she signed up right away even though "I did not know what Zoom was." After her son helped her create an account, Celia was invited to host some of their MOSAIC group events online—including at least four each weekend. "Because of this pandemic," she said, "I've learnt how to use Zoom and have become really busy." She had always wanted to learn piano, and during the pandemic, the ballroom dancing enthusiast group offered a class via Zoom on how to play electronic piano. At home during Covid, she could "play the piano as I please—I play whatever I want to sing," she said. It made her "really happy"!

Celia was also able to help other members learn Zoom. After she learned to integrate a new app called "Solitaire" within WeChat, she organized and invited participants to a new event called "piano solitaire" to learn piano. "We received 30 responses almost immediately, and now we have 40 people." She was grateful that MOSAIC showed her how to get community funding to cover the cost of a Zoom account.

Celia had been reluctant to learn some new things, such as how to drive or become more fluent in English. This hesitation was related to hardships in her life: her husband's death, raising her son alone, and having to change jobs many times. But after almost giving up on being able to sing again or play piano, she has rediscovered the joy of learning and is "chasing after my dreams again." Celia further commented, "people say that we should live each day happily and treasure the life we have, so I thought, 'Well, who cares about how much longer I have left to live, I'll start learning first.'"

<story 3>

Juan Li, 75 years old and originally from Anhui, China, came to Canada in 2004 to be with her daughter, who later moved to Silicon Valley. Juan is a sociable person who enjoys meeting new friends and volunteering her time in local charitable organizations. Juan had been very active with MOSAIC, attending group events and choir every weekday. While Juan self-identifies her English language skills as "poor because I only have a high school degree," her vibrant and optimistic energy brings her many friends from diverse ethnocultural minority groups.

During Covid lockdowns, Juan walked frequently to nearby shops because she was "afraid of riding the bus." While she enjoyed such walks, at times she felt "trapped inside the house." With everything canceled, the lockdown was initially difficult for Juan, especially since she considered herself cherishing friendship very much. But when MOSAIC switched to online events (two a week at first), Juan was thankful. "MOSAIC is like our home... Without MOSAIC's support, this year would have been really difficult for me." She appreciated Ms. Au, the senior club coordinator at MOSAIC, who held online events and seminars and taught the seniors how to use Zoom. Before Covid, Juan did not know about Zoom or how to do group calls on WeChat. But as she recalled, "[Ms. Au] posted the steps on WeChat about what to open and what to do next. We just followed that and downloaded

it. She made Zoom so easy to learn!" She reached the point where socializing online "has become a habit...Even if quarantine ended, I would not want to go out anymore." She even coordinated the seniors' online Zoom check-in group, sending out reminders, hosting the events, and making sure there are no technical glitches during the sessions. In addition, Juan organized an online Chinese New Year's event as well as "carnival" gatherings and online talent shows for other holidays.

Being able to participate in seminars online "opened a whole new world for us," Juan commented. MOSAIC offered seminars on a variety of topics, including COVID-19 information and vaccines, dementia awareness, and seniors' rights. For Juan, a workshop that stood out for her was soap-making, which involved fermenting layers of twigs, leaves, and compost in bins. "The process is also quite hard," Juan said, "[and] since we need to go out and gather leaves, this is also a kind of exercise that encourages me to see the beauty of my neighborhood [*sic*]." She also enjoyed a weekly seminar focusing on discussion of art, especially because the seminar entailed conversations with seniors who are practicing calligraphers and artists. As she mused, "Art is a level higher than daily conversations, so it's a kind of different communication that elevates our thinking. When we are together, we write poems which make us think. Things that are related to literature require you to think."

Support from MOSAIC made Juan feel the lockdown was tolerable. As she put it, "I experience joy that forgets troubles." She had one word to describe what life during Covid would have been like without that support: "Dementia." In a serious tone, Juan explained how she valued the essential role of MOSAIC's online events and activities during the pandemic. It "changed our attitudes," Juan emphasized, and "contributed greatly to maintaining our mental and physical happiness."

<story 4>

Vinita Sud was born and raised in Delhi, India, but her life there was disrupted by the early death of her husband. When her daughter immigrated to Canada, Vinita found herself alone in Delhi. In 2005, sponsored by her daughter, Vinita immigrated to White Rock, BC, where she was able to enjoy her two grandchildren and play a part in their lives. But that too was disrupted 10 years later when work beckoned her daughter eastward to Toronto, Ontario, leaving Vinita alone in BC. As Vinita recounted this challenging time, "Life seemed empty, more so because by this time I had lost contact with my friends and relatives in India." At this juncture, the yoga she learned earlier in India opened an avenue, and she decided to teach yoga in White Rock. Social contact and friendship with new people gave her a fresh purpose for life.

Not long after, however, the Covid lockdowns resulted in her small business, a yoga studio being closed due to government restrictions limiting the size of social gatherings. At age 68, she was not hindered by mobility issues, yet she felt uneasy about shopping for groceries and leaving her home. With no one in her bubble, Vinita communicated with family and friends online and by phone. Occasionally she drove by people's homes to wave to them. Realizing "isolation creates the opportunities for negative thinking," she found yoga helped keep her "constructively occupied."

Looking for new work, she found people were interested in taking online yoga classes with her. This seemed a good fit as she already knew how to use Zoom. However, when she demonstrated yoga poses

on the ground, people could not see her properly. So she adapted her poses, perching on a chair in front of her video camera. As she explained, “Chair yoga was devised especially for the older generations with mobility issues. You can use the chair and do all the breathing exercises and stretches.”

During Covid, MOSAIC was reaching out to connect online with seniors living on their own during the pandemic, and Vinita was invited to teach yoga classes for the members. She received an honorarium as well as “positive feedback from a lot of people that made me feel more useful...It gave me a boost, at a time when I thought my life was gone and done.” Vinita saw how her classes helped seniors overcome the isolation they felt being confined to their homes. As she described it, “[Chair yoga] made yoga more practical, even for seniors with mobility issues. All exercises were done sitting on a chair.”

The popularity of Vinita’s chair yoga classes encouraged her to participate in other online programs offered by MOSAIC. She joined the online choir and was enthusiastic about inviting her friends to check out MOSAIC’s senior programs. Vinita could see beyond the obstacles Covid presented. “I’m really grateful!” she said. She shifted her mindset to see possibilities and learning opportunities instead of being weighed down by negative thinking. No stranger to major life adaptations, Vinita found that changes thrust upon her because of Covid reminded her “to get used to a different system and just make it work.” As she explained, “I had no choice...so this has been a period of growth and learning for me.”

Discussion

We are aware that sharing all collected stories, not only four, would have allowed for more comprehensive analysis of the intersections of immigrant seniors’ digital literacies and social connectedness. However, some participants in our study expressed they did not feel isolated and disconnected from society during the pandemic. We attributed this to their social connectedness through various means, such as owning a business or actively volunteering at MOSAIC programs, which allowed them to stay in touch with friends and family members. Also, unlike the four seniors featured in this study, their digital participation mainly lies on their use online platforms like Zoom to attend MOSAIC’s seminars. While their experiences are valuable, their stories could not provide us with the understanding and lived experience of overcoming social isolation and enhancing digital literacy through community support. Therefore, to ensure a well-rounded and meaningful analysis, the focus has been placed on participants whose experiences more closely align with the objective of this study.

Our data analysis identified multiple themes within the focus of immigrant seniors’ digital literacies: including online social interaction, digital making, digital technology learning motivation, learning through digital social networks, and community support and services. These interrelated themes illustrate the complexity of seniors’ lived experiences. We frame our discussion by adapting Dewey’s (1956) notion of the four natural impulses of a child: communication (the social instinct), construction (the instinct of making), expression [the instinct of expressing and representing], and inquiry (the instinct of “finding things out” (p. 47)]. Dewey posited that these four impulses do not just apply to children; rather, they spark active learning on

which lifelong learning thrives. These impulses have been applied by other researchers as a framework to articulate the diverse uses of technologies for learning (see Bruce and Levin, 1997, 2001; Lei, 2010). We adapted this framework to guide our discussion and foreground the dynamic, interconnected nature of seniors’ digital engagement, as well as to highlight the inseparable connections between community support and the development of seniors’ digital literacy.

Communication

The role of enabling constraints

The seniors in our study were eager to embrace the communicative nature of technology to access up-to-date COVID-19 guidelines developed by the government and stay connected with friends and families. Our participants’ needs reinforced findings by Hänninen et al. (2021) that seniors faced many challenges in using digital services, including limited technical skills, difficulties with the specific device, software updates, complex platforms, and concerns about privacy and security. However, the constraints caused by COVID-19 such as social distancing and lockdown have revealed new opportunities for learning motivations through and about technology. As Manning and Massumi (2014) suggest, a set of restrictions that create conditions for new and creative action to emerge may be enabling constraints that allow seniors to work through the challenges, motivating them to “survive through the Covid,” as Juan put it.

Considering enabling constraints as a positive factor in this context, we observed that seniors adopt peer-based learning dynamics rather than formal instruction to navigate ways of understanding technology. We found that the need to stay informed on Covid information drove seniors’ motivation, and this motivation was sustained through peer interaction: they learned from each other to download and use apps like WeChat and YouTube; they went on Zoom to review government websites by sharing their screens; and they used WeChat to participate in online seminars hosted by MOSAIC. Enabling constraints brought learning differences, generational tensions, collaboration, and stress to the forefront through the process of peer learning, yet they also co-created the conditions for taking risks and developing a sense of trust and belonging. The enabling constraints present an opportunity to address to Schreurs et al. (2017) “digital literacy paradox” as discussed in the literature section, allowing seniors to respond to technology-related barriers through a collective effort of peer support. As Juan described, “[Seniors] do not want to bother our children and grandchildren all the time. We help each other because we know we learn slowly, and we understand each other’s needs”!

Knowledge sharing among peers

Juan’s active involvement as the senior Zoom event coordinator reflected the findings of Seifert et al. (2021) and Yang et al. (2022), who have shown that the dual aspects of digital inclusion and exclusion play significant roles in this population’s encounters with digital services and communication. Digital and social exclusion pose substantial obstacles to digital inclusion and such benefits as mitigating isolation and boosting emotional well-being. This senior group appeared to be very aware of the potentials and challenges of improving social connectedness through technology during the

pandemic. Some of their learning motivation came from the fear of possible social exclusion, extending from digital exclusion. We observed how, to gain digital proficiency, the seniors used WeChat to exchange quick messages and group chats to learn from each other and share knowledge about how to solve digital technology problems. Furthermore, they would refer one another to peer experts, helping each other to seek out further solutions if necessary. For questions about accessing digital tools and the internet, they would reach out to MOSAIC to ensure their needs were met. For example, MOSAIC staff delivered a computer to Celia's house during the pandemic and used WeChat for an online tutoring guide, teaching seniors step by step how to download and use Zoom. In addition, since Xun constantly made event videos shareable, some seniors would attach Xun's videos on WeChat to allow more members to revisit or share the content. They co-created an informal digital space based on peer interaction and driven by their mutual interest in navigating the pandemic through technology. Thus, the seniors produced sites of learning among their peers through a shared understanding of their learning needs and challenges and a recognition of each other's strengths, rather than perceiving their digital practices as "sites of anxiety and tension" (Ito et al., 2009, p. 78). Also, our study underscores how "learning is a social process and thus digital literacy is best acquired in social settings where family, peers, mentors, and gatekeepers come together to provide an environment for exploration" (Schreurs et al., 2017, p. 362).

Construction

Our findings reveal seniors were actively engaged with digital content creation during the pandemic, which points to a distinct domain for considering senior's digital literacy. The mobility and physical limitation brought by the pandemic were challenging for Xun, given his passion for attending and documenting in-person events. Documenting online events as digital creations helped him find a sense of purpose. While some enjoyed taking and sharing photos via digital platforms, Xun was not interested in this type of casual creation and sharing. He enjoyed more sophisticated forms of editing and making as evidenced through a series of videos created from seniors' online events. When asked to identify his role, Xun responded with a smile, "I am not an artist or videographer; I just want to document the events for my memory so I can revisit them if I want! I enjoy making videos and seeing my friends enjoy them." Xun reminded us that his emphasis is on the artistic process rather than an artistic role. Xun's digital making suggests a performative dimension of digital literacy that points to the necessary ongoing experimentation and exploration embedded in learning with technology.

We observed that, in the making of videos, Xun immersed himself in the creative process that reveals his appreciation of the footage/images of his relationships with others. This dimension of literacy is less about using technology to represent things from the past and more about acknowledging the performative nature of digital making that "propels further learning that teaches new potentials" (Triggs and Irwin, 2019, p. 5). Such potentials lie with the dynamics of Xun's work, which is experiential, participatory, dialogical, and collaborative. Furthermore, as we found, the seniors saw themselves as both participants in and users of Xun's videos. The potential of Xun's work thereby moves from spectatorship to participation, with his creative

digital practice as a form of cooperative inquiry creating meaning through the interplay of co-creation and human relationships. As Schreurs et al. (2017) have mentioned, when seniors are familiar with using ICTs, their digital literacy experience does not remain only at the level of "curiosity" (p. 373). Xun became a self-determined user of digital tools and gained digital literacy not only for himself but also his peers through sharing his digital creation work. This resolves Schreurs et al.'s (2017) digital literacy paradox that "ICTs are not senior-friendly" (p. 373).

Expression

Invitation to learning

Our study indicates that learning through expression can motivate seniors to learn about and through technology since their creative and digital work can be viewed by their peers through a supportive online community. Xun's practice of digital content creation became an invitation that encourages other seniors to express themselves through technology. He inspired other seniors to make videos of their interests. For example, Celia learned from Xun to make short videos of her singing and piano performances. As she put it, "Xun showed me the potential of technology and it's fun!" Vinita gained the confidence to use Zoom to make video modules for learning chair yoga. Others posted pictures of paintings, knitting work, or Chinese calligraphy on group chats and enjoyed the feedback received from others. Xun's invitation encouraged seniors to take ownership of, and to address the barriers or discomfort of learning about and through technology.

Digital repertoires

Xun's practice showed the richness of his digital repertoire, a concept often discussed alongside the notion of digital literacy. A digital repertoire refers to the range of digital tools, platforms, and services an individual is comfortable using and the array of tasks they can accomplish using these resources (Hänninen et al., 2021). For seniors, their digital repertoire can be a crucial determinant of their ability to navigate the digital world, engage in online activities, and access digital services. As Xun was known for his breadth of knowledge about technology, other seniors often called him "resourceful." Thus he became the go-to person when seniors needed suggestions on how to digitally execute their ideas. Since a digital repertoire is not static, it evolves in response to changing technologies, personal needs, and social contexts (Hänninen et al., 2021). Xun continued to update his repertoire by self-study and consulting with his grandson, who was a technology expert. This correlates with the importance of peers and family members and their role in senior's engagement with digital technology (Schreurs et al., 2017). This support system empowers seniors to explore digital technology with greater enthusiasm and independence.

Because of trust developed through peer-based learning, some seniors felt they had the scaffolding to shift from being consumers of technology to agentic digital technology users, creating and negotiating meaning through the creative process. They felt supported enough to explore their creativity by trial and error; some received encouragement from their peers and developed reputations as highly skilled. Such collaborative engagement was continually reshaped and evolved in exchanges where social interactions with their peers were based on mutual rapport built over time. Therefore, it is essential to consider the

dynamic nature of seniors' digital repertoires: particularly, that learning is emergent and dynamic in light of rapid technological advancements and the shifting digital landscapes that characterize the modern era.

Inquiry

Digital literacy as contextual

We consider technology as a means for inquiry into seniors' lived experience, as human relationship with technology is a dynamic entanglement with life. Our participants' stories showed seniors were resilient in adapting to new digital technologies, agentively searching for active resolutions of problem-driven situations. For Dewey (1933), inquiry into authentic questions evoked from learners' experiences situates learners at the center, with both the initiative and the responsibility for learning. Considering technology as a means for inquiry viewed through Dewey's lens, we interpret the notion of seniors' digital literacy as a context-bound assembly of dispositions and practices related to what seniors may learn to support their well-being and lifelong learning journeys. To highlight this mediative function of technology, we acknowledge that seniors' digital literacy—especially for immigrant seniors—is complicated. This demographic experiences unique risk factors such as racism, lack of linguistic access, and separation from family and friends—all of which put immigrant seniors at higher risk of social isolation and increases their digital and social exclusion (Johnson et al., 2021).

We observed that seniors' digital participation is never simply about technology; it is in relation to seniors' lived experiences and their attitude toward life. While our participating seniors encountered a set of struggles stemming from financial insecurity, declining health conditions, a higher degree of social isolation, and linguistic inaccessibility, they seemed uninterested in sharing those details. Instead, they referred to using technology to navigate the pandemic just as they would any other ups and downs of life. As Juan explained, "Learning how to communicate through technology was not easy before the COVID-19 already, but Covid gave me a motivation to learn quicker!" Xun found alternatives to keep himself entertained and mentally healthy during Covid restrictions. Learning about new technology was his way of interacting with his friends through a common interest. He commented, "An immigrant myself, I realize how alone and lost some new immigrants may be if they do not have a community of support during the Covid!" Vinita was grateful that she could find a creative way to financially support herself. "No calamity can weight down a spirited person," she commented.

A holistic perspective

Our findings suggest that addressing the challenges faced by immigrant seniors in the digital landscape necessitates a holistic approach that considers the intricate dynamics of inclusion and exclusion in both digital and social realms. Adopting a holistic approach implies moving beyond a prescribed technological or skills-based view of digital literacy and understanding the broader sociocultural factors that influence technology use. Such a perspective recognizes that seniors' digital experiences are deeply rooted in their social contexts and personal histories and are shaped by societal structures and cultural norms. The perspective also aligns with Lee and Robbins' (1995) characterization of social connectedness from a relational standpoint. As Lee et al. (2001) explained, "The emphasis

on social connectedness is on the independent self in relation to others" (p. 310), or in Juan's words, "I am keen to check on my phone and socialize online every morning because my friends are hanging out online! This is a motivation for me to learn new technologies and apps on my phone!"

Thus, in a digital era, we envision seniors' social connectedness as pedagogical pivots for supporting ongoing learning that is situated in broader social relations rather than separating themselves from others and their collective significances. We consider seniors' peer-based learning as a relational practice that emphasizes how *becoming* is always in relation to others as they learn alongside and with others. For example, Celia said,

I was not sure if I could show the videos of me playing piano to my friends; I do not think they are good. But when other seniors started to share their videos online on WeChat, I realized it is okay if my videos are not good. It is about having fun! So now I shared my videos too and I really enjoyed it!

Vinita also observed, "I made more friends through my chair yoga videos. The online world is interesting; I do not know how they found me – now I connected with people even outside of Canada who wanted to learn chair yoga!" In the case of immigrant seniors, this holistic perspective is essential for navigating the digital world while also adjusting to a new cultural context, which adds another layer of complexity to their experiences (Johnson et al., 2021).

Implications

Next, we discuss the implications of our findings to provide insights into, and strategies for, supporting community service agencies in designing and implementing senior-friendly digital literacy programs as well as increasing resources and programming capacity through digital platforms. To ensure digital inclusion for immigrant seniors, our findings demonstrate that the complexity of seniors' lived experiences and their approach to digital literacy requires a more holistic understanding grounded in their stories. Their learning motivation is supported through peer interaction, and the subsequent social connectedness is contextualized through social relations. Taken together, we continue using Dewey's framework of the four natural impulses—communication, construction, expression, and inquiry—to describe implications for seniors' lifelong learning and community support and services.

Enabling communication for seniors' social interaction and interest-driven participation

A digital literacy program that enables communication can effectively capitalize on the inherent social instincts of seniors. From our findings, the inherent desire for social interaction persists regardless of age and remains integral to overall well-being. Therefore, an effective digital literacy program integrating elements of social interaction among seniors can create an environment that not only develops digital literacy but also fosters their sense of belonging.

To this end, group learning may be an integral part of fostering communication between seniors in a digital literacy program. It encourages collaboration and mutual learning and stimulates social engagement through interest-driven activities. Since digital platforms provide avenues of collaboration regardless of physical distance, seniors may learn and work together regardless of location.

Community as context

Considering community as the curriculum for learning can provide an authentic context in which to foster friendship-driven learning networks and interest-driven digital participation, thus honoring seniors' local knowledge and aiding knowledge retention. Inquiry into community can inspire a sense of belonging and purpose among seniors through situating seniors as the knowledge holders of living histories. For instance, seniors could work on a local history project: collecting and digitizing stories, photos, and other historical artifacts. Not only would this increase their digital repertoire and confidence, but it would also contribute to preserving community heritage—a task that seniors, with their wealth of lived experience, are uniquely suited for.

Social connectivity

A socially oriented program design—understood as the ability to access, use, and comprehend digital technologies—can foster digital inclusion among seniors. These technologies are increasingly indispensable for social engagement and overall well-being (Yang et al., 2022). Enhanced digital literacy can lead to increased social connectivity within the digital sphere, challenging the narrative of isolation that often accompanies discussions of seniors and technology. Thus, a holistic approach to a digital literacy program design situates seniors' engagement with technologies as socially constructed and interactively performed as a social praxis. Along this line of thinking, seniors' digital literacy is not just about static competence; it is undetermined, evolving, and developing, positing seniors as lifelong learners who respond to emerging technologies with a growth mindset. This understanding positions seniors as digitally literate and on the pathway to lifelong learning while simultaneously fostering a sense of accomplishment, social connectivity, and resilience needed to sustain their sense of purpose.

Empowering seniors through construction-focused digital literacy activities

Learning from peers

Construction-focused activities can be a crucial element of digital literacy programs for seniors. These activities can stimulate seniors' active engagement with digital technology, providing them with practical, hands-on experience that goes beyond theoretical knowledge. The practical application of digital tools can take many forms, and setting up social media profiles in an interest-driven online social group is one such example (i. e., Facebook or Instagram). Through this process, seniors not only learn the step-by-step procedures required but also gain a better understanding of the different features and functions of various social media platforms. Importantly, peer interactions in these online social

groups can serve as a powerful motivator and resource for learning whereby seniors can exchange knowledge and learn from each other's experiences rather than from expert-driven instruction. The so-called 'experts' are in the group, and everyone has the potential to be an expert in some way. This learning mechanism may empower seniors to participate more actively in online social networks, which—when grounded in trust, friendship, and reciprocity—can contribute to their sense of social connectedness and belonging. Learning to use digital tools involves not only understanding the functionality of different applications, but also gaining the ability to solve problems and troubleshoot issues that matter to seniors. In this context, seniors develop a set of practical skills that increase their digital competency and confidence through peer-based sharing and learning. This process of learning helps enhance seniors' perceived self-efficacy in navigating the digital world, allowing seniors to gain a great deal of agency and a sense of accomplishment.

Creating digital content

Yet another avenue for seniors to engage practically with digital technology is to create their own content. The act of creation can be empowering, providing seniors with a medium for taking charge of their own learning and growth. Such construction-focused activities cater to the instinct of making—a principle as relevant to seniors as it is to younger learners (Ito et al., 2009). These activities align with the natural human desire to create and achieve, fostering a sense of purpose and satisfaction that can enhance the overall learning experience. Furthermore, an approach focusing on creation places seniors at the center of their learning journeys, allowing them to act on developing their digital literacy potential rather than being passive recipients of knowledge. In this context, we recognize seniors as agentive learners rather than active learners. *Agentive* in this sense implies that seniors as learners can exercise agency as the capacity to act, to create learning relationships, and to embrace the learning pathways that are constantly opening.

Fostering self-expression in digital literacy programs

Digital literacy programs for seniors can be significantly enhanced by including activities that encourage diverse modes of self-expression, allowing seniors to effectively convey their experiences, ideas, and creativity within the digital sphere. These modes of self-expression can range from text-based narratives such as blogging to visual storytelling through photography and videography. For example, incorporating blogging or visually focused blogs into digital literacy programs can serve as an effective medium of expression. Seniors can learn not only the technical aspects of creating a blog but also the nuances of effective writing for an online audience. Blogs or video blogs enable seniors to share their life stories, wisdom, and viewpoints with a broader audience, giving them a multimodal platform for self-expression and self-advocacy. Furthermore, the process of writing can help seniors clarify their thoughts and feelings, contributing to their sense of identity and well-being. Another means for self-expression is the use of digital photos and videos. Teaching seniors how to share digital photography and videography can enable them to capture moments

of personal importance, express their creativity, and share their experiences visually. These tools can provide a creative outlet and help seniors communicate their narratives in a way that words alone may not capture.

Through such different means of expression, seniors' digital literacy programs become more than an educational experience; they are also an endeavor for fostering digital creativity. As community-based programs, they offer a platform for seniors to share their experiences and perspectives, engage creatively with digital technology, and connect with others through interest-driven learning. Focusing on self-expression not only caters to the instinct of expressing and representing, as highlighted by Dewey, but also acknowledges the rich life experiences and unique viewpoints of seniors. This approach recognizes and values the voices of seniors in the digital world by conceptualizing them as digital content creators rather than as consumers.

Harnessing inquiry and intellectual curiosity in seniors' digital literacy programs

Drawing on Dewey's conceptualization of the instinct of inquiry, digital literacy programs for seniors can draw from an inquiry-based pedagogy: that is, focusing on how seniors engage the terrains of their lived experience through digital practice to construct and share knowledge. This approach addresses seniors' natural curiosity and desire for knowledge, making the learning process more engaging and personally meaningful. Online research tasks embody the dynamic nature of technology and provide a valuable opportunity for seniors to apply and continually expand their digital repertoire. Whether they are delving into topics of personal interest, seeking health-related information, or staying updated with current news, seniors can develop a dynamic range of skills in discerning reliable sources, interpreting digital information, and understanding digital copyright and ethical issues. Moreover, effective use of search engines—a core element of their digital skillset—can significantly enhance the quality of their online research. By learning to use advanced search functions and critically assess the relevance and credibility of search results, seniors not only adapt to evolving technologies but also increase their resourcefulness in seeking out reliable information. This dynamic approach to digital literacy fosters seniors' independence and agency in the digital sphere, moving beyond a static notion of being 'good' at something to a more fluid, evolving understanding of digital literacy. Encouraging inquiry empowers seniors to navigate the changing digital landscape and embody their role as active participants in the digital world. Aligning seniors' digital literacy programs with their natural instincts for inquiry and understanding recognizes their potential as lifelong learners and stakeholders in a digital society.

As technology continues to evolve rapidly, it's crucial for seniors to feel confident about learning and adapting to new digital tools. By including opportunities to explore a variety of applications, from productivity tools to creative platforms, digital literacy programs can cultivate a mindset of lifelong learning among seniors. Incorporating inquiry-based activities into digital literacy programs not only enhances seniors' digital skills but also nurtures their intellectual curiosity and journey of discovery. This approach acknowledges seniors' active role in their own learning journey and satisfies their

innate desire to engage with the world around them. Through encouraging questions and exploration, we can ensure that digital literacy programs for seniors are not just instructional but also emergent and dynamic, thereby offering the potential for lifelong learning opportunities.

Conclusion

This study offers insights and strategies into digital literacy for seniors through a Canadian study on immigrant seniors' experiences of navigating digital engagement during the COVID-19 pandemic. The findings underscore the essential role of social interaction in community-based digital literacy programs for seniors. Group activities and community projects leverage seniors' social instincts, facilitating communication through collaborative learning and fostering digital inclusion. Construction-focused activities offer important hands-on digital experiences that build competency and a sense of accomplishment. Programs promoting self-expression, such as blogging and digital photography, contribute to seniors' well-being by acknowledging their rich life experiences and offering platforms for advocacy. Seniors' intellectual curiosity should be harnessed with an inquiry-based approach that encourages critical thinking and independent learning, adaptability to a changing digital environment, and potential for lifelong learning. Effective digital literacy programs not only provide seniors with valuable skills but also promote a sense of purpose, agency, and social connectivity. Including diverse learning modalities and cultural sensitivities, particularly for immigrant seniors, is also crucial as these offer learning opportunities for all seniors, irrespective of background. Further research is also needed for delving into relationships between senior digital literacy and well-being—particularly for vulnerable seniors who have experienced depression and anxiety—and how digital connectedness can improve their overall quality of life. In addition, this study gathered a total of 16 immigrant seniors' stories; however, more funding support is needed to conduct comprehensive understanding of the research topic by collecting a larger sample size.

Creating senior-friendly digital literacy programs demands a comprehensive approach that honors seniors' desire for lifelong learning and acknowledges their potential as agentive learners and digital contributors. This approach situates aging as a relational practice that is socially constructed. A nuanced understanding of seniors' lived experiences coupled with an emphasis on social connectedness, peer-to-peer learning, and intellectual curiosity suggests digital literacy programs are not just about static competency checklists. Instead, they are pedagogical spaces where we can focus on the relational and performative dimensions of digital literacy. This holistic pedagogy also invites us to attend more distinctly to power inequities experienced by seniors, highlighted by deficit self-portrayals in some of the stories in this article. As well, since community programs play a vital role in enhancing senior digital literacy, we anticipate that our study can assist in securing increased funding support for none-profit organizations such as MOSAIC.

Envisioning seniors' digital literacy programs as pedagogical spaces allows us to rethink our perceptions of, and strategies for, offering community service and social support for seniors. More importantly, such an approach enables us to invite more conversation among seniors, educators, community professionals, and the public

into ways of illuminating how seniors who are minoritized or dispossessed can push back against hegemonic discourses.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the Office of Research Ethics at Simon Fraser University, Canada. The participants provided their written consent to participate in this study.

Author contributions

C-CL contributed to the conception and design of the study. NL conducted the literature review. EL contributed to the theoretical framing of this study. All authors contributed to the article and approved the submitted version.

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