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Multilingual teaching and digital tools: the intersections of new media literacies and language learning

Multilingual
teaching

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Abstract

Purpose – Computer-assisted language learning (CALL) can create participatory cultures by removing barriers to access materials, encouraging student modes of expression, differentiating student interactions through digital environments and increasing learner autonomy. Participatory cultures require competencies or new media literacy (NML) skills to be successful in a digital world. However, professional development (PD) often lacks training on CALL and its implementation to develop such skills. The purpose of this study is to describe teachers use of digital tools for multilingual learners through a relevant theoretical perspective.

Design/methodology/approach – This design-based research study examines 30 in-service teachers in South Carolina, a destination state for Latinx immigrants, focusing data over three semesters of PD: interviews and instructional logs. The researchers address the question: How are teachers using digital tools to advance NML for multilingual learners (MLs)?

Findings – The authors analyzed current elementary teachers' use of digital tools for language learning and NML purposes. Three themes are discussed: NMLs and digital literacy boundaries, digital tools for MLs and literacy teaching for MLs and NML skills.

Originality/value – Teacher PD often needs more specificity regarding the intersection of MLs and digital literacy. The authors contribute to the literature on needed elementary teaching practices for MLs, the integration of NML and how these practices may be addressed through PD.

Keywords CALL, New media literacies, Multilingual learners, Professional development

Paper type Research paper

Acknowledging the importance of literacies enhanced by technology, [Leu et al. \(2004\)](#) suggested new literacies must merge with multilingual perspectives as these tools are inherent in literacy and language learning. In the present study, we focus on digital tools, or technology for learning, including various applications, devices, software and digital systems, and their application to multilingual learners (MLs). Research has shown promise for immersing all ages of MLs in digital environments ([Van Laere et al., 2017](#)). Potentially, these tools offer multilingual students the opportunity to use their cultural capital to



advance their learning, even in environments where their home language is undervalued. Computer-assisted language learning (CALL) is the umbrella term used to address using digital tools for language learning (Hubbard, 2021; Stockwell, 2012).

Despite the increase in the capabilities of digital tools and students' growing digital literacy in their nonacademic lives, digital tools are not permeating language classrooms, as teachers rely on text-based materials (Zehler *et al.*, 2019). When teachers apply digital tools in classrooms, this usage is limited to more perfunctory activities such as word processing, emailing or presenting information rather than creating (Howell and Reinking, 2014; Howell *et al.*, 2021; Egbert *et al.*, 2002). This signifies a lack of transition from Web 1.0 or presentation tools to Web 2.0, using tools to produce information (Howell and Reinking, 2014). Furthermore, students need more participatory use of current technology to produce and share knowledge in a collaborative culture (Jenkins, 2006). This study contributes to understanding CALL, its intersections with new media literacies (NMLs) and how professional development (PD) can support ML teachers in encouraging participatory cultures (Jenkins, 2006).

We report on a grant program funded to provide teachers in two school districts with a master's degree in literacy and add-on certificates in English for speakers of other languages (ESOL) and literacy teaching. This study examines teacher cohort data from one district from the initial needs assessment through their second semester in the program. We specifically look at data from interviews and teacher logs regarding their implementation of digital tools. We analyze this data to answer the following research question:

RQ1. How are elementary teachers using digital tools to advance NMLs for MLs?

We answer this question by analyzing current elementary teachers' use of digital tools; then, we discuss each teacher's use of NML in a crosswalk with learning objectives specific to MLs (WIDA, 2014). Finally, we discuss how this use of NML for language learning will impact teachers' future PD.

Perspectives: computer-assisted language learning and new media literacy

We look at intersections between CALL and NMLs to understand needed technology use for MLs and their teachers in a digital culture.

Computer-assisted language learning benefits to multilingual learners and need for teacher development

If educators are to reach MLs with relevant and meaningful engagement in a highly digital world, the use of CALL has increasing importance. CALL has potential benefits from increasing language skills in grammar and linguistics to more holistic benefits of creating interest-based learning environments that improve digital literacy (Egbert *et al.*, 2002). Studies observing the effects of digital tools on language learners have shown such benefits as increased confidence and created content (Guo and Lan, 2023) and vocabulary acquisition (Wong and Neuman, 2021; Wong and Samudra, 2021). In addition to the academic benefits for language learners, White and Gillard (2011) analyzed how digital tools can help remedy the problem of a scarcity of teachers available to teach a growing number of ML students while also providing personalized learning experiences. Jenkins (2006) discussed the systematic integration of digital tools for more personalized, digitally fluent learning through cultivating participatory cultures that encourage creation and engagement with opportunities to share and mentor others.

CALL can create participatory cultures in language education classrooms by breaking down barriers, increasing student modes of expression, differentiating student interactions through digital environments and increasing learner autonomy (Stockwell, 2012). Although

access to digital tools has never been greater in schools, they remain underutilized. Unfortunately, CALL has been less successful than its supporters may have hoped due to a cycle of insufficient teacher preparation caused by a lack of experts available in language teacher preparation. Teachers uncomfortable with digital tools are less likely to use them in their teaching practices (O'Hara *et al.*, 2013). The literature analyzing CALL shows a recognized need for more training in teacher education programs (Hubbard, 2021). NMLs can be combined with CALL to support teachers integrating language learning for a participatory culture.

Situating new media literacies in computer-assisted language learning

NMLs are social competencies needed to participate in a participatory culture (Jenkins, 2006). The NML skills include: *play* or experimenting with problem-solving; *performance*, discovery through alternative identities; *simulation*, interpreting models of the world; *appropriation*, remixing media content; *multitasking*, shifting focus; *distributed cognition* or interacting meaningfully with tools for learning; *collective intelligence*, pooling knowledge; *judgment* or evaluating; *transmedia navigation*, following a story multimodally; *networking* or the process of searching, synthesizing and disseminating information; and *negotiation*, discerning multiple perspectives and following alternative norms. With these 11 skills, MLs can participate in the culture of a newly literate world beyond basic interaction or communication.

According to Chen *et al.* (2011), NML skills move along a spectrum from students consuming to creating information. Lin *et al.* (2013) labeled *consumption* as functional understanding, to the other end of the continuum, *creation* as producing content and participation. While some scholars continue to label these ends of the spectrum as Web 1.0 to Web 2.0 and beyond (Leu and Forzani, 2012), we will use the terms consumption and creation to recognize a shift in only receiving information to both receiving and interacting with content for learning (Lin *et al.*, 2013). NMLs enhance the focus on negotiating meaning with others and various sources across online and offline environments. They are thus a version of CALL for language learners. This study contributes to the limited research applying NML in early (Alper, 2011) and elementary classrooms (Tsortanidou *et al.*, 2021) by analyzing elementary teachers' use of NML skills.

Literature review

The current literature on digital tool use with MLs will be explored through two lenses. We first address the research on how early and elementary (defined as preschool through fifth grade) MLs use digital tools for NML purposes. Additionally, we discuss the findings from studies on PD for teachers regarding digital tools and MLs.

Early and elementary multilingual learners and digital tool use

The use of digital tools by early and elementary MLs has been investigated in several ways, including the use of multimodality – or combining genres such as visual, sound, tactile and others (Chen *et al.*, 2017; New London Group, 1996) – hardware and software, including mobile media devices (Rowe and Miller, 2016). However, few understand how NMLs may be applied to elementary-aged children, and even less research exists in early ML settings (Alper, 2011; Guo and Lan, 2023; Panos, 2017; Tsortanidou *et al.*, 2021). Some NML skills have been explored in early childhood and elementary settings. Alper (2011) focused on play, distributed cognition and transmedia navigation in preschool and discussed the benefits of NML skills to participate and collaborate in deep meaning-making. Similarly, Tsortanidou *et al.* (2021) piloted a mixed-methods grounded theory study with upper elementary participants ($n = 104$). The researchers found that using NML skills as a

pedagogical approach extended beyond just technology applications, useful in the arts, storytelling, pretend play, drama and discussion. Thus, NMLs can be implemented in early and elementary classrooms, providing pedagogical and meaning-making potential, yet research remains limited in this area.

Nascent research exploring CALL for elementary-aged MLs included various contexts and purposes (e.g. Jensen, 2019; Terantino, 2016; Wong and Neuman, 2021; Wong and Samudra, 2021). Jensen (2019) found children were motivated by social and higher cognitive purposes rather than simply exposure to English during personal explorations of CALL. This finding suggests agency and social motives are crucial when applying CALL to other contexts, such as the classroom. Additionally, young children can use CALL independently for vocabulary and comprehension (Terantino, 2016). In media literacy explorations, Wong and colleagues (Wong and Neuman, 2021; Wong and Samudra, 2021) examined how screen-based supports influenced vocabulary development in four- and five-year-old MLs. Both studies found screen-based media impacted vocabulary learning for young MLs. These applications of CALL demonstrate social and literacy learning potential, yet more research is needed into how MLs interact with digital tools, including how they use NML in the classroom setting and how PD can support teachers using CALL.

Professional development for elementary teachers of multilingual learners regarding digital tools

Much of the current literature on digital tool training for teachers focuses on pre-service teacher education (e.g. Blythe Liu *et al.*, 2014; Smeins *et al.*, 2022). However, there is a gap in how in-service elementary teachers use NMLs with MLs and what PD exists to support their ongoing learning as new technologies emerge. Skouge *et al.* (2007) explored how teachers used technology toolkits to enhance literacy learning. The findings demonstrated how PD supported multilingual and multicultural contexts, and that teachers benefit from the balance of cultural wisdom and new technologies (Skouge *et al.*, 2007). Other PD research has found promising results from implementing design-based research to support ML teachers with digital tool use (O'Hara *et al.*, 2013). Both studies emphasized the importance of balancing existing knowledge and school cultures to iteratively enhance the application of digital tools to support ML learning.

In their analysis of how teachers use digital technologies for MLs, Zehler *et al.* (2019) found that teachers use digital learning resources for independent work, generally aimed at all students rather than MLs. Additionally, ML specialists reported fewer hours of PD on digital tools than mainstream teachers. Thus, specific digital tool support for teachers of MLs is a needed area of study. The current study provides further insight into how teachers use digital tools for MLs and their application to NMLs.

Method

This design-based research (DBR) study (Philippakos *et al.*, 2021; Reinking and Bradley, 2008) took place in the USA, in a South Carolina school district and aimed to increase its capacity to support multilingual learning. Researchers of DBR enact a pedagogical intervention to reach a stated goal, study resulting enhancing and inhibiting factors of that intervention and make modifications for progress iteratively. DBR often uses mixed methods of data collection and analysis as was done in this study. The data were analyzed to address the research question: *How are elementary teachers using digital tools to advance NMLs for MLs?* In our findings, we address the related inhibiting and enhancing factors as seen in teacher use of NML and resulting modifications in our subsequent discussion and implications.

Context

Riverside School District (all names are pseudonyms) is the first of two participating districts in the larger DBR study. Riverside is a semi-urban school district with roughly 30,000 students. Riverside is racially diverse, with a student population of 82.16% identifying as non-white. This district is also economically diverse, with over 50% of the population classified as pupils in poverty. Riverside’s linguistic diversity is higher than the state average of 6% at 7.2%. For students whose primary language is not English, the most common home language is Spanish, with Vietnamese, Tagalog, Hindi and Korean noted.

In Riverside School District, 30 teachers were recruited to participate in an online master’s in literacy program emphasizing ESOL). K-12 teachers from this district were selected as this district had high need regarding the population of ML students and vacancy for teachers to teach them. Teachers’ coursework leads to certifications in both literacy and ESOL. Recruited teachers were diverse, with about half identifying as non-white and one-third bilingual. Mimicking the national averages, 90% were female. Their experience teaching MLs ranged from less than one year to 16 or more.

Participants

Of the cohort of 30 participants, 22 were elementary teachers. In an initial needs assessment, the elementary participants described feeling confident using digital tools in their classrooms but found tailoring it to MLs challenging. The elementary teacher participants who reported using digital tools for MLs in the second-semester instructional logs were invited to participate in interviews– see Table 1. Five focal participants agreed to be interviewed who taught at four schools from pre-kindergarten to fifth grade.

Data collection and analysis

We used qualitative and quantitative data from instructional logs and qualitative interviews regarding teacher implementation of digital tools. The instructional log captured teachers’ instructional patterns, specifically their teaching of MLs. They were asked if digital tools were used for MLs throughout the day and to describe the digital tools used. Twenty teachers participated with teacher logs in the fall semester, and six elementary teachers responded that they used technology in teaching or learning with MLs. These quantitative responses on the logs of how many teachers used digital tools with MLs and the percentage of elementary teachers included in this use led us to our qualitative analysis. We conducted follow-up

Focal teacher pseudonym	Grade(s)	Years teaching MLs	% of MLs (first semester)	Self-identified as ML?	Race	Age
Alice	Pre-K	7	21	Yes	Black or African American	18–30
Judy	Kindergarten	8	50	Yes	Black or African American	46–60
Laura	K5-5th, Spanish language teacher	8	6	Yes	Hispanic or Latino	46–60
Lisa	Kindergarten	5	6	No	White or Caucasian	46–60
Rose	5th grade	3	2	No	Black or African American	31–45

Table 1.
Focal teacher demographics

Source: Authors’ own work

interviews with five teachers who agreed to share more about their use of digital tools for MLs. We used concurrent analysis, where quantitative and qualitative were analyzed separately and then considered in light of one another to corroborate findings (Creswell and Clark, 2017).

For this study, we center analysis from semi-structured interviews about technology use with MLs. These interviews included follow-up questions regarding the initial teacher log responses to elicit descriptions of how the tools were used, additional information about general technology use and advice for other teachers of MLs was prompted.

During the initial coding phase, we conducted line-by-line coding and used gerunds to preserve the actions of the participants (Charmaz, 2014). Two authors coded the data independently to allow initial codes to emerge, and then to check reliability; we met to compare initial codes and reached 100% agreement. In moving from initial to focused codes, we organized them by their themes and significance into emerging focused codes.

To analyze data, research has effectively used emergent and *a priori* coding (Howell *et al.*, 2021; Fereday and Cochrane, 2006). Although the focused codes emerged from the data, we wanted to capture the use of NML skills and their intersection with language-learning core areas described in the WIDA [1] Tech Tools Evaluation rubric (2014): content, context, language and communication and the individual child. Each focused code was compared with *a priori* coding through the creation of the crosswalk (see Table 2 in supplementary files). The iterative process of comparing the focused codes with *a priori* codes was essential in forming the theoretical assertions. The focused and *a priori* coding were compared and oriented to theoretical perspectives to form theoretical codes (see Table 1 in supplementary files).

As Charmaz (2014) described the analytic process of moving from initial to focused to theoretical coding was an emergent, thematic continual process of abstraction, the main strategy of our qualitative analysis. The authors met weekly to discuss coding using constant comparison analysis (Glaser, 1965).

Findings

Three broad themes emerged: NMLs and digital literacy boundaries, digital tools for MLs and literacy teaching for MLs and NML skills. We discuss the initial codes and *a priori* coding through a crosswalk of the NML skills for each theme. The crosswalk (see supplementary Table 2) was collaboratively constructed by two authors who reviewed specific examples given by teachers of digital tool use for MLs; these examples were placed in corresponding cells of NML skills used and language learning purposes.

New media literacies and digital literacy boundaries

Although Jenkins (2006) did not define digital literacy as an NML, all teachers in this study identified digital literacy as a needed skill to participate. Moreover, all teachers identified digital literacy skills needed to access digital tools. Digital literacy was defined by teachers in several ways. When asked about the digital skills needed for her students to complete digital task cards, Rose, a fifth-grade teacher with over 20 years of experience, lamented, “I would hate to say it, but low-level digital skills, just navigating the keyboard and selecting the answers.” Early childhood teachers Alice, Lisa and Judy discussed practicing keyboard skills for students to log on to Chromebook computers. Digital literacy was defined as a boundary for accessing digital tools for all children, not just MLs.

Understanding the capacities of digital tools

Across interviews, the focused code of understanding the capacities of digital tools emerged. Digital tools are technological applications, devices, software and digital systems (Howell and Reinking, 2014). Overall, teachers had a broad knowledge of many tools

available; collectively, they mentioned 20 different applications and sought new resources for general classroom use. For example, Judy, a kindergarten teacher with one year of teaching experience, said she found resources by “a lot of research, and I ask other seasoned teachers.” Alice, with seven years of experience teaching MLs, answered similarly, saying she used Google and spoke to her peers. Four of the five teachers discussed resources provided and required by the district. Lisa, a seasoned kindergarten teacher, mentioned that her school purchased research-based resources and defined them as increasing difficulty throughout the year. Lisa said, “They’re supposed to increase student reading and math levels by the end of the year if you use them so many minutes with your students a week.” Increasing the challenge levels was common throughout many of the digital tools discussed.

New media literacy skills used in practice

Related to understanding the capacities of digital tools is how the crosswalk demonstrated which NML skills are being used in elementary classrooms. Play and transmedia navigation were the most frequently observed NML skills, with three or more instances each (see Table 2 in supplementary files). Teachers understand that tools can be used to *play* with content in various contexts and for communication and language goals. They use various platforms to encourage *transmedia navigation* through multimodal inputs and outputs. *Simulations* of increasing levels and using digital tools for accuracy (i.e. spell check) supported real-world technology use. *Collective intelligence* was observed in partnerships completing digital task cards and Google Classroom as a home resource hub. Teachers used Reading A-Z, a leveled library application and website with multiple features, to enact *distributed cognition* across listening, reading, recording and comprehension exercises. Digital tools support *multitasking*, such as using apps for various purposes. Finally, a teacher used Google Docs to encourage students to *judge* their writing’s spelling and conventions. The crosswalk revealed that digital tools used were primarily for experimentation, problem-solving and multimodality. Some NML skills were not observed at all: performance, appropriation, networking and negotiation.

Digital tools for multilingual learners

The second theme of using digital tools for and with MLs emerged. We discuss the applications of digital tools for ML-specific uses and how language learning purposes were addressed through a crosswalk with NMLs.

Exploring the applications of digital tools for multilingual learners

Focal teacher experience with MLs averaged just over six years. They easily described the potential language learning benefits of using digital tools, such as providing visuals for students, group work opportunities and tools’ multimodal capabilities. The focused code exploring applications of digital tools for MLs emerged from initial codes, including ML-specific applications of digital tools. For example, Lisa described how digital tools engaged students: “It gives the students a different way to learn because I think sometimes they get tired of hearing us talk.” Alice, Judy, Laura and Rose shared similar sentiments, commenting upon the fun and excitement the students experienced with digital tools. In a question about language-learning purposes, exposure via hearing the English language was the depth of participant responses. For example, Laura was asked several questions about what digital skills and language skills MLs students would need to access a website, and the answer to all questions was “English.”

Teachers were not clear how these resources specifically benefited MLs, except increasing the challenge level of content over time or being able to switch the program to the Spanish language. Lisa found programs offered in Spanish helpful to assess her students’

knowledge: “So that’s really helpful to kind of get a better idea of what your student knows, because sometimes if it’s said in Spanish, then they might do better on it than if it’s said in English.” Laura, a language teacher, and Rose answered similarly about translating to gain insight into content knowledge. The ability to translate was seen as a key feature of digital tools to benefit MLs.

New media literacy skills used for language learning

Through the crosswalk, language learning purposes explored included content, context, communication, language and the individual child (WIDA, 2014). Communication and language, or the explicit elicitation of English acquisition, was the most frequent purpose observed. All five focal teachers explored the junction of digital tools for acquiring language. An example of such use is the multimodality of digital tools in Laura and Rose’s descriptions of video and audio recordings teachers and students completed to enhance language and communication. Content, or the information related to specific learning objectives, was the second most frequently observed language learning purpose. Lisa, Judy and Rose used various digital tools to teach academic content. Context, or the setting in which the tool was described, was excluded except for Judy’s interview, in which she mentioned students collaborating and using Google Classroom to provide home resources. Individual ML children were rarely mentioned throughout the interviews, except for an anecdote by Alice describing one kindergartener’s choices during free choice time. Digital tools for language learning were primarily used for communication and language learning purposes with less focus on the individual child.

Literacy teaching for multilingual learners and new media literacy skills

Experience and comfortability with various capabilities of digital tools influenced how often and the extent to which NML skills were used. First, we discuss how digital tools were used to support language and literacy learning, with teachers’ understanding of home languages as vital bridges to literacy in English. Then, we discuss how teacher comfortability impacted their use of more creative and collaborative NML skills.

Bridging language and literacy learning through funds of knowledge

The code, second language (L2) phonics and phonemic awareness was frequently referenced. Teachers noted students needed to know the letters and sounds of English. Not surprisingly, kindergarten teachers Alice, Lisa and Judy described alphabetic learning time as a focus for using digital tools such as websites that repeated letters and sounds and whole group activities around interactive whiteboards identifying letters by their names and sounds. Judy described how the tool SplashLearn progressed in teaching phonics: “I start with letter recognition, and once the students have incorporated letter recognition, it goes into sounds, and then eventually, it moves up, but it challenges the student.”

Teachers of other grades also used digital tools to aid phonics instruction. Rose, a fifth-grade teacher, used Google Docs to help her students match letter and sound correspondences in spelling. Laura, who taught multiple grade levels, used a dual language website Rockalingua and spent 10 min each day reviewing the sounds of letters in English and Spanish. Other target literacy and language codes included conventions, comprehension and social/communication learning. Judy described a helpful website for more exposure to English, “I do ABCya!, and that’s because they have an extension of games, and it reads books to them, and they can do the alphabet and the sight words, but it’s in English. That supports their communication.” Reading and writing skills were presented using digital tools, and exposure to English via these tools explored.

Teachers referenced home languages and funds of knowledge as vital bridges to language learning. Impressively, Judy taught in English and Spanish throughout the school day, “so I read a book, and then I stop, and then I translated for my student.” Another teacher, Rose, thought aloud about the importance of background knowledge for comprehension: “After you read it, you definitely have to comprehend what you read and apply either background knowledge or the knowledge that I would have just taught them to the task at hand.” Overall, teachers were comfortable implementing digital tools for literacy exposure and found home languages valuable in bridging language students’ funds of knowledge through their repertoires and prior experiences.

Areas of comfort and areas for growth

Teacher comfortability with the consumption applications of NMLs appeared to impact the frequency of their engagement, and independent use of digital tools was common. Focal teachers used the word “communication” 24 times over five interviews, demonstrating their understanding of the social needs of students’ language development. However, collaborative aspects of NML skills with digital tools were underutilized. Rose mentioned students working in partnerships to compare multiple-choice answers on content-related digital task cards: “They can work with a partner to talk their way through any questions they may have.” This is an example of using digital tools to answer a question rather than create a unique response. Simulation, collective intelligence, distributed cognition, multitasking and judgment were sometimes observed. These skills, possibly encroaching on teachers’ comfort zones, were primarily used for the consumption and pooling of materials rather than for creation, such as Judy’s use of Google Classroom to provide families with home learning resources. The highly collaborative skills – performance, appropriation, networking and negotiation – require taking on various perspectives from multiple sources and creating content. The NML skills teachers used show promise in engaging MLs in literacy and content learning and demonstrate a need for further PD on using digital tools for collaborative student-driven creations within and beyond the classroom.

Discussion and implications

We discuss the theoretical codes as they apply to a matrix (see [Figure 1](#)) and focus on engagement with digital tools from consumption to creation and individual to social applications of digital tools for language learning purposes. We discuss the needed applications of digital tools for participatory cultures, the modifications made in this study to further teacher development and study limitations.

Purpose and engagement with digital tools

NML skills can be used from consumption to creation along a spectrum ([Lin et al., 2013](#)). Focal teachers primarily used NML skills for the consumption of information rather than creation (see [Figure 1](#)). Teachers noted overall digital literacy as a barrier to using digital tools. Thus, a dotted line around the matrix demonstrates a boundary to overcome with digital literacy. The frequently observed play and transmedia navigation skills were used for experimentation, multimodality and problem-solving purposes or at the consumption end of the spectrum. The NML simulation skill was observed sparingly. Judy, Rose and Laura mentioned using tools to simulate real-life applications. Laura explored using digital literacy to provide multimodal responses to social studies content questions (i.e. paste a picture of a covered wagon). An example of expanding this activity to fall on the creative side of the spectrum would have students create multimodal texts to teach about various content objectives (i.e. westward expansion). Extending digital tools to compose multimodal

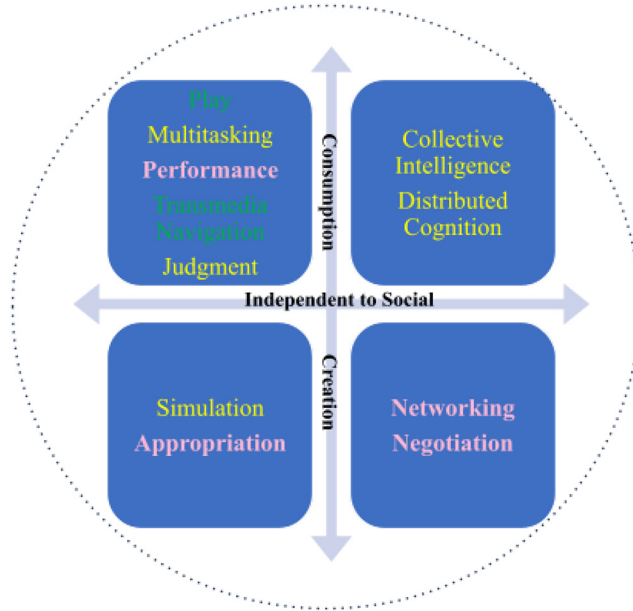


Figure 1.
Matrix of NML skill
use

Notes: Pink equals not used; yellow equals used occasionally; green equals used frequently
Source: Authors' own work

texts is a practice explored in research (Chen *et al.*, 2017) and has potential to harness student's cultural capital.

Independent to social use of digital tools for multilingual learners

Our findings echoed those of Zehler *et al.* (2019) as digital tools were mainly used for independent work rather than collaboratively. Teachers recognized the importance of communication for language learning, yet collaborative learning was underutilized. A key feature of digital tools was the ability to translate information into students' home language. The abilities of digital tools to translate and thus enable conversation across languages were unacknowledged (Groves and Mundt, 2015). For example, using the conversation and lens features on Google Translate allows students to extend their home language into more socially interactive conversations. Furthermore, digital tools enable students to interact in real time with other students worldwide, even when few diverse students are in their respective classrooms (Panos, 2017).

Needed applications of digital tools for participatory cultures

If PD is to encourage teachers to use CALL and develop the skills necessary for a participatory culture, it must provide support in the vast opportunities for creation and collaboration. PD courses that use NMLs in CALL settings must be systematically and intentionally developed through an iterative process such as DBR. As O'Hara *et al.* (2013) noted, teachers need expert-led instruction, opportunities to practice new learning and ongoing support in teaching MLs with digital tools. Focal teachers in this study provided

valuable insight into their knowledge of using digital tools for ML-specific purposes. As a modification to our learnings of their digital tool use, teachers' expertise was showcased in an interactive slide deck provided to other cohort members to support future development of NML skills, and we provided recommendations for digital tool use with MLs in an online PD module. We plan to further investigate the resulting impact of these modifications and apply key learnings to the second iteration school district. The impact of these modifications remains a limitation and an opportunity for further research.

Note

1. WIDA stands for World-class Instructional Design and Assessment, a consortium of 41 states in the USA follow WIDA can-do descriptors and assessment protocols with MLs.

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Further reading

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Supplementary material

The supplementary material for this article can be found online.

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