BEYOND THE ORDINARY: DESIGNING A MOBILE-ASSISTED FUNDS-OF-KNOWLEDGE-FEATURED INSTRUCTIONAL FRAMEWORK FOR ENGLISH LEARNERS

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The design and implementation of hybrid, technology-enhanced learning environments is a sophisticated process, especially when incorporating relevant sociocultural factors to support culturally and linguistically diverse students' learning. In this paper, I review and provide a description of an iterative design process for a mobile-assisted funds-of-knowledge (FoK)-featured instructional framework that aims to facilitate middle-school aged Latinx English Learners' (ELs) literacy development in writing. The sociocultural lens of FoK considers ELs' ordinary experiences as assets in creating inclusivity and engaging flow in learning, which are further enhanced by affordances of mobile-based writing applications. More specifically, this design process was achieved through fieldwork situated in a Latinx community and school district in a rural town in the Midwestern United States. The design process was contextualized into four stages: the *precedent* stage focusing on the formation of the design idea, the *framing* stage focusing on the preliminary design outline, the *co-evolution* stage focusing on the development of the designed product, and the *prototype* stage focusing on experimenting with the designed product through the ELs' classroom writing practice. This instructional framework emphasizes the transformation of diverse ELs' ordinary experiences by guiding them through five sequential learning steps: *discovering*, *connecting*, *writing*, *sharing*, and *preserving* culture. Formative and summative evaluation techniques were embedded through different research phases, such as a preliminary instrumental case study, an ethnographic case study, and the ELs' classroom writing practice. This design case provides an example of socioculturally contextualizing the application of emerging technology to mediate learning for diverse student populations.

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INTRODUCTION

This article presents a design case of a mobile-assisted funds-of-knowledge (FoK)-featured instructional framework as the final product artifact derived from my dissertation research with middle school-aged Latinx English Learners (ELs). This instructional framework highlighted the use of emerging mobile technology to facilitate Latinx ELs in developing their writing skills from a FoK approach. More specifically, this iterative design process and the formative evaluation strategies corresponding to each phase are presented: the *precedent* stage of forming the initial idea through my coursework, the *framing* stage of creating a preliminary design outline through an instrumental case study, the *co-evolution* stage of developing a design product through an ethnographic case study, and the *prototyping* stage of implementing the design product through a non-experimental study in an ESL classroom. A summative evaluation was performed through a questionnaire and individual interviews to examine the EL teachers' and the ELs' perceptions of this instructional framework.

This design case was first envisioned and initiated throughout my dissertation research experience at Northern Illinois University. After completing my doctoral program, I took a postdoctoral fellow position at the University of New Mexico under the mentorship of Dr. Vanessa Svihla. This manuscript was completed through a doctoral-level course on Advanced Instructional Design that I co-taught with her.

CONTEXT

The enrollment of culturally and linguistically diverse ELs is rapidly increasing with the development of globalized social economy and culture. ELs in the K-12 educational system in the United States speak more than 400 languages and yield a highly heterogeneous student population with diverse gifts, educational backgrounds, and learning needs. Among them, the underrepresented EL youth from low-income Latinx families have been reported to have low academic growth, high dropout rates, and low college graduation rates (Ball, 2009; Janzen, 2008). Previous research has demonstrated that one of the significant contributing factors for the underachievement of ELs was the disconnection from the students' race, ethnicity, and cultural background (Ball, 2009; Orosco & Klingner, 2010). To engage Latinx ELs in classroom learning, it is important for teachers to build empathy toward the students' language difficulties and cultural variances as well as adapt the curriculum and instruction to the students' language and cultural disparities (Cummins, 1997).

By definition, ELs refers to students "who are in the process of acquiring English and whose native language is not English or who come from a background where a language other than English is spoken" (O'Malley & Pierce, 1996, p. 238). Most ELs struggle with their writing development in English more than they struggle with the other macro skills (i.e., listening, speaking, & reading) because of their language and cultural barriers, lack of motivation, and inadequate writing skills (Samway, 2006). To overcome these challenges for ELs' writing development, teachers have explored the use of digital technology to enrich their pedagogy. In addition, FoK is considered an inclusive pedagogical approach because it affirms students' sociocultural influences to engage them in writing in the classroom (Newman, 2012).

This design case was concerned with middle-school aged Latinx ELs from families who had immigrated to the United States. To enhance the engagement for learning, both the EL teacher and ELs' parents connectivity (Chen, Carger, & Smith, 2017; Chen, Mayall, York, & Smith, 2019; Lan, Sung, & Chang, 2007). However, the teachers face the challenges of how to integrate emerging technological applications into their classroom instruction to facilitate students' learning as well as the utilization of a FoK approach. perceived the value of incorporating emerging mobile technology in and beyond the classroom because of its accessibility, portability, social interactivity, and Therefore, in order to mitigate these challenges that occur in the ESL classroom, I invited the collaborating EL teacher to be present as a teacher-researcher to research the students' FoK sources and develop a relationship of trust among the ELs' families, the teachers, the students, and myself as an educational researcher. I then co-designed a FoK-featured instructional framework with the EL teacher by employing mobile applications to engage Latinx ELs in narrating multimodally about the ordinary

experiences that happened in their households and in their culturally-related communities (Chen, 2020; Chen, et al., 2017; Liopart & Esteban-Guitart, 2018).

DESIGNED PRODUCT

The final product of this design case was a mobile-assisted FoK-featured instructional framework for developing middle school-aged Latinx ELs' writing skills in the context of second language acquisition. From the perspective of teaching pedagogy, this framework aims not only to create a learning flow embedding sociocultural factors into instructional or curricular design but also to engage the ELs in the learning process with greater emotional involvement and investment. In particular, I aimed to achieve three distinct objectives for helping the ELs overcome the challenges that occurred in their writing processes.

First, to help the ELs generate their writing ideas, they were encouraged to narrate their family's immigration history (e.g., their parents' childhood stories and immigration experiences), to recall their family's travel experiences (e.g., from the United States to Mexico or Cuba), to describe their intercultural communication experiences (e.g., the ELs' English-Spanish translation experiences in communities), and to share their technology-use experiences with their family members or friends (e.g., teaching parents how to use mobile apps or playing online video games with their cousins in Cuba, El Salvador, Honduras and Mexico).

Second, to enhance the ELs' writing motivation in English, they were encouraged to use mobile technology provided to them from the school districts (e.g., Google Chromebook) or brought from home (e.g., tablet or *i*Pod). The ELs were encouraged to use mobile-based writing tools (MBWTs) (e.g., Google Docs within Chromebook or a notebook) allowing them to complete their writing at any time, anywhere. The ELs were encouraged to use the built-in cameras in their mobile devices to take pictures from home or take video/audio clips from community activities that they could embed in their story writing to help them furnish more details. The ELs were encouraged to communicate with their teachers, parents, and peers through instant messaging and email or by providing peer feedback using comment functions.

Third, to transform the students' ordinary experience and create flow in learning, the ELs were encouraged to break out of their silent stage and complete each of the writing tasks through a five-step procedure: *discovering* the main sources of their stories through interaction with their families, *connecting* these ideas to classroom writing practice, *writing* their stories using mobile apps, *sharing* their stories with the EL teachers and peers through mobile apps, and *preserving* their culture by saving and revisiting their writing artifacts in their mobile applications.
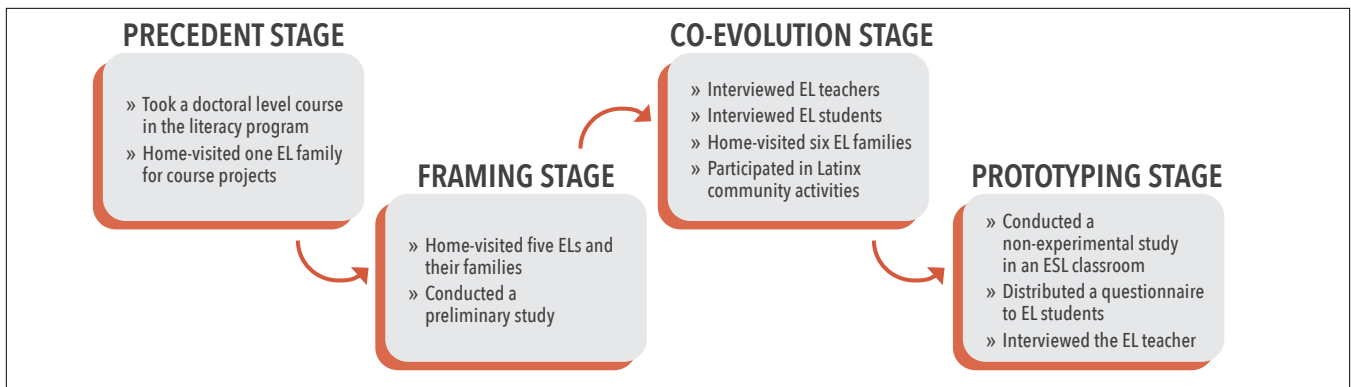
FIGURE 1. Flow chart of the design process.

DESIGN PROCESS

This design case was developed through four stages: precedent stage, framing stage, co-evolution stage, and prototyping stage (see Figure 1).

Precedent Stage: Forming an Initial Design Idea through Coursework

The original idea of this design case was initiated during the second year of my doctoral program. Before I started the doctoral program in instructional technology, literature was my life. I am interested in research related to technology-integration in language and literacy education. Therefore, I enrolled in a course on reading and bilingual literacy in the university's literacy education program and sought more ideas for developing my research agenda. This course was taught by Chris Liska Carger, whose research interests focused on the development of literacy for culturally and linguistically diverse ELs. Carger is the author of *Borders and Dreams: A Mexican-American Experience of Urban Education* and *Dreams Deferred: Dropping Out and Struggling Forward*.

During the class, we used a book entitled *The Circuit: Stories from the Life of a Migrant Child* (Jiménez, 1997) as reading material. *The Circuit* is based on the autobiographical short stories of Francisco Jiménez, a Mexican-American writer and professor emeritus at Santa Clara University. It tells the story of a young Mexican immigrant child named Panchito and his struggles to pursue his childhood dream in the United States. To complete the coursework, we were asked to summarize Panchito's FoK and to home-visit at least one EL to explore his/her FoK in his/her household/community that related to his/her language learning and literacy education.

While reading *The Circuit*, I was deeply touched by Panchito's experiences. Like many of the migrant children in the last century, Panchito's life story was full of clouds and rain. He worked hard both inside and outside of school and dreamed of becoming a beautiful butterfly like a caterpillar does. However, Panchito had to go to school off and on to help his parents support the family. To catch up with school, he

kept his beloved notepad in his pocket for learning new words, spellings, definitions, grammar rules, and math, even when he was working on the farm. However, life was cruel sometimes. An accidental fire burned his notepad. Although he was later able to get a new notepad, his memories of the burned one brought sadness and tears. At this moment, I wondered what kind of experience Panchito would have had if he owned an *i*Pad in the 1960s? What kinds of experiences might be occurring nowadays for digital ELs who have access to personal mobile devices? How might these ELs' home-based technology experiences be connected with their school learning? These questions inspired me to form this initial idea about incorporating mobile technology into ELs' literacy development.

To complete the coursework, I home-visited Larry (pseudonym), a seventh grade EL from a Mexican-American family in my neighborhood. Larry often mowed yards in the neighborhood to earn some money during the summertime. His father worked in construction and his mother was a housewife. Larry's family could not afford the internet at home. However, his parents bought a laptop, mobile phones, and *i*Pods for Larry and his sisters. After the home-visit, I designed a reading lesson plan for Larry based on the explored FoK sources as the final course project (Chen et al., 2017).

These precedent stage experiences derived from reading *The Circuit* and from the FoK-themed home-visits with Larry motivated me to reflect on the relevant connections between Latinx ELs' ordinary experiences at home and in their communities and their formal classroom experiences dominated by the mainstream culture at school (see Figure 2).

To think in a designerly fashion, these discovered specific details and vivid lived experiences of Larry were continually *retrieved* and *applied* in my mind, and they motivated me to form a rigorous design case (Boling, 2010). However, the initial design idea of this instructional framework was full of ambiguity, no matter if it came from the obtained information, the sociocultural variables in the ELs' home
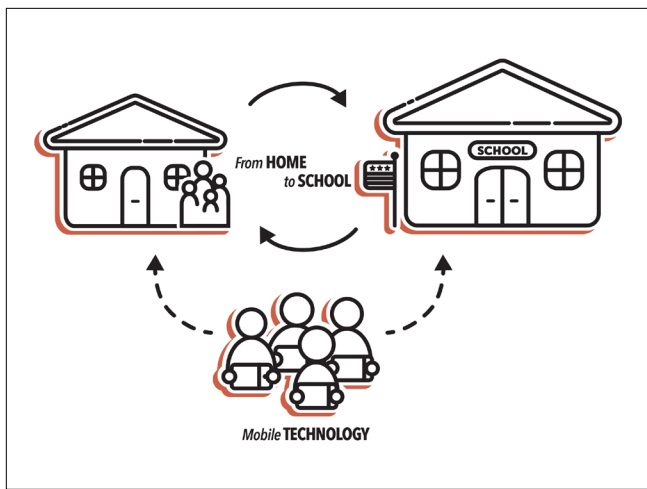
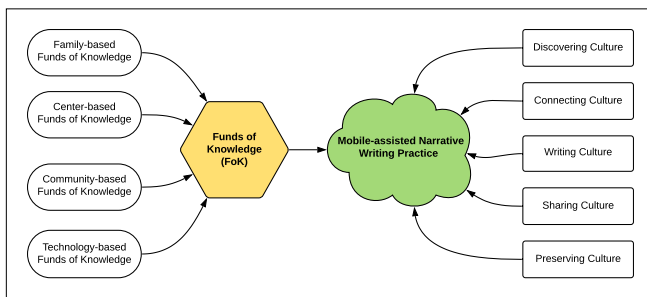**FIGURE 2.** A sketch of the connections between school and home.

FIGURE 3. Preliminary outline of the mobile-assisted funds-of-knowledge-featured writing instructional framework.

environment, or the complex relationships within immigrant families (Gaver, Beaver, & Benford, 2003).

Framing Stage: Creating a Preliminary Design Outline through an Instrumental Case Study

Ambiguity is often considered a "problem," but it also indicates valuable opportunities to solve this "problem." At the beginning, it was unclear to me how to link the ELs' FoK to their mobile learning, especially regarding choosing the appropriate *information* on how to use mobile technology, situating specific learning *context*s, and building positive learning *relationships* around varied sociocultural constructs (Gaver et al., 2003). Therefore, during my ongoing dissertation proposal writing process, I started to practice research proposal writing and hoped to seek feedback from external reviewers. Fortunately, this initial research idea received the Spring Research Grant from the Golden Key International Honour Society. This sponsorship encouraged me to continue working with more informants to frame this design initiative from a broader perspective.

During this period, I recruited five ELs (aged 9-13) from four immigrant families: three ELs who were from two Mexican-American families (including Larry, who visited during the *precedent* stage), one EL who was from a Chinese-American

family, and one EL who was from a one-year visiting Chinese family and recently enrolled in the same ESL program in the local school district in the Midwest. To get a clearer picture of each EL's household experience, I home-visited each of the four families multiple times. Then, I generated culturally embedded writing topics and worked with each EL individually to complete their story writing using their tablets and a free digital writing app, *Penultimate*. For example, the EL from a Chinese cultural background, Liliana, travelled a lot. I encouraged her to describe her travel experiences in China. The EL from a Mexican-American cultural background, Larry, spent his summers working part-time jobs in the neighborhood to mow yards and collect trash. Even though Larry was not interested in writing, he was excited to use an *i*Pad and *Penultimate* to write about his experience and draw a few pictures for this project. At the end of this study, I placed these resources into four FoK categories: family-based, center-based, community-based, and technology-based (Chen et al., 2017; Hedges, H., Cullen, J. & Jordan, B., 2011). I created a preliminary writing instructional framework with a sequential five-step writing procedure for ELs to complete their writing tasks through discovering, connecting, writing, sharing, and preserving culture (see Figure 3, Chen et al., 2017).

However, the *framing* stage of the preliminary design outline revealed greater ambiguity and uncertainty that required me to reconsider this design problem, to reflect on the design contexts, and to deconstruct the complex working tasks by developing a set of more meaningful and possible solutions (Paton & Dorst, 2011; Schön, 1984). For example, the digital ELs had different but varied FoK resources in their households compared with Panchito in *The Circuit*, particularly the emerging technology-based FoK sources. Additionally, the different families' immigrant histories and cultural backgrounds (e.g., Asian-American and Mexican-American) influenced the discrepancy in their children's school learning, educational expectations, digital skills, and individual perspectives towards technology adoption (Chen et al., 2017).

To seek solutions to these emerging ambiguities in this design process and to avoid potential design failures such as the suitability of specific FoK sources for ELs from different cultures, I extended my research horizon and home-visited six immigrant families from Cambodia, China, Japan, and Mexico, focusing particularly on the technology-based FoK categories. Distinct digital divides were found (Chen et al., 2019). These research practices and fieldwork experiences also led to the next *co-evolution* stage of this design case.

Co-evolution Stage: Developing a Design Product through an Ethnographic Case Study

The concept of *co-evolution* generated from Maher and Poon's (1996) problem-design exploration model

metaphorized the iterative interactions and connections between *problem space* and *design space* across time spectrums. I applied this model to the third phase of the present design case. More specifically, the ambiguity and uncertainty that evolved during the *precedent* and *framing* design stages led to solutions for the design problems of this mobile-assisted FoK-featured instructional framework. In addition, the prototype of this instructional framework helped me refocus the design problem over time.

During this period, I received a Doctoral Dissertation Research Grant sponsored by the International Research Foundation for English Education, emphasizing the research priorities of Digital Technology in Language Education. This grant enabled me to enter the local middle school district and collaborate with the ESL program. As such, I was able not only to integrate the *problem space* dimensions with larger culture-specific Latinx EL populations' households and communities but also to expand the *design/solution space* from the EL teachers' and the EL parents' perspectives.

According to the demographic data of the research year, the middle school enrollment was 510, which was 24.6% of the total enrollment of the school district (Illinois Interactive Report Card, 2017). The students' race/ethnicity was 50.0% White, 42.9% Hispanic, 1.8% Black, 1.0% Asian, 0.8% American Indian, and 3.5% two or more races. Among them, 12.4% of the students were ELs and were eligible for bilingual education, and 50.8% were from low-income families. During the course of the research period, the school district provided Google Chromebooks to each student above third grade as an integral part of the students' education to support their learning.

My research request was accepted by the school principal, the EL teacher, and her teaching assistant. The EL teacher was a Caucasian female in her early 30s. She had an undergraduate degree in Spanish Translation, a Master's in Spanish Language and ESL, and a Master of Arts in Teaching. She had been teaching ELs in the school district for over ten years. The teaching assistant, who was in her late 20s, was part of a Mexican-American family in town. She held the state paraprofessional certificate and had worked in the ESL program for two years.

While interacting with the EL teacher and her teaching assistant, I learned that the majority of ELs in this middle school grew up in the Latinx communities nearby or just recently immigrated from Mexico or Cuba with their families. To familiarize myself with this EL group, I interviewed the EL teacher and her teaching assistant. I spent time with a retired EL teacher from the school district to learn more about the students' daily lives. Through this process, I gained more information about the ELs' family histories, school experiences, special needs in language learning, and learning preferences. I got to know certain characteristics of

the Latinx communities, such as their religious beliefs and holiday celebrations. The teachers also mentioned that some ELs preferred to be alone or stay with their small groups and refused to participate in activities outside the classroom because of the language barriers.

In addition, to enable the ELs and their families to get to know more about me, the EL teacher suggested that I go to her classroom every week to assist her with classroom teaching or classroom project management and share my cultural experiences with the group. Based on these preparations, I soon received permission to visit the ELs' families. Within three months, I home-visited six Latinx families (11 parents in total, aged 31-45) to explore the Latinx ELs' FoK sources. Seven ELs (aged 12-15) from the families were present during the home-visits. The EL teacher participated in the home-visits as a Spanish-English translator and teacher-researcher. Besides home-visits during this three-month intensive research experience, I had the opportunity to get involved with the EL families' and communities' activities. I kept record of salient representations of cultural artifacts through photography, such as the ELs' living conditions, reading materials at home, souvenirs brought from Mexico, children's birthday parties, communion ceremonies in the church, holiday celebrations such as *Cinco De Mayo*, and young couples' weddings (see Figure 4). These artifacts are special to me because they are not only expressions of the ELs' ordinary lived experiences and cultural practices, but they also embody these practices and express the unique feeling and spirit of their culture.

To connect the explored FoK sources with classroom learning, I worked with the EL teacher in a *study group* and further refined the preliminary instructional framework that I had developed through the *framing* stage (Lipoart & Estevab-Guitart, 2018). Frequently, the EL teacher and I brainstormed and discussed different types of FoK sources before and after each home-visit and community activity. These conversations led me to further define the concept of family-based FoK as resources in the natural living environment of the ELs, which were categorized into three domains: family history, parents' backgrounds, and skills learned from the family. Center-based FoK was defined as the literacy resources and language-learning-centered resources at the ELs' homes, which mainly included family reading time, literacy resources, and language learning experiences. Community-based FoK was defined as the activities or interactions that ELs participate in within their cultural community, especially in the presence of their parents. Technology-based FoK was defined as the specific activities or interactions related to the use of technology, in which the ELs participated with their parents or other family members at home, in the community, or in school (Chen et al., 2017).

This detailed information was embedded into the preliminary outline of the mobile-assisted FoK-featured writing

FIGURE 4. Photo taken at a young couple's wedding.

instructional framework. First, these identified FoK sources served as a treasure trove of more writing possibilities in different genres (e.g., narrative, expository, and argumentative) (Newman, 2012). Second, the technology-based FoK that were explored provided a solution for incorporating technology that the students were familiar with for learning both at home and school. Third, the parents' perceptions and involvement in their children's mobile-assisted language learning with the explored FoK domains provided the possibility to establish an intercultural communication relationship among the ELs, the EL teachers, and the ELs' family members and friends from the community.

To apply this instructional framework in writing practice, the ELs were scaffolded through five sequential steps of *discovering*, *connecting*, *writing*, *sharing*, and *preserving* cultures with the use of MBWTs. For example, the ELs were encouraged to explore and develop detailed writing ideas by interacting with family and community members and taking photos to enrich their story writing. The ELs were encouraged to share their stories with their teacher, peers, and family members

through MBWTs. The documenting function provided by MBWTs helped preserve these cultural artifacts that were created by the ELs (see Figure 5; Chen et al, 2017; Chen, 2020).

To provide a detailed lesson plan for implementing this instructional framework, the EL teacher and I aligned the writing practice with the Common Core State Standards of English Language Arts in narrative writing for grades six to eight (CCSSI, 2017) and the International Standards for Technology in Education for Students (ISTE, 2017). For each lesson plan, we specified instructional goals, learning objectives, technology integration, technical considerations, and delivery of class activities. See Table 1 for a sample description of a sixth-grade lesson plan.

This developed instructional framework could be viewed as the outcome of the *co-evolution* of the *problem space* and *design space* dimensions in this design case. It presented both a generalization of sociocultural factors derived from ELs' home environments and the basic components for completing a writing task. It also provided a prototype that could be implemented in ELs' classroom writing practice.

Prototyping Stage: Experimenting of a Design Product through a Non-experimental Study in an ESL Classroom

During this period, I received a Graduate Student Mentored Proposal or Pilot Grant (2017–2018) from the Center for the Interdisciplinary Study of Language and Literacy at Northern Illinois University. This grant enabled me to implement this designed mobile-assisted narrative writing instructional framework into an ESL classroom in a nearby middle school district in a rural Midwestern town. In particular, the purpose of this prototyping stage was to examine the learning effects of FoK-featured writing topics compared against non-FoK-featured topics using mobile-based Google Docs as a MBWT. This school district issued Google Chromebook provided
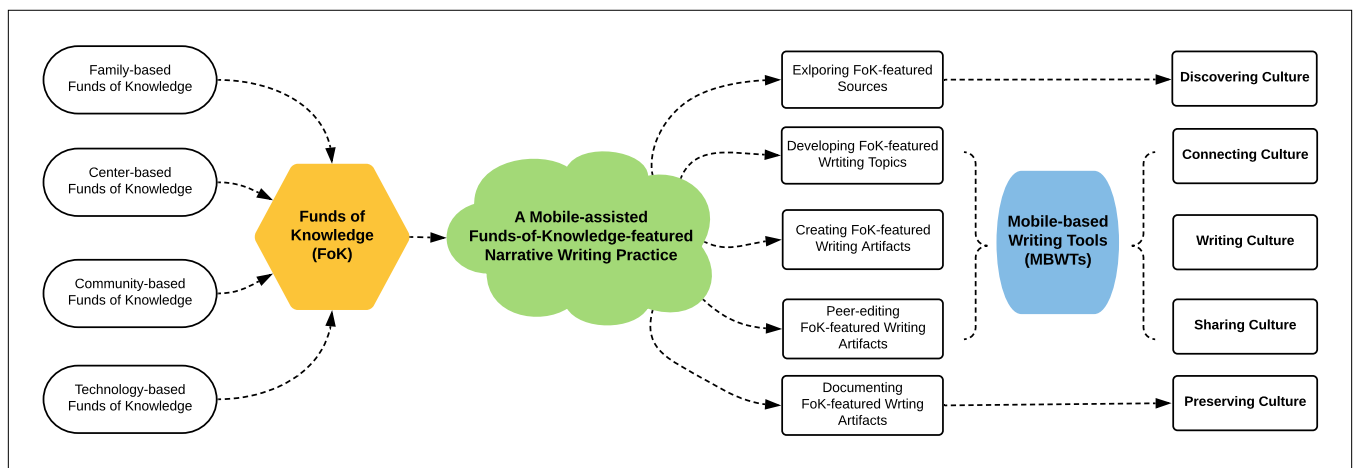

FIGURE 5. A developing model of the mobile-assisted funds-of-knowledge-featured writing instructional framework.

GRADE:	Sixth Grade
CONTENT AREA:	Narrative writing

Instructional Goals:

To develop ELs' narrative writing skills in English, this lesson will ensure that the participants will be able to comprehend 100% of the basic structure of a narrative essay, including *who? what? when? where? why? and how?,* through assigned writing topics based on the students' funds of knowledge by using mobile-based Google Docs as a MBWT.

Learning Objectives:

The ELs will be able to complete the following tasks using mobile-based Google Docs as a MBWT and:

- understand the assigned writing topic clearly.
- take photos or search the images related to the assigned writing topics.
- describe their story by answering the questions who? what? when? where? why? and how?
- use the first-person voice throughout the paper.
- employ dialogue to develop experiences, such as "my mom told me…"
- use transitional words and phrases to enrich the experience, such as "before, after, next, after a while, pretty soon, at the end, at last, and lastly."
- provide a conclusion based on the narrated experiences.
- use various font sizes or colors to express their feelings on the Google Docs.
- produce a narrative paper of 100-150 words.

Aligned CCSS.ELA-LITERACY.W.6.3, 6.5, 6.6, 6.7

Technology Integration:

- Mobile-based Google Docs is used to facilitate the ELs' writing activities both inside and outside the classroom.
- The EL teacher introduces each writing topic to the students, encourages the students to communicate with their family members to discover their FoK-related ideas, search for cultural artifacts, and take photos at home.
- The ELs are encouraged to connect their ideas with their stories, write their stories using Google Docs and share their stories with their teacher, peers, and family members.

Aligned ISTE Standards for Students: 1, 2, 3, 6, 7

Technical Considerations:

Several technical requirements are necessary in the classroom, including:

- Wi-Fi provided
- One computer for the teacher station
- One projector
- Google Chromebook is charged before each class.
- Google account for each student is provided by the school district.

TABLE 1. A sample description of a sixth-grade lesson plan.

convenience for me and the EL teacher to implement our teaching plans into the classroom.

I recruited 18 ELs to participate in this study, including four sixth graders (four boys), seven seventh graders (six boys and one girl), and seven eighth graders (five boys and two girls). The mean number of years they had spent in the United States was 11.38 years (SD = 3.85). The participating ELs were born into Mexican-American families and were English-Spanish speakers. In the school district, the ELs had taken the WIDA-ACCESS Placement Test every spring semester for the teachers to screen their English language proficiency and to identify their eligibility for the ESL program. This process followed the guideline provided by the Illinois State Board of Education (ISBE, 2013). For example, if a student scores an overall composite proficiency level of 5.0 or below, with a composite literacy (reading/ writing) proficiency level of less than 4.2, this student would be placed in the ESL program.

Considering the ELs' limited language proficiency in English as well as the limited number of participants, I employed a multiple before-and-after non-experimental design to implement this prototyping stage through collecting continuous narrative samples. The EL teacher and I integrated the identified FoK sources into the ELs' classroom writing practice across ten weeks with two non-FoK topics (*an unexpected event* and *the best day at school*) and three FoK topics (*my family story*, *my travel story*, and *my game story*). For each of the FoK writing topics, I designed writing prompts based on brief episodes from *The Circuit* to scaffold student learning. In addition, considering some of our ELs might not have had travel experience to Mexico, the EL teacher and I decided to allow the students to share their travel experience to other places such as different cities or towns in the United States. See Table 2 for a sample writing prompt.

The ELs spent 30 minutes on the writing projects on Tuesday, Wednesday, and Friday morning each week. For each topic, the ELs were required to complete a before-essay using pen-and-paper and an after-essay using Google Docs as a MBWT. To complete each essay, the ELs were encouraged to interact with their families to *discover* the main sources of their FoK stories and take pictures from home using the built-in cameras in their Chromebooks or their personal devices (see Figure 6), to *connect* their ideas to classroom writing practice, to *write* their stories using pen-and-paper as well as Google Docs as a MBWT, to *share* their stories with the EL teacher and classmates using Google Docs or Gmail, and to *preserve* their culture by saving and revisiting their writing artifacts in Google Drive.

At the end of each writing practice, the ELs were required to complete a brief questionnaire to self-evaluate their writing practice. The questionnaire was composed of five questions about their perceptions of the writing topics, their willingness towards writing, their evaluation of their own essays, their use of different writing tools, and their writing challenges.

Results of the eighty-three questionnaires that were collected (seven were missing) showed that 46.98% of the students preferred the FoK topics, 15.66% of them preferred the non-FoK topics, 25.30% of them liked both non-FoK and FoK topics, 49.40% of the students were willing to write their stories, 80.72% of the students thought they wrote a good story, 78.31% of the students preferred to use Google Chromebook to write instead of pen-and-paper. For example:

> *Do you like the writing topic about this story?*
>
> Yes, I love talking about my family.
>
> Yes, it tells me what my parents did in their childhood.
>
> *Are you willing to write this story?*
>
> I was willing to write about the story [my family story] because I like telling stories about Mexico.

WRITING TOPIC	MY FAMILY STORY
WRITING PROMPT	In the book The Circuit, Panchito recalled his experiences living in a small village near Guadalajara, Mexico. Panchito wrote, *"I like looking for eggs and going to Mass, too. But what I enjoyed most was listening to stories… We sat around a fire built with dry cow chips and told stories while shaking our grain from the ears of corn" (Jiménez, 1997, p. 2).* Now, iPanchito thinks about the stories his/her parents/grandparents told him/her before. iPanchito wrote his/her family story below…
WRITING INSTRUCTION	Please write a narrative in which you tell about your family story and describe it with specific details by answering the topics of *who? where? when? what? how? and why?* Be sure that your story has a beginning, a middle, and an end.

TABLE 2. A sample writing prompt for My Family Story.

FIGURE 6. ELs downloading photos from their iPod to Google Chromebook in the classroom.

It is about their [my parents] child stories. It is really fun.

Do you think you wrote a good story?

Yes, [I wrote a good story] because I wrote everything that happen to my dad.

Yes. I did it in a good way about my parents' childhood.

With what did you choose to write your story, pen-and-paper or Google Chromebook?

[Pen-and-paper] is actually easy.

[Google Chromebook] is less boring and I type faster.

The results of the questionnaire showed the challenges that the students' encountered while completing their essay writing. For example:

> *Do you like the writing topic about this story?*
>
> *No, I cannot write well.*
>
> *I do not like writing.*
>
> *Are you willing to write this story?*
>
> *No, because it took me a long time to ask my father.*
>
> *I don't know what to write.*

In addition, I interviewed a few ELs about their perspective of this overall writing practice. For example, one EL who did not like writing but preferred to write using Google Docs as a MBWT, stated that:

If we type the stories on the Chromebook it will be fun, fast, and less boring. So my suggestion to you is let the kids type their stories and not write them. Also my favorite topics were gaming with siblings and technology. If I were to do the project again the topics I would want to do are technology related.

The EL teacher and her teaching assistant shared their opinions about this instructional framework. For example, they were interested in helping students write using Google Docs as a MBWT because the students used their Chromebook frequently every day and the students were skilled at using these mobile tools. They were interested in embedding sociocultural constructs in their students' writing practice via mobile technology. However, the teachers indicated that it could be challenging for the students and their parents to recognize the significance of the use of FoK-featured writing topics.

CONCLUDING THOUGHTS

This design case has reviewed and described the design, development, and prototype procedure of this mobile-assisted FoK-featured instructional framework along with my dissertation research. My goal with this framework is to build an interactive mobile-assisted learning system to connect diverse ELs' classroom settings with their informal learning experiences that are centered as much as possible around the students' lived experiences as well as knowledge and skills they obtained from their households and communities. Four attributes are highlighted in this framework: 1) addressing the homogeneity of a specific culture-sharing Latinx EL population, 2) scaffolding cognitive support through multimodal communication provided by emerging mobile applications, 3) creating a flow in learning to assist students in achieving a fluid experience through a five-step sequential writing procedure via the mobility, flexibility, and interactivity provided by mobile devices, and 4) augmenting learning spaces beyond the ELs' ordinary experiences by engaging them in collaborative learning with their family members, teachers, and peers by connecting informal environments with their formal school education.

This design process was iteratively refined and evaluated along with the progress of my dissertation research work. A few major challenges emerged during different design stages. First, I felt an inevitable uncertainty at the initial *precedent* stage because of the lack of adequate experiences working with the Latinx ELs. However, as a result of comparing ELs' from different cultures other than the Latinx culture at the *reframing* stage, I was able to "[learn] the ropes before playing in the field" (Green, 2014, p. 4) and reduce the ambiguity within this design process. Second, it was challenging to recruit participants for home-visits across the four different stages. Particularly, at the beginning of the *co-evolution* design stage, there was some unexpected news about immigration and deportation. Some parents did not want to be visited by strangers, although they had legal immigration status. The number of the participating ELs in the prototyping stage was limited. Third, Spanish was the main language used by the majority of the participating families. Growing up in an Asian culture, I did not speak Spanish. Fortunately, the EL teacher involved in this process as an English-Spanish translator and a teacher-researcher helped me overcome this challenge. Additionally, the ELs showed their curiosity and enthusiasm in communicating with me to share their cultural stories. A few of the ELs volunteered to translate from Spanish to English during the home-visits. However, it was challenging to evaluate the cultural flow through this instructional framework because some of the ELs and their parents might not have been conscious about the significance of using FoK to improve the ELs' learning engagement.

The next step of this design case development will focus on embedding the intercultural communication dimensions into this technology-infused FoK-featured instructional framework to better facilitate digital learner's multi/literacies development. This step would help enhance the transferability of this design product to other cultural groups by further acknowledging distinct sociocultural variables in designated learning environments. This design case might also provide insight to interested students in initiating their research ideas as well as developing their research agendas and researcher positionality through rigorous field work.

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REFERENCES

Ball, A. F. (2009). Toward a theory of generative change in culturally and linguistically complex classrooms. *American Educational Research Journal, 46*(1), 45–72. https://doi.org/10.3102/0002831208323277

Boling, E. (2010). The need for design cases: Disseminating design knowledge. *International Journal of Designs for Learning, 1*(1). https://doi.org/10.14434/ijdl.v1i1.919

Chen, Y. (2020). Conceptualizing a mobile-assisted funds-of-knowledge-featured learning environment for Latinx English Learners. In Gresalfi, M. and Horn, I. S. (Eds.), *Proceeding of the 14th International Conference of the Learning Sciences* (pp. 2673-2674), Nashville, Tennessee: International Society of the Learning Sciences.

Chen, Y., Carger, C. L., & Smith, T. J. (2017). Mobile-assisted narrative writing practice for young English Language Learners from a funds of knowledge approach. *Language Learning & Technology, 21*(1), 28–41.

Chen, Y., Mayall, H. J., York, C. S., & Smith, T. J. (2019). Parental perception and English Learners' mobile-assisted language learning: An ethnographic case study from a technology-based funds of knowledge approach. *Learning, Culture and Social Interaction, 22*. https://doi.org/10.1016/j.lcsi.2019.100325

Common Core State Standards Initiative: Prepare America's Students for College & Career (2017). *English Language Arts Standards in Writing (grades 6-8)*. http://www.corestandards.org/ELA-Literacy/WHST/6-8/#CCSS.ELA-Literacy.WHST.6-8.2

Cummins, J. (1997). Cultural and linguistic diversity in education: A mainstream issue? *Educational Review, 49*(2), 105–114. https://doi.org/10.1080/0013191970490202

Dorst, K., & Cross, N. (2001). Creativity in the design process: Co-evolution of problem–solution. *Design Studies, 22*(5), 425–437. https://doi.org/10.1016/S0142-694X(01)00009-6

Gaver, W. W., Beaver, J., & Benford, S. (2003). Ambiguity as a resource for design. *Proceedings of the Conference on Human Factors in Computing Systems-CHI '03,* 233. https://doi.org/10.1145/642611.642653

Green, K. (2014). Doing double dutch methodology: Playing with the practice of participant observation. In D. Paris & M.T. Winn (Eds.). *Humanizing research: Decolonizing qualitative inquiry with youth and communities*. Thousand Oaks, CA: Sage Publications.

Hedges, H., Cullen, J., & Jordan, B. (2011). Early years curriculum: Funds of knowledge as a conceptual framework for children's interests. *Journal of Curriculum Studies, 43*(2), 185–205. https://doi.org/10.1080/00220272.2010.511275

Illinois Interactive Report Card. (2017). http://iirc.niu.edu

Illinois State Board of Education. (2013). *New "proficiency" definition for identifying English Learners.* http://206.166.105.35/bilingual/pdfs/proficiency-def-modmemo0613.pdf

International Society for Technology in Education. (2017). *ISTE standards for students.* https://www.iste.org/standards/for-students

Janzen, J. (2008). Teaching English Language Learners in the content areas. *Review of Educational Research, 78*(4), 1010–1038. https://doi.org/10.3102/0034654308325580

Jiménez, F. (1997). *The circuit: Stories from the life of a migrant child.* Albuquerque: University of New Mexico Press.

Lan, Y. J., Sung, Y. T., & Chang, K. E. (2007). A mobile-device-supported peer-assisted learning system for collaborative early EFL reading. *Language Learning & Technology, 11*(3), 130–151.

Llopart, M., & Esteban-Guitart, M. (2018). Funds of knowledge in 21st century societies: Inclusive educational practices for under-represented students. A literature review. J*ournal of Curriculum Studies, 50*(2), 145–161. https://doi.org/10.1080/00220272.2016.1247913

Maher, M. L., & Poon, J. (1996). Modelling design exploration as co-evolution. *Microcomputers in Civil Engineering, 11*(3), 195–209.

Newman, B. M. (2012). Mentor texts and funds of knowledge: Situating writing within our students' worlds. *Voices from the Middle, 20*(1), 25–30.

O'Malley, J. M., & Pierce, L. V. (1996). *Authentic assessment for English Language Learners: Practical approaches for teachers*. Boston: Addison-Wesley Publishing Company.

Orosco, M. J., & Klingner, J. (2010). One school's implementation of RTI with English Language Learners: "Referring Into RTI." *Journal of Learning Disabilities, 43*(3), 269–288. https://doi.org/10.1177/0022219409355474

Paton, B., & Dorst, K. (2011). Briefing and reframing: A situated practice. *Design Studies, 32*(6), 573–587. https://doi.org/10.1016/j.destud.2011.07.002

Samway, K. D. (2006). *When English Language Learners write: Connecting research to practice, K-8*. Portsmouth, NH: Heinemann.

Schön, D. A. (1984). Problems, frames and perspectives on designing. *Design Studies, 5*(3), 132–136. https://doi.org/10.1016/0142-694X(84)90002-4