Language Learners as Digital Bricoleurs: Exploring Independent Learning in Individual Digital Ecologies

Sherman, Brandon · Briggs, Neil[*]

(Indiana University - Purdue University Indianapolis · Hannam University)

Though there is a wealth of digital resources available for independent computer-assisted language learning, language teachers may find mixed success in supporting learners in using it. Teachers need to understand their learners and how educational information-communication technology and the target language are integrated in their lives. We present the concepts of digital ecology and digital bricolage. Building on a prior survey study on English learner technology use at a Korean college, this qualitative case study explores ways that four Korean college students integrated technology and English into their lives. Drawing on a priori and emergent themes from interviews, we explore students' digital ecologies and their processes of digital bricolage. We found that types of technology use varied across these cases, suggesting the value of digital ecologies for thinking about student technology use. Further, variations of technology use across the cases suggest that learners draw selectively from their available digital ecologies based on their perceptions of what it means to learn English and their personal priorities. We propose a framework for understanding language learner digital bricolage based on formality and instrumentality. This framework is of value to researchers and teachers who want to support students in digitally mediated self-directed language learning.

I. INTRODUCTION

Where technology is concerned, teachers of language have long lived with a contradiction; On one hand, technologies (both explicitly educational and otherwise) seem to offer a great deal of promise for improving their students' language acquisition, yet on

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[*] First author: Sherman, Brandon; Second author: Briggs, Neil

the other the reality often doesn't bear this out (Bush, 2013). Teachers' expectations for the effectiveness of technology for learning may be informed by their pre-service preparation, their in-service experience, or their personal experience as learners. Further, teachers may believe their responsibility to support their students goes beyond the formal classroom, extending to helping their students become effective independent learners of language. For this endeavor, digital technologies would seem to offer a vast array of differentiated and personalized tools for independent, informal language learning. A teacher may wonder where to start.

We argue that this support starts with knowing who your students are, in terms of the technologies that are a part of their lives and the ways these overlap with the place of the target language in their lives. In other words, teachers wishing to support their students in digitally augmented independent learning should not start with by recommending technologies and applications, but by understanding the technologies that already make up what we refer to as their *digital ecologies*. Additionally, we hold that students do not merely adopt technologies, but integrate them into their lives following their own logics and needs. We refer to this as *digital bricolage* and recognize the need to understand this process.

To that end, this paper explores the ways that four Korean college students integrated technology and English into their lives. This study builds on descriptive quantitative analysis of technology usage of Korean students at the college in question (Briggs & Sherman, 2018). That study analyzed questionnaire data from 197 students across five academic departments, using an instrument developed for the purpose, the Self-Directed Digital Study Instrument, or SDDSI. Among the descriptive findings, this study found that the majority of students who studied English outside of school contexts used digital resources to do so, though there was wide variation across departments. Students who reported studying English mainly in school contexts reported very little use of digital resources. The most commonly used digital resources were streaming online video (YouTube) and suites of functions associated with search applications (Naver, Google), such as dictionaries and translation functions. Students reported a mix of resources specifically designed for English learning (such as Hackers TOEIC) and resources with broader functionality (such as social media). Two major barriers to use of digital resources for language learning were the difficulty of the content and lack of knowledge about what resources were available.

With this description of the context of digital resource use completed, we wanted to explore student use of these resources at a deeper level. For that purpose, we interviewed four students from the college in question to better understand their experience using technology to learn English. We were guided by three research questions:

1. What technologies do Korean college students report as part of their ecology of English language learning and use?
2. What challenges do these Korean college students identify with English and digital technology?
3. How do these Korean students come to use the technologies of their larger digital ecology for English language learning?

The first two questions were natural extensions of the quantitative phase of the research, while the third allowed for new findings to emerge in the course of analysis. This case study allows use to gain insight into students' digital ecologies, and to propose a framework for understanding digital bricolage.

II. LITERATURE REVIEW

For better and worse, technology has long been held to be a major factor for supporting learning (Cuban, 1986), and language learning is no exception (Lomicka & Lord, 2019). There has been a proliferation of digital tools, both specific to language learning (Hubbard, 2019) and useful in a wider sense but applicable to learning (Churches, 2010). Yet, in many ways technology in language learning has been a pharmakon, acting as both medicine and poison (Kern, 2014). For example, for all the successful uses of specific digital technologies in language classrooms (e.g., Shi, Luo, & He, 2017; Sun, 2009), there are also plenty of examples of mixed results (e.g., Abrams, 2003; Kent & Sherman, 2013). Naturally, it doesn't make sense to treat technology in this realm as monolithic, as different technologies have different affordances for learning (Golonka, Bowles, Frank, Richardson, & Freynik, 2014; Lomicka & Lord, 2019). Wright and Parchoma (2011) point out that mobile technologies are characterized by heterogeneity rather than homogeneity, and as a consequence research must focus on the affordances these devices dictated not by instructional design, but by learner choice.

To take it further, however, when considering educational technology it is also important to avoid falling into the trap of technological determinism, the idea that technologies have an essential, pre-determined impact on classrooms and learning outside of context (Warschauer, 1998; Wyatt, 2008). Without technological determinism, it becomes more difficult to make blanket statements about the effectiveness of any particular technology for language learning. Instead, we argue that the effectiveness of any particular technology for learning is entangled with the particular conditions in which it is employed, including teacher beliefs about educational technology (Curwood, 2014; Kessler, 2007) and technological knowledge (Fisher, Denning, Higgins, & Loveless,

2012); learner attitudes towards technology (Gillespie & McKee, 1999), and institutional conditions (Apple, 2004). Taking this perspective, a major goal of CALL research should be to understand the dynamics that allow technology to be effective, that is to say, the relationship between technologies and context. This is the goal of the present paper.

Another implication of such a position is the acknowledgement that the boundary between technology use in and out of formal classroom environments is not absolute, and can in fact be quite permeable (Waycott, Bennett, Kennedy, Delgarno, & Gray, 2010; Yoon, 2016). In other words, teacher and learner relationships to technologies outside the classroom can have bearing on how effective a technology can be for formal learning (Joo, So, & Kim, 2018; Lai, 2019). This is the case for language teachers (Sherman, 2016), and it is the case for learners (Beckman, Bennett, & Lockyer, 2014). Furthermore, scholars have begun to recognize the importance of studying use of technology for informal language learning, whether focused on a specific device like a tablet computer (Chen, 2013), online technologies such as forums and social media (Isbell, 2018), or video games (Ryu, 2013). It is to this growing literature that we contribute here, striving, like Waycott et al. (2010), to account for students' relationships to technology in broad rather than specific terms. To accomplish this, we turn to the concept of digital ecologies.

III. KEY THEORETICAL CONCEPTS

1. Ecologies of Technology Use

Whereas learning technologies are often understood in isolation or abstraction, we approach them from the perspective that they are used as a part of a person's life: complex, messy, entangled, and in flux. Broadly, an ecology is a complex, dynamic system of interdependent elements (Brown, 2000). The technologies in a person's life, and the ways their use overlaps with personal and social dynamics, can be understood as their personal ecology (Bødker & Klokmose, 2011). In this paper, we focus on information/communication technologies, which include both digital technologies (such as smartphone applications) and the technologies that facilitate their use (such as smart phones). We refer to this subset as a students' personal digital ecology, or simply their digital ecology (Briggs & Sherman, 2018).

While some have considered teachers' use of technology in ecological terms (Liu & Chao, 2018; Sherman, 2016), this perspective has not had as much application to language experiences, particularly as related to independent learning. We understand a learner's digital ecology as representing the field of technologies (both physical and digital) that they can leverage, limited by access, awareness, ability, and perceived need. This idea

goes beyond discussion of the digital divide, which is mostly focused on access (van Dijk & Hacker, 2003) or ability (Goode, 2010) to recognize that individual differences in students' ability to leverage digital resources, whether prescribed or self-motivated, must be understood within the complex ecology of their lives. Encompassing, among other things, social, economic, cultural, and personal dynamics, digital ecologies account for differences in student use of technology resulting from individual and overlapping factors.

2. Digital Bricolage

We also draw upon the idea of bricolage. Introduced by Levi-Strauss (1966), bricolage is the pragmatic use of whatever heterogenous elements happen to be at hand to achieve one's goals. It is a theory of improvisation. Within the realm of educational research, the term bricolage was appropriated by Kincheloe, McLaren, and Steinberg (2011) to describe an approach to understanding the world through an assemblage of resources and methods. As bricoleurs, people draw from any sources available to accomplish their desired outcomes. Though the concept of bricolage has been applied to teachers (Hatton, 1989; Scribner, 2005), it has seen little use with regards to language learners or their self-determined use of technology for language learning. Here, we consider the endeavor of language acquisition approached as bricolage, and learners as bricoleurs exploring and constructing their own personal digital biome amidst the larger ecology of digital resources.

This approach has implications not only for language acquisition, but also for the power dynamic of the classroom. Rather than focusing on what digital resources afford teachers in terms of instruction and control, we emphasize students as independent learners encouraged to re-envision existing digital resources as helping them reach their individual goals. In this article, we explore what it means for language learners to act as bricoleurs, drawing examples interviews with students.

IV. RESEARCH DESIGN

This paper represents the second phase of a larger explanatory-sequential mixed-method study (Creswell & Clark, 2017) in which a quantitative instrument was piloted on a small scale, then refined and deployed on a larger scale (Briggs & Sherman, 2018). For the second phase, we employed a qualitative case study method (Yin, 2017) using interview data. It is important to note that this research is not meant to be generalized in terms of describing populations, but rather is meant to develop and illustrate a theory (digital ecologies) that can be employed with other learner populations (Lee & Baskerville,

2012). Simply put, technologies and the learner's relation to them, the specific conditions explored here, will change, but the conceptual framework developed and discussed here is likely to remain applicable in the face of these changes.

1. Context and Participants

Phase two data collection occurred over one semester in 2017 at a central-South Korean professional college. Students in every department at this two-year institution were required to complete at least one year of English instruction. For this reason, study of English was the norm across the institution, though courses in different departments did have different emphases (e.g., test preparation, interview skills, or oral communication). The departments of the participants tended to emphasize test preparation as professional preparation. Using paradigmatic sampling criteria (Flyvbjerg, 2006), four students were selected as representative of the subset of the student population that were A. likely to study English outside of school contexts, and B. likely to use digital resources to study English. The details of the participants are listed below in Table 1. Demonstrated English ability levels were based on researcher estimates derived from interview communication.

TABLE 1
Participant Profiles

Participant	Gender	Age	Major
Student A	M	20	Hotel and Tourism
Student B	M	21	Nursing
Student C	M	23	Hotel and Tourism
Student D	F	21	Hotel and Tourism

1) Participant A

Participant A was a 20-year-old male majoring in Hotel and Tourism. He began learning English at the age of 7 in public school. He noted that his reasons for studying English at that time were aligned with the goals of obtaining favorable test scores and future employment. However, he opined that he only truly began learning the language at age 18 when he took interest in meeting foreigners (non-Koreans) living outside of Korea. After making connections with foreigners online, Participant A developed a keen interest for learning English for communicative purposes and, at the time this research was conducted, demonstrated an upper-intermediate level of English. He completed the interview almost entirely in English.

2) Participant B

Participant B was a 21-year-old male majoring in Nursing. Similar to Participant A, his primary goal for studying English was aligned with the goals of obtaining favorable test scores and future employment. He had also recently discovered an interest communicating with foreigners online. During the interview, he occasionally communicated in Korean, but preferred to Google Translate on his phone to search for the vocabulary words that he needed to communicate his ideas in English. He demonstrated a lower-intermediate level of English.

3) Participant C

Participant C was a 23-year-old male majoring in Hotel and Tourism. He began learning English in public school, but also had the unique experience of attending an international school in India for two years during his high school years. As a result, his English was evidently advanced, although he noted that his skills had experienced substantial second-language attrition, as he had lived in Korea exclusively for the past six years. He noted that he did keep in contact with some international friends via social media. Beyond that, however, he reported having few opportunities to make extensive use of his English.

4) Participant D

Participant A was a 21-year-old female majoring in Hotel and Tourism. She had limited experience with using English for communicative purposes. At the time of the study, she had recently begun attempting to communicate online with foreigners. Her main motivations for studying English were associated with achieving a good TOEIC score and eventual employment.

2. Researchers

The researcher is not just the architect and engineer of research: they are also the instrument (Pezalla, Pettigrew, & Miller-Day, 2012). This is particularly the case with qualitative interviewing, where institutional and interpersonal relationships have bearing on interactions. To that end, we include a brief description of our own position within the research context. Both of us were assistant professors of English as a Foreign Language at the college in question at the time of data collection. Both were citizens of countries other than South Korea (United States and Canada, respectively), and both had at least some facility with Korean language. The four participants were either our current or

former students at the time of the data collection. It was made clear that their participation was completely unrelated to their course grades, and care was taken to ensure that the data collection was in no way connected to their classes.

3. Data Collection

Data collection occurred in three stages. For the first stage, semi-structured interview protocols (see Appendix) were designed based on the findings of the prior quantitative analysis (Briggs & Sherman, 2018). Each participant completed an interview of about 45 minutes, conducted in both English and Korean. For the second stage, the four participants were then tasked with evaluating digital resources, some chosen beforehand and some chosen by the students. For the third stage, semi-structured interview protocols were developed based on the students' commentary on the digital resources. Each participated in an interview of about 45 minutes in length.

The interview topics primarily focused on investigating how the participants used technology to study English. However, a few questions were also designed to explore the possibility that the participants may have also had to use English to effectively make use of the technology itself. During the interviews, the participants were encouraged to speak at length about their use of technology. The interview protocols were referred to and utilized by the researchers to ensure that all key topics were covered during each of the interviews.

4. Analysis

This study employs a hybrid analytic design, drawing on thematic analysis guided by a priori concepts (Braun & Clarke, 2006) while allowing for emergent coding guided by grounded theory (Charmaz, 2006). Audio recorded interviews were transcribed verbatim, with Korean language passages translated and confirmed by a native Korean speaker. Based on the descriptive statistic findings from the first stage of the study (Briggs & Sherman, 2018), transcripts were coded with an a priori focus on types of technology used. As we analyzed transcripts, we allowed for the emergence of new codes, which we then applied to the data iteratively. We frequently consulted with each other to maintain interpretive agreement. The analysis undertaken for this article focused on the first stage interviews.

V. FINDINGS

We present our findings based first on the a priori focus on technology use, followed by emergent themes from the data.

1. Types of Technology Used

Our first research question asks what technologies do these students use or, put another way, what technologies do they draw from their digital ecology to accomplish language learning? Guided by stage one survey findings and the concept of digital ecologies, we set out to analyze the technologies the students mentioned, understood in terms of devices and applications. In this way, we describe the elements of these students' digital ecologies of language learning.

1) Devices and Hardware

The devices in a learner's digital ecology serve as their access point to everything else, and reflect in immediate and concrete ways the contours and conditions of their lives. Three devices were prominent in interviews: Smart phones, tablet computers, and laptops/desktops. Ubiquitous in South Korea at the time of the study, it is no surprise that each student mentioned using smartphones. They were, in a sense, the default device. The students did not talk about their limitations, but did mention one major affordance they provided: flexibility through mobility. One student, for example, mentioned using their phone to study during bus rides. These devices were also the most likely to be employed in formal settings such as classrooms, particularly in conjunction with online dictionaries or translation applications.

Three of the students owned tablet computers, and mentioned using them in relation to English use and/or study. These were mostly associated with the viewing of media (such as streaming video) and chatting (either video, audio, or text), and seemed to be mostly used in informal contexts, particularly the home. One student identified her tablet as her primary English study device.

Finally, personal computers (laptops or desktops) were mentioned in some respect by all four students. Only one student, who seemed to have high socioeconomic status (e.g., owning multiple tablets) suggested that he owned his own computer. The others mentioned either sharing devices with family members (reported as a barrier to use), or going to PC cafes (mainly to play games). No student mentioned making use of the college's computers, though facilities were available.

2) Software

Where software was concerned, the most prevalent applications mentioned were associated with online search site functionalities, specifically Google and Naver. The online dictionary provided by Naver, a South Korean search company, was mentioned by all four students as being a key English resource. Two students also mentioned using Google translate. Interestingly, both compared Naver and Google translate functions, pointing out how both applications had different strengths. One pointed out that "Naver translation, English to Korean language is not bad. But, Korean language to English language translation is very bad." These two students used the respective services strategically, depending on whether they were trying to understand English (Naver was preferred) or express themselves in English (in which case, they used Google). One student indicated a preference for Naver to the exclusion of Google, and one did not mention using Google for language. One important point to note is that these applications were not used alone, but in conjunction with something else, as a support for another activity. Thus, online dictionaries were used to aid online chatting, or understand media.

Media applications were also mentioned by each student. One student mentioned streaming test preparation lectures as her main way of studying English. She also described English pop music, streamed through a Korean application with lyrics, as being her main way of enjoying English. All four students mentioned watching foreign language media, with an emphasis on subtitles. This included online streaming and downloaded media. The students emphasized subtitle functionality, with some making distinctions between watching with and without English or Korean subtitles. One student mentioned the affordance of pause, replay, and rewind. Another student, studying both English and Japanese, mentioned using streaming media to watch Japanese dramas and watching English series on broadcast television, an interesting interplay of preference and availability.

Communication with people outside of Korea was a major theme across cases. Each reported using chat applications with varying levels of success. One student mentioned using a random chat application briefly, stopping because it was too difficult to communicate in English. Another used communication applications to develop long-term relationships with English speakers abroad, even distinguishing between applications for learning English and applications for romantic relationships. A third used a variety of applications to communicate in English with friends he had met while attending international school abroad. Communication applications took the form of multiple channels (text, audio, video) and formats (random, interest-specific, and social media).

As a point of interest, we asked students about games and their related use of English. All four students played digital games, and three mentioned using English to some extent.

One mentioned attempting to play games that were only available in English. Two of the students mentioned using English while playing online cooperative/competitive games, in very different ways. One mentioned directing English profanity at competitors (saying "Korean [profanity] is boring"), while the other used English to compete against players in the United States (active in a different time zone and offering, this student felt, less challenge than Korean players).

We asked the students about their experiences using applications specifically designed for English learner. Each had tried a language learning application at some point, generally related to either vocabulary acquisition or test preparation. None reported these applications as being central to their language learning, or particularly effective. One student, who had been very successful learning English informally, announced his intention to undertake the study of English focused on preparing for a standardized test. He indicated that his intended technology for this endeavor was printed books.

One notable point that arises from these cases, seen with the benefit of hindsight, speaks to the fluid, faddish, and transient nature of some technologies. Three of the participants mentioned using random chatting applications, such as Chatroulette, that randomly connects users around the world. Such applications were wildly popular during the time of data collection, yet quickly fell out of use. This illustrates that the elements of learners' digital ecologies may quickly arrive and depart, even if widely used in their time. The students' experiences can even provide insight into why this might happen. One student said, "I want to talk with foreign people, so I start this app… it was good for me, but many strange people." This sentiment was echoed by the other students.

Other commonly mentioned technologies, such as online dictionary applications, remain in widespread use at the time of writing.

2. Challenges of Technology Use

As we analyzed the transcripts, we allowed for the emergence of themes that describe the dynamic interplay between learners and their digital ecology. Whereas the above findings describe the *what* of digital ecologies, these themes focus on the *how*.

Our second research question focused on the challenges students encountered in using technology to learn English. Whereas the previous section described technologies students used, the themes that emerged related to this question provide a sort of negative image with the technologies the students no longer used, as well their reasons for rejecting them. The most prominent technology in this respect was technology specifically designed for English language acquisition, such as test preparation and vocabulary focused applications. Limiting factors included money, time, access, language ability, and interest. Though

these may not be surprising, it is still worth marking the ways in which they operated in these students' ecologies, and the ways in which they overlap.

None of the students explicitly said that money was a limiting factor in their technology use, yet they implied it in a number of ways. Most of the applications they mentioned using were free, an advantage that the students highlighted multiple times. This may partially account for the relative absence of student use of language learning applications, many of which require payment or subscription. Further, money factored into their limited access to devices such as personal computers. Because these devices were shared in some of the cases, students seemed reluctant to rely on them. Language was also a barrier, with one student in particular indicating that application or activities associated with them (such as chatting with non-Koreans) was simply too difficult. Another student attributed his success with English to meeting a patient and supportive person through online chatting. As he described it, he was very lucky in that respect.

Several students said they did not use language learning applications because they did not have time, preferring to spend their time on leisure or other activities. What this argument essentially amounts to is interest. When discussing their experiences with language learning applications several students indicated that they simply did not find the applications to be effective, or efficient uses of their time. For example, one student stopped using a particular application because he found the content to be irrelevant to his perceived use of English, saying "Oh, do I need these English words? I think I don't need this English." This last point raises another prominent theme, how students perceived the endeavor of language learning.

3. Bricolage: Drawing From the Digital Ecologies

Our third research question asks how students come to draw from their digital ecologies to accomplish language learning in a particular way. What emerged was a picture of the ways these students used technology to meet their personal goals. Two themes related to this question emerged from the analysis.

1) The Problem of Language Learning With Technology

When students learn in a formal environment, instructors generally define the problem of language learning, or the nature and method of language acquisition. This is captured in the differences between language teaching approaches, such as the grammar translation and communicative approaches. When students undertake their own learning, it is up to them to decide the shape it is to take, and where they will focus their efforts. The students in these cases each revealed their own idea of what it means to learn English, in relation

to their use of technology. Within this larger theme, four themes emerged: Test preparation, vocabulary, comprehension, and communicative ability.

Standardized English tests such as the TOEIC exam are a common concern for aspiring Korean professionals. All four students mentioned preparation for standardized testing as one of their self-study activities. Three of these were related to technology, with two referring to test preparation applications and one studying streaming lectures. Related to test preparation, students mentioned using applications that focused on vocabulary. For one student, study of specific academic vocabulary comprised the majority of his independent study, targeted at supporting his formal learning content and performance. For this, he mainly relied on online dictionaries and translation applications.

Another central use of English for the students was listening and reading comprehension related to media. Unlike with test preparation and targeted vocabulary study, students did not necessarily identify this as a formal learning activity, but nonetheless indicated the consumption of media, aided by online dictionaries and translation applications, was a part of their English practice. One student held this to be the best way to study English.

Finally, to different extents, students identified English skills used with chat applications as being part of their practice. For two it was a relatively minor part, and for two it was quite prominent. Asked about the best way to learn English, one learner expressed his view quite clearly, saying "I always say try to talk first to foreigners. I think this is the best way for learning the language."

2) Technology for English, or English for Technology?

A final distinction that arose from student talk of English and technology was that of technology used for the purpose of learning English, and English used with technology for another purpose, such as social communication. The former could be seen in student use of language acquisition applications, the viewing of language acquisition media (i.e., one students' use of TOEIC lectures), and use of online dictionaries to study for courses. Each of the students provided examples of this sort of technology use, though larger patterns of use differed. Two of the students reported using technology for the purpose of English in most of their examples, whereas the other two described these sorts of technologies in terms of examples from their past but not current use habits.

The examples of English for technology purposes included watching English media, playing games, and chatting with non-Koreans for social purposes. For two of the participants, English served as a Lingua Franca that, used in tandem with the chat technologies, allowed them to communicate with people around the world, a phenomenon that has been observed in a range of different learning contexts (Kohn & Hoffstaedter, 2017).

The distinction these two categories was not always clear. Even when the focus of the technology use was not for the purpose of language acquisition, participants recognized potential benefits. For example, the student who was the greatest proponent of talking to non-Koreans as a way of improving English skills also had clear socio-emotional motivations. All of the students enjoyed non-Korean language media, and recognized its value for both entertainment and language acquisition. The student who enjoyed English language music believed she was both improving her skills and appreciating the music on another level. This is to say that these motivational distinctions seem not to be mutually exclusive.

VI. DISCUSSION

1. The Digital Ecologies of Language Learners

What is a digital ecology? It is the sum total of the hardware and software in a student's life, understood both in terms of the resources they can access and those of which they are aware. The findings above relating to the technologies they report using and the challenges they have faced in using technologies allow us to consider the contours these students' digital ecologies and some of the ways these are limited. Looking at access, for example, a student may be limited by socio-economic factors in what devices they have in their homes and who they have to share it with, or by finite resources such as mobile data plans. Though internet access is widespread in the Korean context (Lim, Lee, & Choi, 2019) and South Korea has one of the highest rates of smartphone ownership in the world (Winskel, Kim, Kardash, & Belic, 2019), access is hardly universal. Schools transitioning to distance education under pandemic conditions have found that internet-connected devices were not part of many students' digital ecologies (Ramsetty & Adams, 2020).

One important factor seemed to be the ways that the resources within the students' digital ecologies fit into the patterns of their life. This was suggested by the use of some resources on mobile technologies during one student's bus commute, in another's shared access to a computer with her family, and with the social elements of technology use seen across the interviews.

Even where access to physical technology is not an issue, the experiences of these students show how digital ecologies can also be circumscribed by a number of factors, including money, language ability and, importantly, the learner's own ideas about how and why to learn English. These ideas may reflect, in part, their formal English learning experience. However, these cases suggest that students' lives, goals, and motivations are also likely to give rise to their own personal views of what is worth their time. It is here

that we begin to see how students act as bricoleurs of their learning amidst their available digital ecology.

2. Language Learners as Digital Bricoleurs

In our third research question, we set out to explore the ways in which students come to use the technologies they use for independent English learning. The above findings highlight how students, acting as self-motivated and independent learners, engage in individualized processes of bricolage to agentively assemble their own unique set of digital resources to meet their personally defined goals as language learners. From this, we can gain some insight into how this digital bricolage worked for these students. In our interpretation of the findings above, we found two patterns that can be helpful in informing our understanding of this process: formality and instrumentality.

1) Formality

Though the focus of this investigation was independent English study, the formal sphere of the classroom still loomed large in the students' perspectives. Independent learning need not necessarily be individually driven and idiosyncratic. It can also be a reflection of rigid, structured, extrinsically motivated modes of learning that too often characterize language learning classrooms in Korea (Choi, 2012).

Thus, it is possible to distinguish between examples of independent English related technology use by their formality or informality. A formal emphasis means the activity is guided by formal institutional goals, generally external to the learner. Examples from this study include use of online dictionaries for school assignment completion, or applications designed to prepare students for standardized tests. Informal activities, on the other hand, are guided by learner-determined goals, such as with the self-guided viewing of English media.

2) Instrumentality

As mentioned in the discussion, students seemed to apply digital resources as solutions to the problem of learning English as they perceived it. The students offered examples of how they employed diverse digital resources to address the problem of learning English as they define it, whether as being instrumental for achieving institutional capital (in the form of TOEIC scores) or for communicating with people outside of Korea. Each of the four students articulated the problem of English learning differently, reflecting their individual motivations and understanding of the world, and assembled digital resources

accordingly. It is not a great leap to consider gulfs that likely exist between English teachers' understanding of the problem of learning English and those of their students.

Historians of technology have noted how social groups define and identify what counts as a problem, thus shaping how technologies are used as a solution (Pinch & Bijker, 1984). This phenomenon has been observed in English teacher use of technologies to address their perception of the problems of English teaching (Sherman, 2016). Thus, the second pattern, instrumentality, refers to technology being employed to address the problem of English, or vice-versa. The cases examined reveal three relevant modes of instrumentality: Technology for learning English, English for use of technology, and technology and English used in tandem to accomplish a third goal. Technology used to learn English is exemplified in English vocabulary applications mentioned by several participants. Technology and English used in tandem can be seen in the use of messaging apps and English to communicate with people around the world. There were few examples of English as instrumental for using technology; one participant mentioned using English to play a computer game that was not available in Korean.

3. A Framework for Digital Bricolage for Language Learning

Based on these two themes that emerged from comparative analysis of the four cases, we have developed a framework that can be helpful in understanding the idiosyncratic differences in learners' individual processes of digital bricolage.

FIGURE 1

A Framework for Language Learner Digital Bricolage

Formality	Instrumentality		
	Technology for English	English for Technology	Tandem Use
Formal	Online dictionary for assignment completion	(No example)	Viewing of online TOEIC lectures
Informal	Self-study application	English-only computer game	English films with subtitles and online dictionary

By taking these elements together, we have a framework that helps us understand the choices that learners make in drawing different technologies from their personal digital ecologies and putting them to work in different ways (Figure 1). In it, we see examples, drawn from these cases, of how different uses of technologies in relation to English might be understood. The only exception is in the category of formal use of English for the goal of using technology, a circumstance that did not arise in the cases explored here but might have easily been present had the learners been studying computer science or engineering.

What is particularly interesting in this framework is that all four of the participants gave

examples of varying formality and instrumentality, indicating different emphases in their technology use. Three of the participants (from the tourism department) described most of their technology use as informal, oriented to their own personal goals, language learning and otherwise, whereas one participant (in the nursing department) describes most of his English related technology use in relation to formal study. Informal uses of technology heavily favored tandem use of technology and English to accomplish other goals, particularly to interact with people outside of Korea (mentioned by three participants). Another example of informal tandem use found across cases was the viewing of English media, using streaming or torrent technology in conjunction with downloaded subtitles and online dictionaries. In these cases, technologies are used with English to achieve entertainment, though also with the stated goal of improving English.

VII. LIMITATIONS AND CONCLUSION

Though the sampling serves well enough as representative of students who are likely to use digital resources to study English, the first stage descriptive statistics as discussed in prior work (Briggs & Sherman, 2018) indicate that there is a much wider variation within the population of the students at the college. Further, though the researchers were able to conduct the interviews using English and Korean, the participants were able to converse in English to some extent. It is very likely that learners with lower communicative ability in English would have different perspectives on digital resources for English learning.

It must be also be acknowledged that circumstances tend to change quickly and constantly where technology is concerned. Data collection for this study occurred in 2017, and so represents a snapshot of this time. Even in normal times, the specifics of student technology use are likely to change as new resources become available and larger societal trends shift. This is all the more true given the contemporary trend of online learning necessitated by Covid-19, a trend that is likely to have a lasting impact on digital learning patterns even after extreme pandemic conditions have passed. Yet, there are things to learn from this picture of bygone times. Even while much instruction has moved online, the gulf between the technologies that instructors might prescribe for language learners and the technologies that students are likely to use of their own volition remains. In online learning contexts, supporting learners in exploring and learning through their own preferred digital resources becomes a major way of centering student agency and student directed learning. It is more important than ever to understand how students might use diverse technologies to accomplish their own learning by drawing from their person digital ecologies to act as digital bricoleurs of their language learning.

In spite of these limitations, we hold that the insights gained from these four students

are useful in informing language teacher practice by providing a framework for understanding their learners as either potential or experienced digital bricoleurs. By seeing their students this way, instructors can design their instruction in ways that encourage their students to exercise agency over their language learning, while avoiding attempts to leverage digital resources that are alien or even hostile to their students' digital ecologies. Furthermore, we have provided tools for teachers to conduct their own action research, both quantitative (the SDDSI, from Briggs & Sherman, 2018) and qualitative (the theoretical constructs of digital ecologies and digital bricolage as applied to language learning, and the framework for language learner digital bricolage). Finally, there is potential for educational researchers to explore the phenomena of learners as digital bricoleurs in other areas, such as K-12. With the current norm of online instruction at all levels, it would be interesting to see how students' digital ecologies and bricolage have changed.

Ultimately, this portrait of Korean students as digital bricoleurs cobbling together resources from the field of their digital ecology presents a dynamic of independent learning as inseparable from the unique conditions of a student's life and understanding of the world. The differences between these students' use of technology for learning English can be partially accounted for by issues of access, but not completely. Further, we can think of bricolage as a skill, one that can be supported and developed by teachers inclined and prepared to do so. The alternative is the imposition of learning technologies as a procrustean bed of English learning, with learners being bent, stretched, or cut down to fit. Language instructors would do well to think of their learners as each inhabiting their own unique digital ecologies, acting as bricoleurs within them to assemble their own learning practices. The framework we have provided here can be of use to understand this process. It is not meant to be exhaustive, but is rather a conceptual tool that can be used by both researchers and teachers alike.

REFERENCES

Abrams, Z. I. (2003). The effect of synchronous and asynchronous CMC on oral performance in german. *The Modern Language Journal*, *87*(2), 157-167. https://doi.org/10.1111/1540-4781.00184

Apple, M. W. (2004). Are we wasting money on computers in schools? *Educational Policy*, *18*(3), 513-522. https://doi.org/10.1177/0895904804265022

Beckman, K., Bennett, S., & Lockyer, L. (2014). Understanding students' use and value of technology for learning. *Learning, Media and Technology*, *39*(3), 346-367. https://doi.org/10.1080/17439884.2013.878353

Bødker, S., & Klokmose, C. N. (2011). The human-artifact model: An activity theoretical approach to artifact ecologies. *Human-Computer Interaction*, *26*(4), 315-371. https://doi.org/10.1080/07370024.2011.626709

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101. https://doi.org/10.1191/1478088706 qp063oa

Briggs, N., & Sherman, B. (2018). The digital ecologies of Korean college students: An exploration of digital self-directed learning. *STEM Journal*, *19*(1), 107-127. https://doi.org/10.16875/stem.2018.19.1.107

Brown, J. S. (2000). Growing up digital: How the web changes work, education, and the ways people learn. *Change: The Magazine of Higher Learning, 32*(2), 11-20.

Bush, M. D. (2013). Computer-assisted language learning: From vision to reality? *CALICO Journal*, *25*(3), 443-470. https://doi.org/10.1558/cj.v25i3.443-470

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. Thousand Oaks, CA: SAGE.

Chen, X.-B. (2013). Tablets for informal language learning: Student usage and attitudes. *Language Learning*, *17*(1), 20-36.

Choi, J. (2012). A study on college students' perceptions of English learning in Korea. *Foreign Languages Education,19*(4), 99-126.

Churches, A. (2010). *Bloom's digital taxonomy*. Retrieved from http://burtonslifelearning. pbworks.com/f/BloomDigitalTaxonomy2001.pdf

Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Thousand Oaks, CA: SAGE.

Cuban, L. (1986). *Teachers and machines: The classroom use of technology since 1920*. New York, NY: Teachers College Press.

Curwood, J. S. (2014). English teachers' cultural models about technology: A microethnographic perspective on professional development. *Journal of Literacy Research*, *46*(1), 9-38. https://doi.org/10.1177/1086296X13520426

Fisher, T., Denning, T., Higgins, C., & Loveless, A. (2012). Teachers' knowing how to use technology: Exploring a conceptual framework for purposeful learning activity. *Curriculum Journal*, *23*(3), 307-325. https://doi.org/10.1080/09585176. 2012.703492

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry*, *12*(2), 219-245. https://doi.org/10.1177/1077800405284363

Gillespie, J., & McKee, J. (1999). Resistance to CALL: Degrees of student reluctance to use CALL and ICT. *ReCALL*, *11*(1), 38-46. https://doi.org/10.1017/S0958344 00000207X

Golonka, E. M., Bowles, A. R., Frank, V. M., Richardson, D. L., & Freynik, S. (2014). Technologies for foreign language learning: A review of technology types and their effectiveness. *Computer Assisted Language Learning*, *27*(1), 70-105. https://doi.org/10.1080/09588221.2012.700315

Goode, J. (2010). The digital identity divide: How technology knowledge impacts college students. *New Media & Society*, *12*(3), 497-513. https://doi.org/10.1177/1461444809343560

Hatton, E. (1989). Lévi-Strauss's bricolage and theorizing teachers' work. *Anthropology & Education Quarterly*, *20*(2), 74-96. https://doi.org/10.1525/aeq.1989.20.2.05x0841i

Hubbard, P. (2019). Five keys from the past to the future of CALL. *International Journal of Computer-Assisted Language Learning and Teaching*, *9*(3), 1-13. https://doi.org/10.4018/IJCALLT.2019070101

Isbell, D. R. (2018). Online informal language learning: Insights from a Korean learning community. *Language Learning & Technology*, *22*(3), 82-102.

Joo, Y. J., So, H.-J., & Kim, N. H. (2018). Examination of relationships among students' self-determination, technology acceptance, satisfaction, and continuance intention to use K-MOOCs. *Computers & Education*, *122*, 260-272. https://doi.org/10.1016/j.compedu.2018.01.003

Kent, D., & Sherman, B. (2013). Pilot study for use of Memrise application by Korean junior college students studying EFL vocabulary in a blended learning context. *STEM Journal*, *14*(3), 169-192. https://doi.org/10.16875/STEM.2013.14.3.169

Kern, R. (2014). Technology as Pharmakon: The promise and perils of the internet for foreign language education. *The Modern Language Journal*, *98*(1), 340-357. https://doi.org/10.1111/j.1540-4781.2014.12065.x

Kessler, G. (2007). Formal and informal CALL preparation and teacher attitude toward technology. *Computer Assisted Language Learning*, *20*(2), 173-188. https://doi.org/10.1080/09588220701331394

Kincheloe, J. L., McLaren, P., & Steinberg, S. R. (2011). Critical pedagogy and qualitative research: Moving to the bricolage. In N. K. Denzin & Y. Lincoln (Eds.), *The SAGE handbook of qualitative research* (4th ed., pp. 163-177). Thousand Oaks, CA: SAGE.

Kohn, K., & Hoffstaedter, P. (2017). Learner agency and non-native speaker identity in pedagogical lingua franca conversations: Insights from intercultural telecollaboration in foreign language education. *Computer Assisted Language Learning*, *30*(5), 351-367. https://doi.org/10.1080/09588221.2017.1304966

Lai, C. (2019). Technology and learner autonomy: An argument in favor of the nexus of formal and informal language learning. *Annual Review of Applied Linguistics*, *39*, 52-58. https://doi.org/10.1017/S0267190519000035

Lee, A. S., & Baskerville, R. L. (2012). Conceptualizing generalizability: New contributions and a reply. *MIS Quarterly*, *36*(3), 749-761. https://doi.org/10.2307/41703479

Levi-strauss, C. (1966). *The savage mind*. Chicago, IL: University of Chicago Press.

Lim, C., Lee, J., & Choi, H. (2019). South Korea. In O. Zawacki-Richter & A. Qayyum (Eds.), *Open and distance education in Asia, Africa and the Middle East* (pp. 87-100). Singapore: Springer.

Liu, Q., & Chao, C.-C. (2018). CALL from an ecological perspective: How a teacher perceives affordance and fosters learner agency in a technology-mediated language classroom. *ReCALL*, *30*(1), 68-87. https://doi.org/10.1017/S0958344017000222

Lomicka, L., & Lord, G. (2019). Reframing technology's role in language teaching: A retrospective report. *Annual Review of Applied Linguistics*, *39*, 8-23. https://doi.org/10.1017/S0267190519000011

Pezalla, A. E., Pettigrew, J., & Miller-Day, M. (2012). Researching the researcher-as-instrument: An exercise in interviewer self-reflexivity. *Qualitative Research*, *12*(2), 165-185. https://doi.org/10.1177/1468794111422107

Pinch, T. J., & Bijker, W. E. (1984). The social construction of facts and artefacts: Or how the sociology of science and the sociology of technology might benefit each other. *Social Studies of Science*, *14*(3), 399-441.

Ramsetty, A., & Adams, C. (2020). Impact of the digital divide in the age of COVID-19. *Journal of the American Medical Informatics Association*, *27*(7), 1147-1148. https://doi.org/10.1093/jamia/ocaa078

Ryu, D. (2013). Play to learn, learn to play: Language learning through gaming culture. *ReCALL*, *25*(2), 286-301. https://doi.org/10.1017/S0958344013000050

Scribner, J. P. (2005). The problems of practice: Bricolage as a metaphor for teachers' work and learning. *Alberta Journal of Educational Research*, *51*(4), 295-310.

Sherman, B. J. (2016). *Agency, ideology, and information/communication technology: English language instructor use of instructional technology at a South Korean college* (Unpublished doctoral dissertation). The Pennsylvania State University, University Park, PA. https://etda.libraries.psu.edu/catalog/13341bjs460

Shi, Z., Luo, G., & He, L. (2017). Mobile-assisted language learning using WeChat instant messaging. *International Journal of Emerging Technologies in Learning (IJET)*, *12*(2), 16-26. https://doi.org/10.3991/ijet.v12i02.6681

Sun, Y.-C. (2009). Voice blog: An exploratory study of language learning. *Language Learning*, *13*(2), 88-103.

van Dijk, J., & Hacker, K. (2003). The digital divide as a complex and dynamic phenomenon. *The Information Society*, *19*(4), 315-326.

Warschauer, M. (1998). Researching technology in TESOL: Determinist, instrumental, and critical approaches. *TESOL Quarterly*, *32*(4), 757-761. https://doi.org/10.2307/3588010

Waycott, J., Bennett, S., Kennedy, G., Dalgarno, B., & Gray, K. (2010). Digital divides? Student and staff perceptions of information and communication technologies. *Computers & Education*, *54*(4), 1202-1211. https://doi.org/10.1016/j.compedu.2009.11.006

Winskel, H., Kim, T.-H., Kardash, L., & Belic, I. (2019). Smartphone use and study behavior: A Korean and Australian comparison. *Heliyon*, *5*(7), 1-8. https://doi.org/10.1016/j.heliyon.2019.e02158

Wright, S., & Parchoma, G. (2011). Technologies for learning? An actor-network theory critique of 'affordances' in research on mobile learning. *Research in Learning Technology*, *19*(3), 247-258. https://doi.org/10.1080/21567069.2011.624168

Wyatt, S. (2008). Technological determinism is dead; Long live technological determinism. In E. Hackett, O. Amsterdamska, M. Lynch, & J. Wajcman (Eds.), *The handbook of science and technology studies* (3rd ed., pp. 165-180). Cambridge, MA: MIT Press.

Yin, R. K. (2017). *Case study research and applications: Design and methods*. Thousand Oaks, CA: SAGE.

Yoon, S.-Y. (2016). Exploring learner perspectives on learner autonomy for blended learning in EFL conversation classes. *STEM Journal,* *17*(1), 197-220. https://doi.org/10.16875/stem.2016.17.1.197

APPENDIX

A. Language Background

How long have you studied English?

Have you studied English abroad? At Private Schools?

Why do you study English?

What materials do you usually use to study English?

How do you feel about studying English?

Have you studied any other languages?

B. Technology to Study English

Do you spend a lot of time online? What sites or mobile applications do you often use?

Have you ever used your phone or a computer to study English?

What are some applications you've used?

What are some of the websites you've used?

Are there any English learning applications or websites that you didn't like? Why?

Are there any English learning applications or websites that you know about that you haven't used?

If you do not use online resources to help you learn English, which constraints prevent you from doing so?

C. English to use Technology

Do you ever need English when you use your phone or a computer?

Give an example of a time you needed English to use an application or a website.

If you do not often use English while using mobile applications, surfing the web, or playing games, which constraints prevent you from doing so? (Already translated)

Sherman, Brandon (First author)

Research/Project Manager

Department of Education

Indiana University - Purdue University Indianapolis

ES 3116 EDUC

902 W. New York St. Indianapolis, IN, USA

E-mail: brandsherman@gmail.com

Briggs, Neil (Second author)

Assistant Professor

Talmage College of Liberal Arts

Hannam University

70 Hannamro, Daedeok-Gu, Daejeon, 34430, South Korea

E-mail: nrbteach@gmail.com