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Modernizing the Language Laboratory: Physical Place to Online Space

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ABSTRACT

This study investigates the ways in which synchronous and asynchronous activities create an online language laboratory that mediates second language (L2) learning for 188 L2 university participants over a 6-week period. Completion of tasks and pre-, post-, and weekly surveys were analyzed. Statistical analyses were run on self-rated questions while coding was complete on open-ended questions. Quantitative results revealed significant differences when comparing pre- and post-surveys on questions regarding L2 skills and knowledge while qualitative results indicated that participants had preferences between the technology tools used during the treatment. Although the physical language lab has become almost non-existent, this study suggests that L2 instructors should provide opportunities where L2 learners can expand their language skills outside of the classroom through the creation of an online language laboratory. This laboratory has the ability to transform L2 students' language learning as well as be very valuable in today's classroom given the current COVID-19 global crisis.

KEYWORDS

Computer-Mediated Communication, L2 Teaching, Language Laboratory, Second Language (L2) Learning

1. INTRODUCTION

The use of technology in the language classroom is widely discussed in current literature (Blake, 2013, 2016; Stanley, 2013). Technology, via computer-mediated communication, is a resource that can be utilized in a variety of ways in the language classroom to connect learners with coursework and other learners. Prior to the 21st century and Web 2.0, technology was utilized in the second language (L2) classroom as learners connected with the instructor and course material through the physical language laboratory, a space where students interacted with their instructor utilizing microphones, headsets, and other audio equipment (Kitao, 1995; Sánchez, 1959). Even though there was much value in utilizing the language laboratory as each student was "a performer during the entire practice period" (Lorge, 1964, p. 416), with the onset of technology and the changing education landscape (Kern, 2006), the physical language laboratory has become an out-of-date L2 learning and teaching resource (Garcia & Wolfe, 2001).

Unlike when technology was "vastly underutilized as a topic and medium of instruction" (Grosse, 1993, p. 310) in the 1990s, now in the 21st century, the majority of teachers are utilizing technology in a variety of ways in many classrooms (Guichon & Hauck, 2011). Technology allow learners to develop their L2 language skills (Lenkaitis, 2019) and be more engaged in the learning process (Balaman & Sert, 2017; Kern, 2014; Lewis & O'Dowd, 2016). Also as more and more people own personal devices (Lenkaitis, 2020; Kukulska-Hulme & Shield, 2006), students and teachers alike can access

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applications by a click of a button (Bohinski, 2014[1]; Lenkaitis, 2019, 2020) "anywhere, anytime" (Geddes, 2004, p. 1). Because technology is readily available and supports both L2 learning and teaching (Blake, 2013, 2016; Lenkaitis, 2019, 2020; Lenkaitis, Hilliker, & Roumeliotis, 2020; Stanley, 2013) and the physical language laboratory has become almost non-existent (Garrett, 2009), this study examines ways to reimagine the physical language laboratory to an online language laboratory space for students and teachers through the utilization of synchronous (real-time) and asynchronous (non-real-time) tech tools that are available for free. More specifically, it explores the synchronous tool Zoom and asynchronous tools Edmodo and Wikispaces over the course of six weeks.

2. LITERATURE REVIEW

2.1 The Language Laboratory

In the late 1800s, as a result of Edison's phonograph, the concept of the language laboratory was born, as L2 students were able to record their own voices (Kitao, 1995). Although the first language laboratory appeared in 1929 in Middlebury College (Middlebury, Vermont), not until 1945 at Louisiana State University was a physical space installed for a language laboratory (Rivers, 1982). By the 1950s, with inventions such as the tape recorder, schools started creating physical language laboratories where students individually interacted with instructors to improve language proficiencies (Sánchez, 1959). By 1959, 240 out of almost 1900 institutions of higher education in the United States had language laboratories (Haber, 1963).

The popularity of the language laboratory increased in the 1960s (Roby, 2004) in the United States not only due to the 1958 National Defense Act, legislation where the government helped to fund the installation of language laboratories, but also due to new language theories, such as Audiolingualism, emerging (Salaberry, 2001). By 1964, 6,000 language laboratories had been installed in secondary schools (Diekhoff, 1965; Hocking 1967; Roby, 2004). It was during this boom (Roby, 2004) that the majority of research on the language laboratory was completed. Research showed that language laboratories have a positive impact on developing L2 skills (Allen, 1960; Keating, 1963; Lorge, 1964; Ross, 1967; Smith, 1969a, 1969b). Lorge (1964) examined two groups of high school L2 French students, one that completed language laboratory activities for 60 minutes weekly and one that did not complete these activities with the aid of the language laboratory, over the course of a year. In order to assess conventional skills (vocabulary, grammar, silent reading) and audio-lingual skills (listening, speaking), a variety of tests were administered to all students. Although no differences were found for the conventional skills, the language laboratory group received higher scores for listening and speaking. Ross (1967) discussed the advantages of utilizing the language laboratory was that it provided a way to train students' ears for listening as it offered individualized instruction and a way to directly receive input from the instructor without having interference from other stimuli.

In addition to the advantages of language laboratories, Neidt & Hedlund (1965) explored students' reactions to language laboratory activities in the high school setting. Six hundred twenty language learners from French, German, and Spanish courses completed a variety of activities in an audio-lingual laboratory. Their experiences were assessed through questionnaires that were administered five times throughout the school year. Results revealed that students believed that the effective length of a language laboratory activity for optimal concentration should be approximately be 20 minutes and that different activities were perceived to be better for certain languages and levels.

Although research showed that there were benefits to the physical language lab during its height, throughout the next several decades, due to other technologies developing and pedagogical approaches to L2 learning evolving, the demand and use of language laboratories constantly fluctuated (Garcia & Wolfe, 2001). In the 21st century, the physical language laboratory is almost non-existent (Garrett, 2009). However, research still has indicated that with the integration of a physical language laboratory, L2 skills, such as speaking (Mohammed, 2017) and listening (Navas Brenes, 2006) have improved.

It has also shown that when a language laboratory is used, it should be modernized to include the most current tools (Lokmacioğlu et al., 2015) or a multimedia tools used in the classroom to "develop an interactive multimedia system for language classroom to facilitate learning activities" (Yulianto, Shodiq, & Dewi, 2013, p. 708).

In the 21st century, computer assisted language learning (CALL) and Web 2.0 provides L2 learners a variety of opportunities to engage with technology (Ostrow et al., 2017; Soumplis et al., 2011). Since language learning is considered a social process (Vygotsky, 1978; Lantolf & Pavlenko, 2000), these technological means allow learner-learner interaction to occur online (Karpova, Correia, & Barana, 2009; Lewis, O'Rourke, & Dooly, 2016; Lin, Zheng, & Zhang, 2016) and mediate learning (Lenkaitis, 2020). Textbook companies have also designed online platforms where students and instructors can interact with course material and one another (Bohinski, 2014) and virtual environments, including software, exist were students and instructors can communicate with one another to strengthen language skills (Sanako Corporation, 2019; SANS Inc., 2019). These technological tools are even more valuable today with the current COVID-19 global crisis (Lenkaitis et al., 2020). Because of this, it is important to examine the ways in which these tools can modernize the physical space to an online space.

2.2. Online Pedagogical Approaches

Instructors can utilize synchronous and asynchronous means to carry out computer-mediated communication (CMC) activities. Synchronous CMC is complete in real-time while asynchronous CMC is done in non-real-time. Regardless of what type of pedagogical approach is chosen, each has its unique advantages and disadvantages. Therefore, both synchronous and asynchronous CMC need to be explored to create an online language laboratory.

2.2.1. Advantages and Disadvantages of Synchronous Learning

Interactionist theories (Gass, 1997; Long, 1996; Pica, 1991, 1994) support that face-to-face (F2F) interaction promotes second language learning. Due to the technologies that are available for the 21st century learner, a variety of interaction, a face-to-face interaction can be created between language learners via synchronous environments. Online language learning occurs as communication skills develop (Bueno 2011; Chen et al., 2005; Kern et al., 2004) and a virtual co-presence is created (de Fornel, 1994).

In synchronous CMC, students virtually connect in real-time through applications such as live online chat and video conferencing (Healey, 2016; Helm & Guth, 2010). Through virtual exchange,[2] instructors and students are able to interact with others by using a personal device, from off-campus, and out of the classroom to complete course activities (Bohinski, 2014; Lenkaitis 2019). This type of collaboration, where learners in geographically different locations are partnered with one another through the use of technology (Dooly, 2017), affords students to benefit from the social aspects of language learning (Borup et al., 2012; Little, 1990; Prince, 2011) and have a joint autonomous experience (Little, 1991; Little & Brammerts, 1996) since it allows for "team decision-making, brainstorming, [and] community building" (Branon & Essex, 2001, p. 36). It also supports the creation of a more authentic language environment (Morollón Martí & Fernández, 2016) by providing students more opportunities to practice the L2 (Bueno, 2011) and, in turn, reducing the frequency of students switching to their first language (L1). Lenkaitis (2020) examined the use of SCMC among L2 Spanish learners from the same university for a 6-week period. Participants used video conferencing, via Zoom, to explore language learning and autonomy by discussing weekly topics that coincided with coursework. In addition to significant differences between pre- and post-surveys, qualitative data showed that Zoom afforded participants a way to engage with the L2 (Little, 1991) and interact with other L2 learners (de Fornel, 1996) to develop their language skills and develop autonomy through individual and group authentic experiences.

Although synchronous communication allows learners to get immediate feedback from their partners, not only can organizing meeting times be challenging (Branon & Essex, 2001), but students

also do not have adequate time for reflection (Branon & Essex, 2001). O'Dowd and Ritter (2006) also discuss several studies (Belz, 2003; Ware, 2005) that were not highly successful due "low levels of participation, indifference, tension between participants, or negative evaluation of the partner group" (p. 624).

2.2.2. Advantages and Disadvantages of Asynchronous Learning

The time delay that is made available through asynchronous communication has provided students with more time to delve deeper into the text or topic and provide more thoughtful responses in return (Branon & Essex, 2001; Burnett, 2003; Meyer, 2003; Sotillo, 2000; Wu & Hiltz, 2004). Online discussions often require students to be more active on a continuous basis and are typically student-driven and autonomous in nature (Little, 1991); therefore, the students take responsibility in directing and molding the class's discussion (Wu & Hiltz, 2004). Bohinski and Leventhal (2015) carried out a 6-week asynchronous exchange between L2 Spanish participants in the USA and L2 English participants in Spain. Via an asynchronous virtual exchange, participants discussed specific holidays with their partners through email, which allowed the authors to analyze the ways in which participants discussed cultural aspects of a language (Klein & Solem, 2008). Results revealed that participants' intercultural communicative competence developed as they enthusiastically participated and shaped their virtual discussion, the majority of which took place over break and all of which was apart from coursework.

Although the ability to work at home, at one's own pace, and take charge of one's learning (Holec, 1981) are major advantages to asynchronous learning (Buxton, 2014; Koory, 2003; Murphy et al., 2011; Wen et al., 2012), the flexibility also creates challenges in the course as well. Due to the lack of face-to-face interaction or time differences, it is difficult for students to get answers to their questions and/or appropriate feedback (Wen et al., 2012). Other disadvantages of asynchronous communication include a long delay in feedback, disconnect among students, and fewer student responses received (Branon & Essex, 2001).

3. RESEARCH QUESTIONS

Due to the affordances of the physical language laboratory realized during its peak and the present-day value seen in using synchronous and asynchronous technological tools in the classroom, this study will create a personalized online language laboratories with these synchronous and asynchronous tools. Although current research has shown that the integration of a physical language laboratory is beneficial to L2 learners (Mohammed, 2017; Navas Brenes, 2006) and that tools should include modern (Lokmacioğlu et al., 2015) and interactive (Yulianto et al., 2013) tools, this study is the first to propose the creation of a completely online language laboratory. Therefore, this study will answer the following research questions (RQs):

RQ1: What are the affordances for L2 learners of an online language laboratory created from synchronous and asynchronous tech tools?

RQ2: What are the L2 learners-perceived satisfaction of the synchronous and asynchronous activities used in the creation of an online language laboratory?

4. METHODOLOGY

Prior to the 6-week study, participants completed practice synchronous and asynchronous activities with all the technologies that would be involved in the online language laboratory to ensure that everyone had accounts and understood the functionality of each tool. When the 6-week treatment began, participants received weekly instructions regarding their synchronous and asynchronous

class assignments. Activities included a blend of synchronous and asynchronous group activities on Zoom, (synchronous), Edmodo (asynchronous), and Wikispaces (asynchronous). In addition to these activities, participants were also asked to complete a weekly survey that included Likert-scale and open-ended questions. A mixed methods design was carried out as both qualitative and quantitative analyses were completed. Descriptive statistics and t-tests were run using IBM SPSS Statistics 25.0 on Likert-scale questions while NVivo 12 for Windows was used to analyze open-ended responses.

4.1. Participants

There were a total of 289 students who completed all pre- and post-surveys. However, only the 188 students who completed the additional six weekly surveys were included in this study. Therefore, a student's data was included in the analysis if he completed all eight surveys.

The 188 total participants were registered for an introductory or intermediate French, Italian, or Spanish course at a public university in the United States at the time of the study. Out of the total participants, 43 were L2 French learners, 45 were L2 Italian learners, and 100 were L2 Spanish learners. The average age of participants was 18.93 years old (SD=1.86). No control group was used as this was a quasi-experimental study and all students were using the synchronous and asynchronous tools for their coursework.

4.2. Weekly Procedures

Over the course of six weeks, participants were instructed to complete a required weekly synchronous and asynchronous activity. However, in Weeks 3-4, participants were told to try just the audio feature for part of their synchronous sessions so that in Weeks 4-5 that could choose whether to complete their sessions using audio AND video or just audio.[3] In Weeks 3- 6, participants also had the option of what asynchronous tool to choose to complete their assignments. Besides all of the required synchronous and asynchronous activities, participants were instructed to complete a weekly survey.

This study's participants were told to complete these weekly online tasks in groups without the assistance of an instructor (Balaman & Sert, 2017). Participants were given weekly directions to activities, but no explicit feedback was given and the data collected was 'completely based on emergent and situated learner-learner interactions' (Balaman & Sert, 2017, p. 606). Table 1 details all of the weekly activities during the language laboratory treatment period.

4.3. Technology Used

Although the physical language laboratory has become archaic, the aim of this study is to reveal the ways in which an online space can be created to become the "modern-day" language laboratory, one that will benefit L2 learners in their language learning process. A variety of tech tools were chosen by the researcher to create the online language laboratory space, each being free to access. Although some of these tools may have been studied apart from the context of being used for a language laboratory (Balasubramanian, et al., 2014; Sulisworo, 2012), this article aims to look at using these tools for this purpose.

4.3.1. Zoom

Zoom (https://zoom.us) is a resource that allows its users to video conference using audio and/or video, record, screen share, and online chat. The basic free account allows users to synchronously meet with one person for unlimited minutes and more than two people for up to 40 minutes per Zoom session. It is user-friendly since only the person hosting the meeting needs to have an account. For others to join the synchronous session, the meeting host will share a meeting link with attendees. Zoom was chosen for the online language laboratory to promote spontaneous conversation (Kern, 2014), language learning, and autonomy (Lenkaitis, 2020).

Table 1. Online language laboratory activities during the 6-week treatment

<table>
<tr><th></th><th>Synchronous group work</th><th colspan="2">Asynchronous group work</th></tr>
<tr><th>Week</th><th>Zoom</th><th>Edmodo</th><th>Wikispaces</th></tr>
<tr><td>1</td><td rowspan="4">For Weeks 1 – 4
- Videoconferencing session</td><td>- Post as a follow-up to Zoom session
- Respond to at least one person in your partnership</td><td>N/A</td></tr>
<tr><td>2</td><td>N/A</td><td>- Post as a follow-up to Zoom session
- Respond to at least one person in your partnership</td></tr>
<tr><td>3</td><td colspan="2" rowspan="3">For Weeks 3 – 6
- Choice to complete the asynchronous work using either Edmodo or Wikispaces
- Post as a follow-up to Zoom session
- Respond to at least one person in your partnership</td></tr>
<tr><td>4</td></tr>
<tr><td>5</td><td rowspan="2">For Weeks 5 & 6
- Choice to use audio AND video or just audio during the videoconferencing session</td></tr>
<tr><td>6</td><td></td><td></td></tr>
</table>

4.3.2. Edmodo and Wikispaces

Edmodo (https://www.edmodo.com) and Wikispaces (https://www.wikispaces.com) are online platforms that students can join for free. They are used to collaborate, upload documents, create blogs, create groups, and share resources. Although these resources have synchronous features such as chat, they were both used as asynchronous tools for this study. Although Wikispaces was used for this study, since having collected data, Wikispaces is no longer hosting sites as the costs associated with updating its infrastructure was too high. Edmodo was chosen for the online language laboratory to foster student engagement (Balasubramanian et al., 2014) and collaboration (Sulisworo, 2012).

4.4. Data collection

4.4.1. Pre- and Post-Surveys

All participants completed a pre-survey prior to the study to gather background information. In addition to this background information, students were asked Likert-scale questions regarding language skills, knowledge, and technology tools. Since videoconferencing activities, via Zoom, were complete each week, participants were asked an additional question about L2 speaking. The following questions were on pre-surveys:

1. Using the scale below, how satisfied are you regarding your _____ (L2 listening skills, L2 reading skills, L2 speaking skills, L2 writing skills, or knowledge of the L2)?
2. Using the scale below, how long do you believe you could carry on a conversation in the L2?
3. Using the scale below, how satisfied are you regarding the _____ technology (Zoom, Edmodo, and Wikispaces)?

To answer all Likert-scale questions regarding satisfaction, participants used these five levels to indicate the level of satisfaction: 1 – Very dissatisfied; 2 – Somewhat dissatisfied; 3 – Neither dissatisfied nor satisfied; 4 – Somewhat satisfied; 5 – Very satisfied. To answer the Likert-scale question about L2 conversation length, the following seven levels were used: 1 – Not at all; 2 - 1 – 15 minutes; 3 – 16 – 30 minutes; 4 – 30 – 45 minutes; 5 – 46 – 60 minutes; 6 – More than an hour, but less than two; 7 – More than two hours.

At the end of the 6-week treatment period, participants completed a post-survey to reflect upon their entire experience. Besides background information, the pre-survey questions were used on the post-survey. However, because participants were rating themselves based on the impact of the online language laboratory, the phrase of "As a result of your synchronous and asynchronous activities via the online language laboratory…" was added to the beginning of each question. In addition, participants were also asked to discuss their tech tools preferences during their online language laboratory experience.

4.4.2. Weekly Surveys

Participants completed weekly surveys to reflect on the options that they had during weekly online language laboratory assignments in Weeks 3-6. Participants answered questions the following open-ended questions regarding their decision to use audio AND video or solely video for Zoom sessions and their choice as to whether to use Edmodo or Wikispaces for asynchronous activities. The weekly open-ended survey questions included:

1. Please discuss your thoughts on using the audio versus the video feature. (Weeks 3-4)
2. Please explain why you chose the audio AND video versus solely the audio feature for the weekly Zoom activity. (Weeks 5-6)
3. Please explain why you chose Edmodo or Wikispaces for the weekly discussion activity. (Weeks 3-6)

5. RESULTS

5.1. Participant Completion of Activities

Researchers confirmed participants' completion of the online language laboratory activities. Over the course of 6 weeks, the 188 participants of this study completed a variety of synchronous and asynchronous activities. At least 74% of all participants completed synchronous and asynchronous activities every week. Throughout the 6-week study, participants had a higher completion rate of synchronous activities than asynchronous work. When given the opportunity to choose to use just audio for Zoom sessions, 21% and 25% of participants choose solely this feature for Weeks 5 and 6, respectively.

Although all participants were required to complete weekly asynchronous work. When given the option of what platform to use in Weeks 3 - 6, the majority of participants chose Edmodo week after week. Table 2 shows the completion rate for all of the weekly activities while Table 3 and 4 show additional breakdowns of group work.

5.2. Quantitative Results

5.2.1. Pre- and Post-Surveys

Statistical analyses were complete on the pre- and post-survey Likert-scale questions using IBM SPSS Statistics 25.0. All means for self-rated questions regarding language skills, knowledge, and conversation length increased from the pre- to post-surveys, the largest being for L2 speaking skills. Table 5 details the means and standard deviations for self-rated questions on the pre- and post-surveys.

When comparing participant pre- and post-surveys, for the five self-rated questions regarding language skills and L2 knowledge, results from repeated-measures t-tests revealed significant differences for all questions: L2 reading skills $t(187) = -6.32$, $p = 0.00$, L2 writing skills $t(187) = -9.38$, $p = 0.00$, L2 listening skills $t(187) = -7.69$, $p = 0.00$, L2 speaking skills $t(187) = -9.88$, $p = 0.00$, L2 knowledge $t(187) = -8.79$, $p = 0.00$, and Conversation length $t(187) = -7.01$, $p = 0.00$. The effect size for this analysis ($d = 0.88$ for L2 speaking, $d = 0.57$, for L2 reading, $d = 0.86$ for L2 writing, $d = 0.62$ for L2 listening, $d = 0.77$ for L2 knowledge, and $d = 0.32$ for L2 conversation

Table 2. Completion of online language laboratory activities*

Week	Synchronous group work		Asynchronous group work	
	Zoom		Edmodo or Wikispaces**	
	Number of participants who DID complete activity	Number of participants who DID NOT complete activity	Number of participants who DID complete activity	Number of participants who DID NOT complete activity
1	173 (92%)	15 (8%)	140 (74%)	48 (26%)
2	175 (93%)	13 (7%)	151 (80%)	37 (20%)
3	174 (93%)	14 (7%)	161 (86%)	27 (14%)
4	173 (92%)	15 (8%)	152 (81%)	36 (19%)
5	167 (89%)	21 (11%)	148 (79%)	40 (21%)
6	175 (93%)	13 (7%)	153 (81%)	35 (19%)

*Percentages were rounded up at 0.5. Therefore, some percentages are identical for two different numbers.

**Participants were required to use Edmodo for Week 1 and Wikispaces for Week 2. For Weeks 3-6, participants had the option to use either Edmodo or Wikispaces.

length) indicated that there were moderate to large practical significances for all language skills while there was a small practical significance for conversation length. (Cohen, 1969).

When looking at self-rated questions on the technology tools used in the online language laboratory from the pre- to post-surveys, means increased for satisfaction with Zoom, Wikispaces while satisfaction with Edmodo stayed the same. Table 6 details the means and standard deviations for the self-rated questions on technology tools on the pre- and post-surveys.

When comparing participant pre- and post-surveys for these four self-rated questions regarding the technology tools used in the online language laboratory, results from repeated-measures t-tests revealed significant differences for three of the four questions: Zoom $t(173) = -7.76$, $p = 0.00$, and Wikispaces $t(150) = -8.11$, $p = 0.00$.[5] Results for the effect size for this analysis ($d = 0.68$ for Zoom and $d = 0.80$ for Wikispaces) showed that there were small to large practical significances (Cohen, 1969).

Table 3. Breakdown of participants' completion of Zoom sessions[4] when given the option to use audio and/or video

Week	Audio	Audio and Video
3	13 (7%)	161 (93%)
4	9 (5%)	164 (95%)
5	35 (21%)	132 (79%)
6	43 (25%)	132 (75%)

Table 4. Breakdown of participants' completion of Edmodo and Wikispaces work[4] when given the option to choose either Edmodo or Wikispaces for asynchronous work

Week	Edmodo or Wikispaces
3	Edmodo – 143 (89%) Wikispaces – 18 (11%)
4	Edmodo – 138 (91%) Wikispaces – 14 (9%)
5	Edmodo – 132 (89%) Wikispaces – 16 (11%)
6	Edmodo – 146 (95%) Wikispaces – 7 (5%)

Table 5. Means and standard deviations for self-ratings on pre- and post-surveys regarding language skills, knowledge, and conversation length*

	Mean		Std. Deviation	
Using the scale below, how satisfied are you regarding your…	**Pre**	**Post**	**Pre**	**Post**
L2 reading skills?	**3.17**	**3.69**	1.01	0.82
L2 writing skills?	**2.76**	**3.56**	1.01	0.84
L2 listening skills?	**2.79**	**3.41**	1.09	0.89
L2 speaking skills?	**2.64**	**3.46**	1.01	0.84
knowledge of the L2?	**2.93**	**3.61**	0.95	0.81
Using the scale below, how long do you believe you could carry on a conversation in the L2?	**1.23**	**1.61**	1.15	1.20

*Groupings that are bolded had significant differences as per repeated-measures t-tests.

Table 6. Means and standard deviations for self-ratings on pre- and post-surveys regarding technology tools*

	Mean		Std. Deviation	
Using the scale below, how satisfied are you regarding the…	**Pre**	**Post**	**Pre**	**Post**
Zoom technology?	**2.84**	**3.46**	0.82	1.00
Edmodo technology?	3.70	3.70	0.85	0.90
Wikispaces technology?	**3.03**	**3.70**	0.76	0.90

*Groupings that are bolded had significant differences as per repeated-measures t-tests.

5.3. Qualitative Results

5.3.1. Weekly Surveys

Qualitative analyses were completed on the weekly survey open-ended questions using NVivo 12 for Windows. After completing word frequencies, it was clear that informed patterns emerged from the data for coding. From these, the researcher created five categories for the weekly open-ended questions. Regarding the explanation of using certain Zoom features included: 1) Influence of partner(s), 2) No reason for choice, 3) Preference, 4) User-friendliness, and 5) Virtual co-presence. The five categories for the explanation of choosing Edmodo or Wikispaces were: 1) Familiarity, 2) Influence of partner(s),

Table 7. Researcher-created coding categories, definitions, and breakdown for Zoom choice6

Coding categories	Week → Definitions of coding categories↓	3	4	5	6
Influence of partner(s)	When a participant wrote about making a decision based on their partner(s). This included when a partner did not have a camera.	3 (2%)	3 (2%)	9 (5%)	4 (2%)
No reason for choice	When a participant indicated choice was made randomly or for no reason. This category also included non-applicable responses.	16 (9%)	23 (13%)	26 (15%)	19 (11%)
Preference	When a participant specified that they or the group just liked either audio or video better.	20 (11%)	9 (5%)	7 (4%)	13 (7%)
User-friendliness	When a participant discussed the ease of using one feature to make the assignment more manageable for them.	37 (21%)	43 (25%)	52 (31%)	70 (40%)
Virtual co-presence	When a participant discussed creating an interactive environment with the feature(s).	99 (57%)	94 (55%)	74 (44%)	69 (39%)

3) No reason for choice, 4) Preference, and 5) User-friendliness. For the explanation of completing Duolingo, the six coding categories were: 1) Extra credit, 2) Fun and enjoyable, 3) Good use of time, 4) Goal motivation, 5) No reason for choice, and 6) Practice.

After the two coders independently coded the data, a 99.0% agreement was reached for the open-ended Zoom data (Kappa = 0.94 with $p < 0.001$) and a 98.8% agreement for the Edmodo and Wikispaces open-ended data (Kappa = 0.76 with $p < 0.001$). Coders then worked together to reconcile the differences and reach a 100% agreement. For explanations regarding the use of audio AND video versus audio, the two highest coded categories across Weeks 3-6 were Virtual co-presence and User-friendliness. For all weeks where participants had a choice as to what technology tool to use for their asynchronous work, User-friendliness was the highest coded category while Extra credit had the most coded instances for Weeks 3-6. Table 7 indicates the researcher-created coding categories, their definitions and breakdown of the participant responses for the Zoom features of using audio AND video versus audio while Table 8 gives examples of coded instances. Table 9 and 10 list the same for the participant responses of the choice between Edmodo and Wikispaces.

5.3.2. Post-Surveys

Qualitative analyses were also complete on the post-survey open-ended questions using NVivo 12 for Windows. Word frequencies were also completed on the open-ended answers to discuss preferences of all technology tools using during the entire 6-week online language laboratory experience. Because the majority, if not all, responses contained explanations that referred to more than one tool, the total number of coded instances were more than number of responses. Informed by the word

Table 8. Examples of coded responses for Zoom choice

Coding category	Example
Influence of partner(s)	Week 5 – Participant 1 My partner chose to use the audio and I'm assuming so she would be able to read off her notes on the computer.
No reason for choice	Week 5 – Participant 37 Decided randomly.
Preference	Week 4 – Participant 15 I preferably don't like video chat especially with people i [sic] don't know really well. it gets a little awkward. If you know your partner its [sic] not a problem.
User-friendliness	Week 6 – Participant 24 Audio and Video is the easiest way to carry out a conversation.
Virtual co-presence	Week 3 – Participant 161 I think video chat is the most interactive and it is helpful to be able to see the persons face when communicating.

Table 9. Researcher-created coding categories, definitions, and breakdown for Edmodo and Wikispaces choice[6]

Coding categories	Week → Definitions of coding categories↓	3	4	5	6
Familiarity	When a participant mentioned having used the platform before.	18 (11%)	15 (10%)	22 (15%)	35 (23%)
Influence of partner(s)	When a participant wrote about making a decision based on their partner(s).	28 (17%)	25 (16%)	14 (9%)	14 (9%)
No reason for choice	When a participant indicated choice was made randomly or for no reason. This category also included non-applicable responses.	26 (16%)	14 (9%)	14 (9%)	20 (13%)
Preference	When a participant specified that they or the group just liked one platform better.	9 (6%)	15 (10%)	13 (9%)	8 (5%)
User-friendliness	When a participant discussed the ease of using the platform, visual appeal, and helpful features.	80 (50%)	83 (55%)	85 (57%)	76 (50%)

frequencies, the three researcher-created categories included the following: 1) Negative aspects, 2) Positive aspects, and 3) Indifference/neutrality. The first two main categories were further broken down into each synchronous and asynchronous technology tool: Edmodo, Wikispaces, and Zoom. As the names imply, the Negative aspects and Positive aspects categories referred to aspects, either negative or positive, that the participant about a particular technology tool. Indifference/neutrality is when a participant noted that there was no difference between tools.

Table 10. Examples of coded responses for Edmodo and Wikispaces choice

Coding category	Example
Familiarity	Week 5 – Participant 7 I have no preference for either; it just so happens that we have utilized Edmodo more and so we stuck with it.
Influence of partner(s)	Week 6 – Participant 112 My partner chose it!
No reason for choice	Week 5 – Participant 51 No particular reason.
Preference	Week 3 – Participant 78 I prefer to use Edmodo to Wikispaces.
User-friendliness	Week 4 – Participant 79 Edmodo is easier to use than Wikispaces, it's easier to navigate and more straightforward.

Two coders worked independently to code the data. A 97.8% agreement was achieved (Kappa = 0.81 with $p < 0.001$). To reach a 100% agreement, they worked together to reconcile differences. Out of the 168 total number of coded instances, the highest coded tool for Positive aspects was Zoom. Conversely, for Negative aspects, Zoom and Wikispaces were the two highest coded technology tools. Table 11 details the breakdown of coded instances indicating preferences of the technological tools.

6. DISCUSSION

Although the physical language laboratory is almost non-existent (Garrett, 2009), quantitative and qualitative indicated that with the integration of an online language laboratory provided participants with opportunities to interact with their partners and the language they were learning (Lenkaitis, 2020). Just like the traditional physical language lab was visited as part of the learning experience, participants accessed this language laboratory through virtual means apart from class. It was clear that this experience modernized the laboratory experience as it included current tools (Lokmacioğlu et al., 2015) and activities that promoted learning (Yulianto et al., 2013). Via the synchronous tool Zoom and asynchronous tools of Edmodo and Wikispaces, participants collaborated through CALL resources (Karpova et al., 2009; Lewis et al., 2016; Lin et al., 2016). It is important to note that the findings are limited to the choice of tools for both synchronous (Zoom) and asynchronous platforms

Table 11. Researcher-created coding categories and breakdown for technology preferences*

Main category	Sub-category	Number of coded instances
Negative aspects	Edmodo	7 (4%)
	Wikispaces	22 (13%)
	Zoom	23 (14%)
Positive aspects	Edmodo	36 (21%)
	Wikispaces	6 (4%)
	Zoom	52 (31%)
Indifference/neutrality	N/A	22 (13%)

*Percentages were rounded up at 0.5 and calculated by the total number of coded instances.

(Edmodo & Wikispaces) used in this study. In order to answer this study's research questions, the following two subsections will answer RQ1 (What are the affordances for L2 learners of an online language laboratory created from synchronous and asynchronous tech tools?) and RQ2 (What are the L2 learners-perceived satisfaction of the synchronous and asynchronous activities used in the creation of an online language laboratory?) respectively.

6.1 Affordances of An Online Language Laboratory

It was evident that the creation of an online language laboratory provided opportunities for a collaborative (Little, 1991; Little & Brammerts, 1996) and individual autonomous learning (Holec, 1981) in higher education. Asynchronous and synchronous group work was completed through synchronous (Zoom) and asynchronous (Edmodo and Wikispaces) resources. Participants were able to record their voices like in physical language laboratories (Kitao, 1995), interact with partners (Karpova et al., 2009; Lewis et al., 2016; Lin et al., 2016), and have these autonomous learning experiences (Holec, 1981; Little, 1991). The majority of participants' completion of the required synchronous and asynchronous work over the 6-week study suggested that the language laboratory experience was a fruitful one. The participants' self-ratings of L2 language skills, knowledge, and conversation length showed that the online language laboratory allowed students to engage with other L2 learners beyond the classroom walls to complete course activities (Lenkaitis, 2017, 2020a). It was apparent that participants believed that their L2 speaking skills improved the most and their confidence of how long they could participate in a conversation increased. Perhaps it was due to the fact that the majority of students completed the required synchronous activities more than asynchronous ones and/or that the time spent on Zoom sessions was greater than that on Edmodo or Wikispaces. This may also suggest why participants noted more positive aspects of Zoom in their final ratings.

Regardless of the reasons, the synchronous sessions allowed L2 learners to "practice...speaking skills with...fellow classmates" (Participant 44) since Zoom "very helpful for practicing real conversation [and] listening and speaking skills" (Participant 59). Completing synchronous sessions more than asynchronous ones showed that participants believed that "talking to someone was more enjoyable than writing a post" (Participant 64). Even though "it was hard to work . . . when everyone is fairly busy" (Participant 39), the engagement with other L2 learners (Little, 1991) allowed them to create an interactive environment (Lenkaitis, 2017, 2020a) by creating a virtual co-presence (de Fornel, 1996). In addition, it provided learners with an autonomous experience (Little, 1991; Little & Brammerts, 1996) where they were able to work with their partners to create a speaking community (Branon & Essex, 2001) an authentic learning environment (Bueno, 2011).

The majority of participants also completed all asynchronous activities and their self-ratings for these skills also increased as a result of the study this coursework. They recognized that "writing and reading skills can be improved upon" (Participant 143) through non-real-time activities. Nonetheless, it was apparent that there was a strong preference of Edmodo over Wikispaces since it was "easier to navigate and understand" (Participant 155) and "more like a social network" (Participant 159). Since Edmodo was similar to other platforms that participants used outside of coursework and "[W]ikispaces was a more confusing version of [E]dmodo" (Participant 150), it appeared that Edmodo was the favored choice for a variety of reasons. However, participants' self-rating of satisfaction with the Wikispaces increased and showed significant results from pre- to post-survey while that of Edmodo stayed the same. Perhaps, with additional time spent utilizing this synchronous tool, L2 learners would recognize additional value that it could bring to the learning process.

6.2 Participant-Perceived Satisfaction of Synchronous and Asynchronous Activities

Participants recognized the advantages and disadvantages of utilizing both synchronous and asynchronous applications as they noted their satisfaction of using this study's technological tools. Regarding Zoom, the synchronous tool, when L2 learners were given a choice to choose solely video or audio AND video, the majority of participants choosing both audio AND video suggested that they

valued "collaborative learning experience" (Participant, 159) and benefited from the socialness of the learning process (Borup et al., 2012; Little, 1990; Prince, 2011) because it "felt like . . . actually talking to people. Instead of talking to my computer screen" (Participant 84). Because the majority of L2 learners are used to learning the language in a traditional classroom setting with an L2 instructor, the data also suggested that "facial expressions and body language matters [sic] when talking to people and understanding them" (Participant 40) since it is possible to "read lips as well as hear what the person is saying" (Participant 22). As the weeks continued, participants who were using just audio increased. Interestingly enough, although asynchronous communication allows students to have more time to reflect on the topic (Branon & Essex, 2001), some participants believed that being without video, but still utilizing real-time communication, allowed them to use notes, reflect about what they were doing (Little, 1991) and "focus more on dialogue" (Participant 62).

In addition to some of these synchronous activities affording participants time to reflect on their learning (Little, 1991), asynchronous activities showed that participants observed that non-real-time activities allowed the opportunity to spend additional time to focus and "practice" (Participant 174) topics. Although asynchronous communication allowed a self-paced environment (Holec, 1981), where participants were able to explore course content further (Branon & Essex, 2001; Burnett, 2003; Meyer, 2003; Sotillo, 2000; Wu & Hiltz, 2004), the data also suggested that participants felt disconnected from other L2 learners since there was a delay in communication (Branon & Essex, 2001) and the tools didn't "provide feedback" (Participant 40). Participant 3 said it best when stating the following: "[It] was kind of annoying because I had to wait for my partner to post before I could finish the assignment."

In any case, all types of online language laboratory resources were beneficial to at least one student and facilitated an interactive space for collaboration and learner autonomy. Participants found many, if not all, of the technology tools beneficial for L2 language learning and knowledge building. The words of Participant 147 "I feel that the technology is there to help us" demonstrate the reasons why regardless of preferences, a variety of resources should be available to accommodate all types of learners. For instance "Zoom offer[ed] the best of both worlds" (Participants 147) to one L2 learner since "with the video I could see myself speaking and that helped because I'm a visual learner not really an audio person" (Participant 163). But to another L2 learner it was "less distracting just to use audio because it allows me to focus more on what my partners are saying" (Participant 106).

7. LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

Even though this study explored both quantitative and qualitative data, most of the data was self-reported. Therefore, some participants may have not wanted to fully express their ideas, which in turn could have impacted their reflections. However, coding was complete to find commonalities among answers and the two independent coders did work together to choose the most representative examples from the analysis. In addition to having a control group in future studies in order to compare those who receive treatment with those that do not and implementing additional synchronous and asynchronous activities, adding additional questions to the weekly survey would be helpful.

Although there were many advantages of this modernized (Lokmacioğlu et al., 2015) language laboratory as seen through the data analysis, addressing the limitations for future studies will only strengthen the virtual language laboratory that was created by the researcher. Since language learning was assessed through participants' self-ratings, providing a language test before and after the online language laboratory experience in forthcoming research will be able to provide data to examine in what ways L2 learners' proficiencies developed as a result of the treatment. In addition, although participants had the choice to decide between using audio and video Zoom features, having more than one synchronous tool for L2 learners to utilize in future studies will allow the researcher to explore what real-time tool was their preferred choice. Finally, researching other asynchronous tools would be imperative as Wikispaces is no longer hosting sites.

8. CONCLUSION

The online language laboratory created in this study is a far cry from the first physical language laboratories (Sánchez, 1959). Regardless of the study's constraints, Web 2.0 allowed the researcher to create a collaborative environment (Ostrow et al., 2017) where L2 learners were able to engage with the L2 (Little, 1991) and interact with other L2 learners (de Fornel, 1996) in a completely online environment. Both quantitative and qualitative data suggested that participants were able to benefit in similar ways to the physical language laboratory. Individual and group authentic language experience made participants realize the value of both synchronous and asynchronous computer-mediated communication.

Since the physical language laboratory has become almost non-existent (Garrett, 2009), this study showed how it can be reimagined to an online language laboratory space for students and teachers by utilizing synchronous (real-time) and asynchronous (non-real-time) tech tools. Through the creation of this online language laboratory, development of participants' self-rated L2 language skills, knowledge, and conversation length was apparent and showed that L2 instructors should provide opportunities where L2 learners can expand their language skills outside of the classroom (Lenkaitis, 2017, 2020a). With the wealth of technology tools that are available in the 21st century, L2 instructors should incorporate these instruments to revolutionize their university classrooms in order to create a personalized online space (Nacheva-Skopalik & Green, 2016) for L2 learning. Learner-learner interaction that can occur online (Karpova et al., 2009; Lewis et al., 2016; Lin et al., 2016) and mediate learning (Lenkaitis, 2020a), as shown with this study, through the creation of an online language laboratory utilizing synchronous and asynchronous tools. These tools will ultimately transform their L2 students' language learning and will be applicable for both students and teachers during the current COVID-19 global crisis.

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ENDNOTES

1 Prior to a name change due to marriage, Chesla used her maiden name, Bohinski, for publications.

2 Terms that are synonymous with virtual exchange are telecollaboration, online intercultural exchanges, and teletandem (O'Dowd, 2018).

3 Prior to Week 3, participants were told that if they did not have access to a camera, they could record their session using just audio.

4 Percentages were calculated from the total number of participants who completed the weekly assignment. Percentages were rounded up at 0.5. Due to rounding, some totals may not equal 100%.

5 Although all participants completed all surveys, not all participants answered questions relating to the technology tools used in this study. Therefore, means were compared with the total number of participants that completed the post-survey questions. Having said that, df values are different for all of these t-tests.

[6] All participants did not indicate their explanations on the weekly surveys. Therefore, all totals are not identical. Percentages were also rounded up at 0.5 and calculated by the total number of participants that responded to each question per week. Due to rounding, some totals may not equal 100%.

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