The Role of Technology in Implementing Formative Assessment among Language Instructors

A dissertation presented to

the faculty of

The Gladys W. and David H. Patton College of Education of Ohio University

In partial fulfillment

of the requirements for the degree

Doctor of Philosophy

Yue Dong

April 2021

This dissertation titled

The Role of Technology in Implementing Formative Assessment Among Language Instructors

by

YUE DONG

has been approved for

the Department of Educational Studies

and The Gladys W. and David H. Patton College of Education by

Greg Kessler

Professor of Educational Studies

Renée A. Middleton

Dean, The Gladys W. and David H. Patton College of Education

Abstract

YUE DONG, Ph.D., April 2021, Instructional Technology

The Role of Technology in Implementing Formative Assessment Among Language Instructors

Director of Dissertation: Greg Kessler

This study sought to explore what formative assessment strategies are better supported using technology according to college language instructors, and how technology can be used to facilitate the implementation of formative assessment strategies. A gap between the teachers' beliefs about formative assessment and their real formative assessment applications was found existed due to a lack of professional support (Brink, 2017), heavy workload (Buyukkarci, 2014) and over-crowded language classes (Chen et al., 2013). However, few studies discussed how technology can be used to close the gap and facilitate formative assessment. In this study, 30 language instructors who were interested in computer assisted language learning (CALL) completed a web-based questionnaire of 42 questions. The questionnaire was used to collect both quantitative and qualitative information regarding the perceived use of technology in implementing different formative assessment strategies.

Dedication

To all the families, friends, and professors who have helped me along the way.

Acknowledgments

I would like to express my gratitude to my advisor Dr. Greg Kessler, and my committee members Dr. Strycker, Dr. Zhou, and Dr. Lascar for their consistent support and guidance during the running of this dissertation project.

Table of Contents

Page

Abstract 3
Dedication 4
Acknowledgments 5
List of Tables 8
List of Figures 9
Chapter 1: Introduction 10
Background of the Problem 10
Statement of the Problem 12
Purpose of the Study 13
Significance of the Study 13
Theoretical Framework 14
Definition of Terms 17
Research Setting 20
Limitation and Delimitation 21
Chapter 2: Literature Review 23
Definitions of Formative Assessment 23
Formative Assessment Strategies 30
Teachers' Perceptions and Practices of Formative Assessment 36
Formative Assessment in Second or Foreign Language Education 39
Technology Facilitated Formative Assessment 41
Computer-Based Formative Assessment 43
Student Response System Formative Assessment Method 45
Technology Facilitated Formative Assessment in Language Classroom 46
Chapter 3: Methodology 48
Research Purpose 48
Research Questions 49
Research Design 49
Participants and Sampling 51
Researcher's Role 52
Data Collection Procedures 52

Research Instrument 53
Reliability and Validity 57
Summary 58
Chapter 4: Results 62
Data Analysis Procedures 58
Participants 62
Gender and Native Language 63
Teaching Information 65
Technology Confidence 68
Definition of Formative Assessment 69
Research Question One 72
Research Question Two 78
Questionnaire Results 78
Document Analysis Results 87
Summary 93
Chapter 5: Discussion and Conclusion 97
Discussion of Results 97
Overall Frequency of Implementing Formative Assessment Strategies. 91
Student-Driven Formative Assessment Strategies 100
Teacher-Driven Formative Assessment Strategies 104
Summary 106
Implications 107
Research Implications 107
Implications for Action 108
Limitations and Future Research 109
References 112
Appendix A: Questionnaire: Language Teachers' Perceived Use of Technology for the Implementation of Formative Assessment Strategies 121
Appendix B: Questionnaire: Permission to Use and Adapt the Questionnaire 127
Appendix C: IRB Approval Letter 128
Appendix D: Participant Recruitment Email 129
Appendix E: Documents Analysis 131

List of Tables

Page

Table 1 A Comparison of Definitions of Formative Assessment 29
Table 2 Aspects of Formative Assessment 31
Table 3 The Seven Strategies of Assessment for Learning 32
Table 4 The Fifteen Strategies of Assessment for Learning 34
Table 5 Gender and Native Language Information 65
Table 6 Teaching Contexts 66
Table 7 Students' Language Proficiency Levels 67
Table 8 Language Skills 68
Table 9 Definition of Formative Assessment 71
Table 10 Technology Use and Formative Assessment Strategies 76
Table 11 Technology Use 85
Table 12 An Average Frequency of Formative Assessment Strategies Used 92
Table 13 A Summary of the Results of Student-Driven Formative Assessment Strategies 95
Table 14 A Summary of the Results of Teacher-Driven Formative Assessment Strategies 96

List of Figures

Page

Figure 1. Theoretical Framework: UTAUT-2. 16
Figure 2. A Screenshot of Document #1..... 87

Chapter 1: Introduction

Background of the Problem

After Assessment is known as one of the fundamental components of an education system. Formative assessment has emerged as an essential component of teaching for promoting students' learning achievements in K-12 and higher education over the past two decades and has been drawing increased attention among scholars in education. In this study, I used the Formative Assessment for Students and Teachers (FAST) State Collaborative on Assessment and Student Standards (SCASS)' s (2008) definition: "Formative assessment is a process used by teachers and students during instruction that provides feedback to adjust ongoing teaching and learning to improve students' achievement of intended instructional outcomes" (p. 1). Similarly, Black and Wiliam (2009) claimed the following:

> The teaching practice is formative when evidence about student achievement is elicited, interpreted, and used by teachers, learners, or their peers, to make decisions about the next steps in instruction that are likely to be better, or better founded, than the decisions they would have taken in the absence of the evidence that was elicited. (p. 7)

In my experience working as a language teacher teaching Chinese as a foreign language in the United States, I often observe teachers focusing more on summative assessment and grades instead of formative assessment and students' ongoing learning process. Most of the time, teachers would rather rely on graded homework, weekly quizzes, and mid-terms and final exams to judge students' learning progress than using formative

assessment strategies. Besides, many language teachers may lack the awareness and recognition of formative assessment when they are using teaching strategies such as collecting students' learning evidence using quick thumbs-up and thumbs-down, guiding peer-assessments and self-assessments, and providing descriptive feedback to students in practice. Moreover, most language teachers I know are still sticking with traditional paper-and-pencil formats when conducting both formative and summative assessment. For example, language teachers often assign oral practice homework to formatively assess students' speaking skills and wish to provide descriptive feedback on students' oral assignments. However, after receiving the students' electronic recording assignments, many teachers' practice is still to print out the text, circle the wrong pronunciation on the paper with a red ink pen, and write down the correct pronunciation. Language teachers need to notice and accept that information technologies are available to help remove some of the constraints limiting assessment practices in the past. And the burden of implementing assessment tasks no longer needs to fall on the teachers themselves.

Technology has been applied to facilitate teaching and learning in many different aspects and has expanded the means for assessing students' learning by providing new options of delivering, reporting, scoring, and collecting learning evidence (Jamieson & Musumeci, 2017). As reported by the National Research Council (2001), "it is possible to assess a much wider array of cognitive competencies than has heretofore been feasible" (NRC, 2001, p. 10). More specifically, emerging technologies have revolutionized the shift in focus from summative assessments to the ongoing and progressive nature of formative assessment.

Statement of the Problem

Formative assessment has been recognized as a promising instructional practice for improving students' learning achievement in many content areas. On the one hand, previous studies (Black & Wiliam, 1998; Buyukkarci, 2014; Chen et al., 2013), have shed light on teachers' perceptions and practices of formative assessment. However, most previous studies in formative assessment were only conducted within the context of K-12 education or college-level math and science classes. Few studies included college-level language instructors as their participants. Therefore, an investigation of language teachers' perceptions and practices of formative assessment is needed to reveal how language teachers understand and implement formative assessment.

Researchers found that a gap between the teachers' beliefs about formative assessment and their real formative assessment practices existed due to a lack of professional support (Brink, 2017), heavy workload (Buyukkarci, 2014) and over-crowded language classes (Chen et al., 2013). However, few studies discussed how technology can be used to close the gap and facilitate formative assessment. Many technological applications have been developed to help instructors implement formative assessment in their classes. But few studies have addressed how different emerging technologies fit with the variety of teachers' formative assessment strategies.

In conclusion, few studies have discussed the perceived role of technology in implementing formative assessment among college-level foreign or second language instructors.

Purpose of the Study

Noticing that the research on language teachers' implementation of formative assessment is insufficient, the purpose of this study is to explore what formative assessment strategies are better supported through the use of technology according to college language instructors, and how technology can be used to facilitate the implementation of formative assessment strategies.

The guiding questions of this study are:

1. What formative assessment strategies are supported by technology according to second and foreign language instructors? (QUAN)

2. How do language instructors who are interested in CALL perceive their use of technology to assess students' learning? (QUAL)

Significance of the Study

This study goes beyond previous studies in many ways. Firstly, the study presented in this dissertation is important for expanding on the basis of existing research and developing a more in-depth understanding of how language teachers implement formative assessment strategies using technology. According to Chang in her keynote speech in February 2019 at the eleventh annual English as a second language (ESL) symposium of the University of Arkansas, formative assessment is "a systematic change in how teachers function". She mentioned that formative assessment can be used for students of any level. However, it would be especially helpful for language learners because language learners are "dealing in the moment with language and cultural differences". Therefore, it is important for language teachers to understand and value the

progression of learning with the use of formative assessment strategies. Secondly, this study aims to explore language teachers' perceived role of technology in implementing formative assessment strategies, which is a research area that has not been sufficiently investigated by scholars.

Moreover, technology has been increasingly prevalent in language classrooms, especially among teachers who are interested in computer assisted language learning (CALL). With a focus on exploring how different emerging technologies fit with the variety of teachers' formative assessment strategies in the technology-rich college-level language teaching environment, I attempt to identify frequently used formative assessment strategies through technology in language classrooms, and to provide practical teaching suggestions regarding the use of technology.

Theoretical Framework

Many technology adoption models and theories have been developed to ensure the acceptance of innovative technology use, among which UTAUT-2 has been identified as the most suitable theoretical framework to frame this research.

Venkatesh and his colleagues incorporated four key factors that could influence adoption of technology in the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh et al., 2003). The first factor is performance expectancy, which refers to the degree to which a person believes that he or she could attain gains in performance with the help of a new technology. The second factor is effort expectancy, which refers to the degree of perceived ease of use of a new technology. The third factor in UTAUT model is social influence, meaning the influence from other people. The

fourth factor is facilitating conditions, which include the organizational support and technical support of technology adoption. According to their recent work published in 2012, Venkatesh, Thong, and Xu (2012) further incorporated three new constructs into UTAUT, which are hedonic motivation, price value, and habit, and extended UTAUT to UTAUT-2. UTAUT-2 has been tested and validated since it was published, and it has been widely quoted and reviewed over the past years, as evidenced by over 4600 citations. According to Chang (2012), UTAUT-2 produced an 18 percent improvement in the explained variance in behavioral intention and a 12 percent improvement of explained variance in actual technology use.

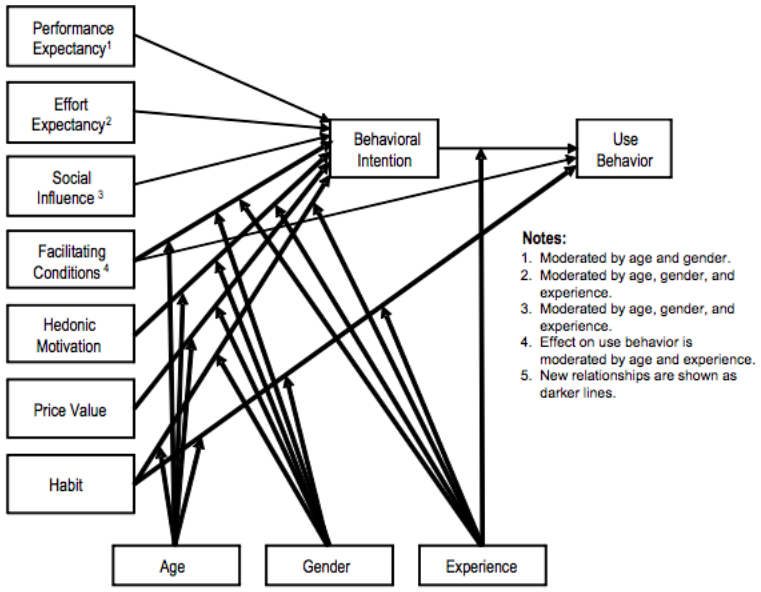
Figure 1 shows the model of UTAUT-2, which is used as the theoretical framework of this research. Hedonic motivation in UTAUT-2 refers to "the fun or pleasure derived from using a technology" (Venkatesh et al., 2012, p. 161). Price value factor is defined as the tradeoff between the perceived value of using a technology and the monetary cost of services. After examining relative empirical studies, the predictor of habit, which reflects the results of prior technology experiences, was added to UTAUT. In addition, three key moderators were identified as gender, age, and experience. It was noted that the impact of the four key factors on behavioral intention would be moderated by different combinations of the three moderators of age, gender, and experience.

Guided by this theoretical framework, one of the demographic questions asks about participants' confidence of using technology for educational purposes. According to Wozney, Venkatesh, and Abrami (2006), one of the greatest predictors of teachers' technology use would be their confidence that certain instructional goals can be achieved

using technology. And their confidence of using technology to achieve instructional goals could be influenced by their performance expectancy, effort expectancy, social influence, and other predictors in UTAUT-2 framework. Even though language instructors' perceived challenges or difficulties of using technology to support certain formative assessment strategies are not the focus of this study, in the discussion phase of this research, the seven key constructs of UTAUT-2 are used to understand instructors' response of why technology cannot be used to support certain formative assessment strategies.

Figure 1

Theoretical Framework: UTAUT-2



Note: The figure is taken from (Venkatesh et al., 2012, p. 160)

Definition of Terms

Test. A test is a method of measuring a person's ability, knowledge, or performance in a given domain. Most language tests are designed to measure language students' ability to perform language, which is speaking, writing, reading, and listening to a subset of language (Brown, 2004).

Assessment. Assessment is an ongoing process that covers a wider domain than a test. "Whenever a student responds to a question, offers a comment, or tries out a new word or structure, the teacher subconsciously makes an assessment of students' performance (Brown, 2004, p. 4)".

Summative Assessment. Assessments administered to students at the end of an instruction cycle to certify students or curriculum (Black & Wiliam, 2003).

Formative Assessment. Formative assessment is a process used by teachers and students during instruction that provides feedback to adjust ongoing teaching and learning to improve students' achievement of intended instructional outcomes (FAST SCASS, 2008, p. 1). Formative assessment is often also referred to as assessment for learning. In order to maintain the consistency of the original and adapted questionnaires, formative assessment is also defined as: "Formal and informal processes teachers and students use to gather evidence for the purpose of improving learning." (Chappuis, 2009) in the questionnaire.

Formative Assessment Strategies. According to (Goggin, 2018), Chappuis (2009) offered a more condensed interpretation that divided these conditions into three questions, and it has been commonly accepted and used in professional development

programs of formative assessment in the State of Ohio (Battelle for Kids, 2017; Snodgrass, 2010). Therefore, in this study, fifteen formative assessment strategies are framed as below:

Question one: Where am I going?

1. I post learning targets for what I am currently teaching.

2. I provide my students with learning targets that are in student-friendly language.

3. I provide my students with checklists and/or rubrics that are teacher- or commercially made.

4. I help my students develop checklists and/or rubrics.

5. I provide my students with models or examples of anonymous student work at various levels of quality.

Question two: Where am I now?

6. I gather real-time evidence of student learning simultaneously from all of my students with quick- check techniques like clickers, ABC cards, white boards, and/or thumbs-up.

7. In my classroom, students act as instructional resources to each other.

8. I provide descriptive feedback to my students about their performance.

9. My students provide each other with descriptive feedback.

10. My students are provided the opportunity to self-assess and set goals

Question three: How can I close the gap?

11. My students are given time to revise their work based upon feedback that they received.

12. My students engage in self-reflection about the quality of their work.

13. My students monitor their learning over time, using recordkeeping techniques.

14. I adjust the sequence and pacing of my instruction, based upon information gathered from ongoing formative assessments.

15. I target my instruction to learning gaps, misconceptions, or other incomplete understandings identified through formative feedback.

Technology-facilitated formative assessment. This term refers to any episode of the teacher learning more about student understanding through the use of technological devices (Shirley, 2009). Technology-facilitated formative assessment can be mediated through several types of device, such as audience response systems, interactive presentation tools, and computer adaptive testing programs.

Second language education. Second language education is where a language is taught to students in a country where that language is the primary language (Lake, 2013).

Foreign language education. Foreign language education is where the teacher teaches a language to students in a country where that language is not the native language (Lake, 2013).

Second language teachers. Teachers who are teaching a language in countries where that language is the native language. (e.g., teaching English to speakers of other languages in the U.S.).

Foreign language teachers. Teachers who are teaching a language in countries where that language is not the native language (e.g., teaching French in the U.S.).

Language Instructors. For the purposes of this study, language instructors are defined as college-level instructors engaged in teaching language skills, including second language teachers and foreign language teachers.

Technology confidence. Technology confidence in this research refers to teachers' confidence for using technology to achieve their instructional goals (Wozney et al., 2006; Ertmer & Ottenbreit-Leftwich, 2010).

Research Setting

The data of this research will be collected by web-based surveys through recruitment emails that are sent to the members of Computer-Assisted Language Instruction Consortium (CALICO). CALICO is an international organization dedicated to researching and developing the use of computer technology in language learning (CALICO, 2017). According to the official statement on the CALICO website, CALICO members include language educators, programmers, technicians, web designers, CALL developers, CALL practitioners, and second language acquisition researchers (CALICO, 2017). Therefore, CALICO members are interested in the application and exploration of CALL. And most CALICO members are college second or foreign language instructors who are enthusiastic about CALL. By targeting at language instructors who are CALICO members or attended at least one CALICO annual conference, participants of this exploratory research are expected to have a deep understanding of the potential of using technology to facilitate the implementation of different formative assessment strategies.

Limitation and Delimitation

Mauch and Birth (1993) stated that limitation is a factor that "may or will affect the study in an important way, but is not under control of the researcher" (p. 103) when a delimitation is a factor that purposefully controlled by the research to set boundaries of the study.

In my study, there are several delimitations concerning the time and location of the study and the sample of the study. Data collection of this study occurred from late November of 2019 to the beginning of January, 2020. It was deliberately set to cover the winter break of most universities in western countries in order to give participants more free time to answer the questionnaire. A study recruitment letter and a link to the web-based survey were sent via emails. This study only included college level language instructors who have shown their interests in applying technology in language teaching by joining a CALL-related organization, CALICO. Therefore, the participants of this study are all members of CALICO, which is an international organization in computer assisted language learning. However, most of the members of CALICO are from western countries or are engaged in English as a second or foreign language education. In this study, a voluntary and representative sample is used to explore college language instructors' perceived role of technology in implementing formative assessment regarding what formative assessment strategies can be supported through the use of technology and how technology can be used to facilitate different formative assessment strategies.

In this nonexperimental study, a web-based survey was used to collect language instructors' perceptions of using of technology in implementing formative assessment. Therefore, the investigation of this study is exploratory. Information about how technology could be used is gathered. Even though several documents and screenshots were provided by participants as examples showing how they actually used technology for implementing formative assessment, the investigation still cannot verify the quality of technology use. However, this may be an opportunity for further research. In addition to the limitations of lacking experimental design, the sample size of this research is also a limitation.

Chapter 2: Literature Review

The purpose of this research is to explore how technology can be used to facilitate the use of formative assessment strategies. This chapter will first provide an overview of the current understanding and definitions of formative assessment and formative assessment strategies. The researcher will next look into how second or foreign language instructors uses formative assessment and their perceptions on using formative assessment. Lastly, literature on how technology can play a role in facilitating formative assessment will be reviewed and summarized in this chapter. This chapter will also look into second/foreign language teachers' perceptions and practices of using technology to facilitate formative assessment, including their perceived benefits and barriers of using technology.

Definitions of Formative Assessment

Many researchers and scholars have made an effort to provide a comprehensive definition of formative assessment. In contrast to a summative assessment, which is also known as the assessment of learning, formative assessment is also often interpreted as the assessment for learning. A summative assessment usually refers to "the overall assessment of one's learning in order to measure the quality of instruction or mastery of one's learning" (Brink, 2017, p. 18) in the format of final grades. Black and Wiliam (1998) used the term assessment to refer to the activities teachers can use to know about their students' progress and difficulties with learning, which may include class observation, discussion with students, the reading of students' written work, and students' self-assessment. They argued that all of these activities undertaken by teachers or by their

students in self-assessment provide information for teachers to modify their teaching and learning activities. “Such assessment becomes formative assessment when the evidence is used to adapt the teaching to meet student needs” (Black and Wiliam, 1998, p. 3). Through this definition, (Black & Wiliam, 1998) showed a focus on the change in instruction for adapting to learning needs.

Later, the Assessment Reform Group (2002) defined formative assessment as “the process of seeking and interpreting evidence for use by learners and their teachers to decide where the learners are in their learning, where they need to go and how best to get there” (p. 2). Based on this definition, ten principles for formative assessment was set out to state that assessment for learning should:

Be part of effective planning of teaching and learning;

Focus on how students learn;

Be recognized as central to classroom practice;

Be regarded as a critical professional skill for teachers;

Be sensitive and constructive because any assessment has an emotional impact;

Take account of the importance of learner motivation;

Promote commitment to learning goals and a shared understanding of the criteria by which they are assessed;

Enable learners to receive constructive guidance about how to improve;

Develop learners’ capacity for self-assessment so that they can become reflective and self-managing;

Recognize the full range of achievements of all learners.

Based on both their earlier work (Black & Wiliam, 1998) and (Assessment Reform Group, 2002) mentioned above in this literature review, Black and Wiliam (2009) further restated their definition of formative assessment. They claimed that the teaching practice is formative when

> evidence about student achievement is elicited, interpreted, and used by teachers, learners, or their peers, to make decisions about the next steps in instruction that are likely to be better, or better founded, than the decisions they would have taken in the absence of the evidence that was elicited. (p. 7)

Comparing with their former definition mentioned earlier, this revised definition of formative assessment clearly pointed out that formative assessment should involve not only instructors, but also students. Similarly, in 2006, the Formative Assessment for Students and Teachers (FAST) State Collaborative on Assessment and Student Standards (SCASS) adopted the following definition for formative assessment as "a process used by teachers and students during instruction that provides feedback to adjust ongoing teaching and learning to improve students' achievement of intended instructional outcomes" (p. 1).

Black and Wiliam are definitely not the only researchers that noted the importance of student involvement. Involving students as instructional resource and peer reviewers in the process of assessment has been advocated many other education researchers and experts. Early in 1989, Sadler described the conditions for students' improvement as students' awareness of the learning goals, their continuous monitoring of personal growth, and students' ability to have "a repertoire of alternative moves or strategies"

(Sadler, 1989, p. 121). This description is interpreted and phrased as three leading questions of formative assessment that are often asked from the student's point of view: Where am I going? Where am I now? How can I close the gap? (Chappius, 2009, p. 11). These three leading questions of formative assessment are also used to structure the practical strategies when implementing formative assessment (Chappuis, 2009; Chappuis, 2014). It is worth noting that Chappuis published the second edition of her book in the formative assessment strategies in 2014. The three essential questions of formative assessment remain unchanged. However, Chappuis restated her definition of formative assessment from "formal and informal process teachers and students use to gather evidence for the purpose of improving learning" (Chappuis, 2009, p. 5) to "formal and informal processes teachers and students use to gather evidence for the purpose of informing next steps in learning" (Chappuis, 2014, p. 3), which emphasizes the key point of adjusting ongoing instruction as needed according to the information gathered.

Similarly, another commonly accepted definition of formative assessment was developed by Heritage in 2007. Heritage also mentioned the importance of involving both students and teachers with a special focus on using feedback loops to close the learning gap between the learning goal and their current learning achievement. Therefore, formative assessment is referred to "a process that takes place continuously during the course of teaching and learning to provide teachers and students with feedback to close the gap between current learning and desired goals" (Heritage, 2007, p. 10).

In addition, based on a critical review of previous literature in formative assessment, Bennett (2011) provided another definition of formative assessment, which is accepted by

many later studies in formative assessment (Shute & Rahimi, 2017; Close, 2017). According to (Bennett, 2011) formative assessment is regarded as an "ongoing process of assessment used by teachers and students during instruction, which provides feedback that allows students to improve the achievement of instructional outcome goals" (Bennett, 2011).

Moreover, it is also essential to distinguish formative assessment with other similar terms. Competency Assessment (CA) refers to the assessments of knowledge, decision making, personal performance attributes, and other integrated practice-based skills that are described and compared on the basis of their validity, feasibility and practicality, fidelity, and relevance at different stages of professional development (Leigh et al., 2016). Alternative Assessment (AA), on the other hand, is used as the opposite to traditional test-based assessment, which provides alternative means of assessment (Chandio & Jafferi, 2015). The term competency assessment is more commonly addressed in research in nursing, dental, and medical professions as well as psychology according to (Leigh et al., 2016; Giroux et al., 2015). Learning Progress Assessment (LPA) is a term that is used in the field of formative assessment. It is the prominent tool that can be used to serve teachers and students to optimize learning and instruction in the field of formative assessment (Black & Wiliam, 2009). However, studies on LPA usually only focused on investigating teachers' use of the diagnostic information to adapt instruction using curriculum-based measurement (CBM) (Deno, 1985), which is a method for learning progress assessment (LPA) that provides teachers with diagnostic information on students' learning progress. Curriculum-based measurement applies

parallel forms of short tests at intervals of a few days up to two weeks throughout the school year (Fuchs, 2004). Moreover, each CBM test assesses the different skills required for successful long-term performance to quantify the rate of learning. By using the term "assessment in the classroom" researchers categorize assessment strategies according to the place where assessments happen (Airasian, 1996; Cohen, 1994). In other words, assessment in the classroom includes both summative assessment in the classroom using scoring strategies as well as formative assessment strategies such as self-assessment, peer assessment, and descriptive feedback. Moreover, according to Mertler (2016), another well-accepted term performance assessment is one of the alternative assessment techniques of "classroom assessment" or "assessment in the classroom". Other alternative assessment techniques are: informal assessments and portfolio assessments (Mertler, 2016). With a focus on directly applying students' knowledge or skills, performance assessment, or performance-based-assessment, can be used as the basis for both formative and summative assessment.

In conclusion, it is agreed by most scholars and researchers that formative assessment should be a process that involves both teachers and students. The purpose of implementing formative assessment is to improve students' learning and help them close the learning gap rather than giving them a grade. It is also pointed out by most formative assessment researchers that the instrument or activity itself cannot be called formative if it is not used to provide information to modify teaching and learning activities as needed afterwards. As emphasized by Chappuis (2014), it is the use of information to adjust teaching and learning that "merits the 'formative' label" (p. 3). Table 1 below presents a

summary of the key points of formative assessment emphasized in five commonly accepted definitions mentioned in this section. The definition provided by (FAST SCASS, 2006) is chosen to be the definition of formative assessment in this dissertation because it successfully includes all of the five points in a relatively concise definition. At the same time, the definition by (Chappuis, 2009) is also included in the instrument of this research adapted from (Goggin, 2018), which will be explained in more details in chapter 3.

Table 1

A Comparison of Definitions of Formative Assessment

	A learning process	For improving students learning	Involving both teachers and students	Teacher-student interaction	Adjusting ongoing instruction
(Black & Wiliam, 2009)			√	√	√
(FAST SCASS, 2006)	√	√	√	√	√
(Heritage, 2007)	√	√	√	√	
(Bennett, 2011)	√	√	√	√	
(Chappuis, 2009)	√	√	√	√	√

Formative Assessment Strategies

In previous studies in formative assessment, each kind of understanding of the definition of formative assessment leads to the development of a series of similar but not identical formative assessment practices or strategies. For instance, FAST SCASS (2006) summarized key attributes of formative assessment as learning progressions, learning goals and criteria for success, descriptive feedback, self- and peer-assessment, collaboration.

Similarly, Table 2 shows the different aspects of formative assessment based on (Black & Wiliam, 2009, p. 5), which are also noted as the five basic formative assessment strategies. These five basic formative assessment strategies include all of the five key attributes of formative assessment mentioned above by FAST SCASS. The five basic formative assessment strategies are both categorized by whether it is teacher-led,

peer-led, or student-led, and also by the three leading questions derived from Sadler's conditions. Furthermore, Bennett (2011) agreed with (Black & Wiliam, 2009) on the key strategies of applying formative assessment including sharing learning expectations, questioning, feedback, self-assessment, and peer-assessment. It was claimed that each strategy mentioned above carries a specific instructional purpose. For example, sharing learning expectations allows students to clarify the learning objectives and know where to go; Questioning provides students with information about "where they are right now", which is their current learning achievements and problems; Feedback guides students with instructions on how to improve from their current achievements and how to get their learning goals; Self-assessment helps establish students' awareness of the ownership of learning; And finally, peer assessment helps with building activating students as instructional resources for their peers and building the learning communities. Instead of regarding these strategies individually, Shirley (2009) argued that the process of formative assessment is often conceptualized as a cycle, which consists of the teacher posing an instructional task to students, teacher questioning to probe understanding; awareness about student understanding, and engaging in follow-up strategies feedback and/or adjusting instruction. The use of formative assessment has been advocated because it can help teachers to plan and implement the learning cycle properly, adjust the instruction when needed, develop the program to enhance student learning (Black & Wiliam, 1998).

Table 2

Aspects of Formative Assessment

	Where the learner is going?	Where the learner is now	How to get there?
Teachers	1. Clarifying learning objectives and criteria	2. Empowering effective classroom interactions and tasks that elicit evidence of students' understanding	3. Providing appropriate feedback that promotes learning
Peers	Peer-assessing	4. Activating students as instructional resources	
Learners	Self-assessing	5. Activating students as the owners of their learning	

As mentioned earlier, Chappuis (2009) also rephrased Sadler (1989)'s conditions for students' improvement, but from the students' point of view, as three leading questions: Where am I going? Where am I now? How can I close the gap? (p. 11). Based on these three questions, Chappuis developed a framework using seven strategies for high-impact formative assessment from a more student-centered perspective. The Seven Strategies of Assessment for Learning was designed to suit both K-12 and higher education across disciplines and content standards. Comparing with the five strategies provided in (Black & Wiliam, 2009), The Seven Strategies of Assessment for Learning is more applicable in terms of guiding the teaching practice. The first two strategies are regarding the question: Where am I going? Strategy number 3 and 4 provide insight on the question: Where am I now? Finally, the last three strategies help teachers across disciplines better answer students' confusion: How can I close the gap? Table 3 shows Chappuis' table detailing The Seven Strategies of Assessment for Learning.

Table 3

The Seven Strategies of Assessment for Learning

Where am I going?
Strategy 1: Provide students with a clear and understandable vison of the learning target.
Strategy 2: Use examples and models of strong and weak work.
Where am I now?
Strategy 3: Offer regular descriptive feedback during the learning.
Strategy 4: Teach students to self-assess and set goals for next steps.
How can I close the gap?
Strategy 5: Use evidence of student learning needs to determine next steps in teaching.
Strategy 6: Design forced instruction, followed by practice with feedback.
Strategy 7: Provide students opportunities to track, reflect on, and share their learning progress.

Note: The table is taken from (Chappuis, 2009, p. 11).

According to Goggin (2018), Chappuis' strategies of formative assessment have been commonly accepted and used in professional development programs in the State of Ohio (Battelle for Kids, 2017; Snodgrass, 2010). Moreover, based on Chappuis' seven strategies, Goggin (2018) adopted Chappuis' student-centered leading questions, and further developed 15 formative assessment strategies in his quantitative dissertation study on the implementation of formative assessment strategies in the classroom. Table 4 shows Goggin's 15 formative assessment strategies categorized by the three leading questions, which are also noted as the operational steps of formative assessment

strategies, by (Chappuis, 2009). Goggin's 15 formative assessment strategies are all written in the first person with sample teaching activities given as examples when necessary, which could make it easier for teachers to reflect on their teaching practices. Goggin surveyed the implementation of these formative assessment strategies among K-12 teachers of various subjects. And he found that the most frequently used formative assessment strategy is the 14th strategy: Teacher adjusts pacing or sequence of instruction based upon information gathered from ongoing formative assessments. However, according to Goggin (2018), only about half of the teachers included both information gathering and instruction adjustment when they were asked to provide their definitions of formative assessment. And the other half of the participants only mentioned the collection of information. Goggin did not discuss this conflict in his dissertation because of the focus of his research. However, this inspired me in exploring how technology can play a role in implementing these 15 strategies in the field of second or foreign language teaching.

Table 4

The Fifteen Strategies of Assessment for Learning

Where am I going?
Strategy 1: I post learning targets for what I am currently teaching.
Strategy 2: I provide my students with learning targets that are in student-friendly language.
Strategy 3: I provide my students with checklists and/or rubrics that are teacher- or commercially made.
Strategy 4: I help my students develop checklists and/or rubrics.
Strategy 5: I provide my students with models or examples of anonymous student work at various levels of quality.
Where am I now?
Strategy 6: I gather real-time evidence of student learning simultaneously from all of my students with quick-check techniques like clickers, ABC cards, white boards, and/or thumbs-up.
Strategy 7: In my classroom, students act as instructional resources to each other.
Strategy 8: I provide descriptive feedback to my students about their performance.
Strategy 9: My students provide each other with descriptive feedback.
Strategy 10: My students are provided the opportunity to self- assess and set goals (e.g. Stars and Steps).
How can I close the gap?
Strategy 11: My students are given time to revise their work based upon feedback that they received.
Strategy 12: My students engage in self- reflection about the quality of their work.
Strategy 13: My students monitor their learning over time, using recordkeeping techniques.
Strategy 14: I adjust the sequence and pacing of my instruction, based upon information gathered from ongoing formative assessments.
Strategy 15: I target my instruction to learning gaps, misconceptions, or other incomplete understandings identified through formative feedback.

Note: The table is taken from (Chappuis, 2009, p. 11).

Teachers' Perceptions and Practices of Formative Assessment

First of all, Black and Wiliam (1998) reviewed research evidence on the effects of classroom formative assessment. They found that ongoing formative assessment, when done appropriately with helpful feedback to students, can have positive effects on students' learning achievement. However, it was also reported that the teachers' understanding and practices on the characteristics of appropriate formative assessment were still limited (Black & Wiliam, 1998).

Many researchers have conducted studies to explore pre-service and in-service teachers' attitudes towards formative assessment. For example, Young and Jackman (2014) explored Grenadian lower secondary school teachers' perceptions and practices of formative assessment and found that most participants had positive attitudes towards formative assessment, especially teachers with professional training of formative assessment. Buyukkarci (2014) surveyed 69 primary school English teachers in Turkey and interviewed 10 of them to investigate primary teachers' beliefs and actual practice of formative assessment. Chen, May, Klenowski, and Kettle (2013) conducted a case study on two college English teachers in China. According to both (Buyukkarci, 2014) and (Chen et al., 2013), the Ministry of Education in Turkey and Chinese Ministry of Education both encourage a more formative assessment-based learning process in the English language curriculum, but the actual in-class formative practices of the teachers in English classes are not fully reflected in this curriculum. Due to high workloads and overcrowded classes of about 60 students, there is a gap between teachers' beliefs about formative assessment and actual formative application (including self/peer assessment,

sharing of learning objectives and giving written or verbal feedback). As a result, the majority of teachers in Turkey tend to choose summative assessment in their schools (Buyukkarci, 2014). The enactment of formative assessment was also impacted by the traditional testing culture and conventional values regarding the central role of teachers (Chen et al., 2013).

Sach (2010) presented her work on teachers' perceptions of formative assessment at the British Educational Research Association Annual Conference. According to her research, teachers held diverse views about the concept, value and practical implications of formative assessment. In addition, five key themes of formative assessment emerged and identified as important to teachers based on teachers' interview data. These five key themes were: accountability; prescription and ownership; school context, culture and collaboration; leadership and management; the complexity of teaching and learning. Brink (2017) also found that teachers understood the accountability of both teachers and students in the process of assessment, but they also needed individualized professional supports in understanding the shifted focus on student learning and types of different methods of formative assessment, and also supports in improving overall teacher competencies about formative assessment such as the design of formative assessment activity in a lesson plan, the best practices that surround formative assessment, and the use of formative assessment to apply differentiated teaching. (Brink, 2017, p. 44) In addition to the studies that investigated the perceptions of teachers, Garcia and Maxwell (2014) also explored two rural South Texas curriculum coaches' perceptions of formative assessment through interviews. Broader themes including the level of knowledge in the

area of formative assessment practice by teachers, reasons for lack of use, and the role of instructional coaching were summarized by the researchers, among which curriculum-based assessment was perceived as the barrier to teachers' formative assessment practice.

Close (2017) further explored faculty perceptions of formative assessments with or without technology. Four kinds of perceptions of formative assessment were interpreted as confident users, unfamiliar supporters, purposeful users, and cautious users. Confident users referred to faculties who felt knowledgeable and confident about formative assessment. Unfamiliar supporters were teachers who felt unfamiliar about the concept of formative assessment, but assumed they were useful. Purposeful User were faculties who understood the concept and purposefully implemented formative assessment. Cautious users, on the other hand, felt knowledgeable about formative assessments, but have had prior experiences that influence their practices of formative assessments (Close, 2017). Overall, these studies shed lights on teachers' understandings and practices of formative assessment both inside and outside the United States contexts. Among all of these studies, Close (2017) had the most similar research purposes with my research, but with a research focus on the role of formative assessment while my research will focus on the perceived role of technology for facilitating the practices of formative assessment.

In conclusion, Previous studies (Black & Wiliam, 1998; Buyukkarci, 2014; Chen et al., 2013) have shed light on teachers' perceptions and practices of formative assessment, but few studies included language instructors as their participants. In

addition, researchers found that a gap between the teachers' beliefs about formative assessment and their actual applications of formative assessment (Close, 2017).

Formative Assessment in Second or Foreign Language Education

Formative assessment is not a popular term in the field of second or foreign language education. Some researchers would rather use classroom assessment or alternative assessment to indicate a portion of formative assessment strategies. For example, Chandio and Jafferi (2015) wrote about the use of formative assessment in ESL in Pakistan. They identified several means of alternative assessment in second language teaching such as peer assessment, self-assessment, portfolio assessment, dialogue journal, and additional tools including teacher observation, homework, project work, audio-tapes of discussion, videos of role-plays, which can also be regarded as formative assessment strategies. Moreover, Cheng, Rogers, and Hu (2004) studied ESL/EFL instructors' classroom assessment practices in Canada, Beijing, and Hong Kong. After surveying 461 ESL/EFL instructors teaching at universities in Canada, Beijing, and Hong Kong, they identified factors that could potentially affect the implementation of classroom assessment in different ESL/EFL settings. Those factors include nature of courses, instructors' teaching experience, levels of students, and the role if external standardized testing (Cheng et al., 2004). They found that instructors used fewer objectively scored assessment methods in Hong Kong when instructors in Hong Kong did not report any existing external testing, whilst ESL and EFL students are facing standardized tests such as national College English Test (CET) in China and TOEFL in Canada.

Perhaps one of the reasons that the term formative assessment is not frequently used in the field of language assessment may be that scores are still regarded as an important part of motivating language learning. Cohen (1994), in his book of classroom assessment of language ability, claimed that summative assessment may be more helpful than some "ongoing non-test-like means of collecting materials for assessment" such as using portfolios, writing samples, or samples of speaking on cassette tapes (p. 35).

On the other hand, Brown (2004) briefly introduced formative assessment in his book on language assessment principles. He noted that the key to formative assessment in language education is "the delivery and internalization of appropriate feedback on performance", with a focus on future formation of learning. He claimed that for practical purposes, "all kinds of informal assessment are formative" (p. 35) because of their primary focuses on the ongoing process of language development. Brown's summary of formative assessment revealed several phenomena regarding the research on formative assessment in second/foreign language teaching. Firstly, instead of viewing formative assessment as a whole picture of identifying "where am I going", "where am I now", and "how can I close the gap", most researchers in the field of second or foreign language teaching tend to focus their formative assessment studies on use of descriptive and formative feedback, which is only in the category "how can I close the gap". Secondly, research in language assessment would incorporate formative assessment strategies into the category of other assessment terms such as informal assessment, alternative assessment, and classroom assessment. These terms have different focuses on the

characteristics of assessment. However, they do not carry the whole concept of formative assessment.

Several formative assessment researchers found the value of formative assessment in second or foreign language classrooms. For example, Ross (2005) studied the effectiveness of formative assessment among Japanese ESL learners. She found that formative assessments have better effects on the development of ESL students' language proficiency than traditional summative assessments. She also found that the proficiency growth could be more salient in specific domain, and ESL students' listening comprehension may benefit most from formative assessment activities.

In addition, Radford (2014) investigated the effect of knowing "where am I going" by teaching trainees who are learning Spanish as a foreign language at the Missionary Training Center in the US about language performance criteria. According to (Radford, 2014), the training of language performance criteria helped the trainee with self-assessing their own performance and peer assessing other language speakers' speaking proficiency. Therefore, those trainees with a clear understanding of criteria performed better in speaking proficiency than other trainees.

Technology Facilitated Formative Assessment

According to Herman (2013), technology may play a role in the enactment of formative assessment practices in all formative assessment stages. Different technologies have been used to facilitate formative assessment activities. For example, technology has been applied to collect quick feedback from students, give live quizzes, create integrated and interactive presentations, make formative assessment with multimedia resources such

as online videos (Davis, 2017). A few commonly seen programs for managing the formative assessment activities mentioned above would include Socrative, Kahoot, Nearpod, and Seasaw. Socrative allows teachers to engage students with formative assessment through pre-designed quizzes or quick questions like polling. Kahoot application is a game-based student response system, which enables students to think and give answers with a mobile device in their hands, and gets motivated with the award and points that they collected. Nearpod is an interactive slide presentation program where students can stay connected to instructors' presentations on any device with a web browser. It allows all students who are collected to provide responses to teachers' pre-designed questions by clicking answers, writing comments, or drawing pictures. Seesaw helps create student-driven digital portfolios that teacher can use to understand students' progress better and give differentiated instruction based on students' reflections (Seesaw, 2019).

Besides these general tools that can be utilized in various subjects, Mitten, Jacobbe, and Jacobbe (2017) reported how four primary school math teachers used different apps to improve students' mathematical understanding and make their formative assessment more engaging and effective. According to their work, Sum Dog engaged students with games designed to measure basic fact fluency. Another software called Show Me allows teachers to elicit students' understandings of mathematical concepts by watching students' videotaped problem-solving process. Being able to watch a student's problem-solving process provides the teacher with learning evidence and data about "a student's prior knowledge, possible misconceptions, or even reading and writing skills

that may be impeding their demonstration of a mathematics concept" (p. 10). And Fresh Grade is a platform where students can contribute to their online portfolios by posting written responses, pictures, or even a video showing their work, and later receive detailed feedback from the teacher with an understanding of students' learning progress in math courses (Mitten et al., 2017).

As mentioned in the definition of terms in chapter 1, in this research, technology facilitated formative assessment is used as a term to include any episode of the teacher learning more about student understanding through the use of technological devices according to (Shirley, 2009). Several types of technological devices and platforms can be used to help implement formative assessment strategies, including adaptive learning systems, student response systems, learning management systems, and also online quiz generators, web-based rubric generators, and Web 2.0 tools that are mentioned in (Saglam, 2018).

Close (2017) summarized literature on the use of technological devices in formative assessment into two categories: computer-based formative assessment and student response system formative assessment method.

Computer-Based Formative Assessment

According to Close (2017), computer-based assessments often embed assessment into the learning process and provide feedback for students' self-regulation. With a focus on using feedback to promote individualized learning, the benefits of computer-based feedback include its immediacy of feedback to both students and instructors, repeatability of assessments, diversity of assessments, efficiency and accessibility, and students'

increased sense of responsibility of learning (Jenkins, 2005). Miller (2009) also claimed that computer-based assessment would help with addressing the challenge of meeting students' individual needs in large college-level classes.

The integration of emerging technology enables new possibilities of formative assessment, which include directly assessing problem-solving skills, visualizing the sequences of actions taken by learners in problem-solving progress, as well as modeling and simulating complex reasoning tasks (National Research Council, 2001). Technology also makes it more convenient to collect information on aspects of students' knowledge structures as well as their learning progress while participating in activities such as discussions and group projects. According to National Research Council (2001), technology has contributed to the implementation of sophisticated classroom-based formative assessment practices. Computer-based formative assessment programs have been developed to support differentiated student-centered teaching by "extracting key features of learners' responses, analyzing patterns of correct and incorrect reasoning, and providing rapid and informative feedback to both student and teacher" (p. 10).

Joshi and Babacan (2012) discussed the importance of blogging as tool for providing formative assessment in college level education. Similarly, Fuller (2017) investigated the use of e-portfolio for teaching introductory biology classes. In Fuller's design of formative assessment, students were asked to respond to low-stakes reflective assignments and would be given individualized feedback from the instructor in time. It was found that e-portfolio provides a decreased turn-around time between assignment submission, feedback, and revision, and stimulates improvement of student engagement.

Zhan and So (2017) shifted the focus from the design of computer-based formative assessment to teachers' perceptions and practices of a formative assessment multimedia learning platform. They identified four challenges teachers encountered when using a computer-based formative assessment platform, which are students' engagement, assessment task design, teachers' feedback, and follow-up issues.

Student Response System Formative Assessment Method

According to (Close, 2017), student response systems are popular in higher education and are commonly used as tool for assessing "in real-time the learning process of students in large classes" (p.41). Many studies in technology facilitated formative assessment involved the use of student response systems, which were traditionally only known as "clickers" but have been rapidly developed with many new possibilities because of the popularity of wireless Internet. For example, Beatty and Gerace (2009) explored the implementation of formative assessment in science classrooms with the use of clickers. They suggested four principles of technology facilitated formative assessment with more effective use of student response system. The first principle is to "motivate and focus student learning with question-driven instruction". The second principle requires teachers to "develop students' understanding and scientific fluency with dialogical discourse". The third principle calls for "informing and adjusting teaching and learning decisions with formative assessment". Finally, they claimed that technology facilitated formative assessment should be used to "help students develop metacognitive skills and cooperate in the learning process with meta-level communication" (p. 153).

Moreover, after investigating the use of student response system in formative assessment, Shirley (2009) suggested that, in the process of formative assessment, the implementation of instructional tasks that make it easier for the teachers to understand students' thinking is an area in which the use of technology can help the most. This area, according to Shirley (2009), is exactly an area where student response systems can be used to help.

All of the studies mentioned above were aimed at the integration of emerging technology when implementing formative assessment strategies. Despite of all of these external supports from technology, Shirley (2009) argued that "the use of connected classroom technology does not, in itself, bring about formative assessment. It does, however, provide a medium through which teachers can deliver rich instructional tasks that allow them to find out what students know" (p. 158).

Technology Facilitated Formative Assessment in Language Classroom

Fageeh (2015) conducted a survey of college level EFL (English as a foreign language) teachers and students' perceptions on the use of web-based assessment using Blackboard, which is a computer-based learning management system. It was reported that college level language teachers and students held positive attitudes towards the use of web-based assessment because it would provide immediate feedback and automated scores. Instead of studying general technology-facilitated language assessment, Turkish scholar Kilickaya (2017) studied EFL teachers' experiences and their perceptions of technology facilitated formative assessment. According to Kilickaya, GradeCam Go, which is a Web 2.0 tool that allows teachers to grade multiple choice questions with the

cameras of their mobile device, was highly valued for facilitating formative assessment in large classrooms. Because the use of technology offered opportunities for EFL teachers give timely feedback, monitor students' learning progress and adjust teaching accordingly. In one of the latest issues of The Journal of Teaching English with Technology, Kent (2019) reviewed the use of Plicker application, which is a type of student response systems, in ESL/EFL classes. He suggested that the use of student response systems like Plickers can potentially increase language learners' participation, motivation, and linguistic skill development when coupled with formative assessment (Kent, 2019).

In conclusion, computer-based formative assessment and other online formative assessment applications have been mostly applied and studied by scholars and researchers in the area of mathematics and science teaching (Beatty et al., 2008; Feldman & Capobianco, 2008; Beatty & Gerace, 2009; Shirley, 2009; Close, 2017; Fuller, 2017; Mitten et al., 2017). From the literature review above, we can find that even though more researchers have begun to pay attention to the use of technology-facilitated formative assessment in second or foreign language teaching (Kilickaya, 2017; Kent, 2019), research on the language teachers' perceptions and applications of technology-based formative assessment is still insufficient.

Chapter 3: Methodology

Research Purpose

Researchers have identified a gap between the teachers' beliefs about formative assessment and their real formative applications (Close, 2017) due to a lack of professional supports (Brink, 2017), heavy work-load (Buyukkarci, 2014) and over-crowded classes (Chen et al., 2013). But few studies discussed how technology can be used to close the gap and facilitate formative assessment. Moreover, past and present studies on the topic of formative assessment have shed light on teachers' perceptions and practices of formative assessment. However, little research included second and foreign language instructors as their participants so far. It is likely that research has not covered the language instructors' practices of formative assessment because language instructors and researchers tend to focus their studies on the use of some specific aspects of formative assessment such as descriptive and formative feedback, peer assessment, and self-assessment. Some other factors like the administrative pressure for the use of the standardized tests, and teachers' working load would also be potential reasons of the lack of formative assessment research in second or foreign language education.

Therefore, the purpose of this study was to explore which of the 15 formative assessment strategies identified could be supported through the use of technology and how technology could be used to facilitate the implementation of formative assessment strategies from the perspective of college-level language instructors who are interested in computer assisted language learning.

Research Questions

This study was guided by the following research questions:

1. What formative assessment strategies are supported by technology according to language instructors? (QUAN)

2. How do language instructors who are interested in CALL perceive their use of technology to assess students' learning? (QUAL)

Research Design

As Johnson and Christensen (2017) stated in their well-known textbook on educational research methods, survey research is "a nonexperimental research method based on questionnaires or interviews" (p. 253). It is also believed that questionnaires are useful tools for researchers to gather information and understand the characteristics of their participants. As stated in the research problems and research purposes of this study, this research sought to explore what formative assessment strategies can be supported through the use of technology and how technology can be used to facilitate the implementation of formative assessment strategies from the perspective of college language instructors. Therefore, using a survey methodology and collecting both quantitative and qualitative data through a web-based questionnaire was believed to be the best way to address the research questions presented above.

In this study, a survey methodology was adopted for many reasons. Firstly, using the convergent design allows the researcher to bring together different but complementary data on the same topic of language instructors' implementation of formative assessment. Given thoughts to the limited time for collecting data, it is more

efficient to collect both quantitative and qualitative data at the same time. Secondly, by comparing both qualitative and quantitative results, the researcher of this study could develop a more comprehensive understanding of second and foreign language instructors' implementation of formative assessment strategies and their perceived ways of using technology to facilitate those strategies.

The steps mentioned above were used to guide the design of this research.

First, both quantitative data and qualitative data were collected concurrently using one web-based questionnaire, but also separately through different questions in the questionnaire. Quantitative data including participants' demographic information, their confidence level of technology use, and their frequencies of using each formative assessment strategy in second or foreign language teaching were collected through closed-ended questions in the questionnaire. Concurrently, qualitative data including participants' own definitions of formative assessment, their perceived ways of using technology to facilitate each formative assessment strategy, or their perceived challenges of using technology for each strategy were collected through 16 open-ended questions in the same questionnaire.

Second, quantitative data and qualitative data were analyzed separately and independently using their specific analytic procedures. In this research, quantitative data were analyzed using descriptive statistics when open coding and axial coding were used to analyze qualitative data.

Participants and Sampling

The participants of this study were all college level language instructors who are a member of CALICO or attended an annual CALICO conference. CALICO is an international organization committed to studying and developing the use of computer technology in language learning (CALICO, 2017). CALICO started with a group of people interested in using technology-based materials for second/foreign language teaching. Nowadays, after almost 30 years of growth, CALICO includes "language educators, programmers, technicians, web page designers, CALL developers, CALL practitioners, and second language acquisition researchers–anyone interested in exploring the use of technology for language teaching and learning" (CALICO, 2017). And language instructors who are a member of CALICO or interested in attending a CALICO conference are assumed to have a deeper understanding of the potential of using technology to facilitate the implementation of different formative assessment strategies. Therefore, they were recruited as the participants of the study.

The web-based survey powered by Qualtrics was first distributed through emails in the November of 2019. Advice about the distribution of the survey was sought from CALICO conference coordinator in advance. She kindly agreed to help distribute the survey to all CALICO members who had joined the mail-list on November 25, 2019. One week later, on December 3, 2019, the participant recruitment email was sent again to three graduate student members of CALICO. These three graduate student members of CALICO were all active members of CALICO Graduate Student Special Interest Group and they all had experience in teaching college-level second or foreign language classes.

Furthermore, participants were also encouraged to help distribute the survey to other qualified language instructors. Therefore, both convenience sampling and snowball sampling were used for the distribution of online surveys in this research.

As an incentive to complete the survey, 10 participants won an Amazon e-gift cards of 15 dollars. Winners of the e-gift cards were randomly selected from the participants who indicated interests in being entered for chances to win e-gift cards by providing an unidentifiable email address. All of the e-gift cards were sent directly through Amazon on December 31, 2019.

Researcher's Role

The researcher's role of this research is more emit than etic. Because the researcher is also a member of CALICO and also served as one of the volunteers of 2019 CALICO conference in Montreal, Canada. Moreover, the researcher is also an active member of CALICO's Graduate Student Special Interest Group, which is known as Graduate Student SIG. Being actively involved as a group member has made it more convenient for the researcher to be acquainted and recruit participants. Additionally, it is conducive to a better interpretation of the research findings.

Data Collection Procedures

The adapted questionnaire was pilot tested on October 4, 2019 by two second/foreign language teachers who are also CALICO members. Appropriate changes to the settings of questionnaire were made based on the feedback collected from the two participants. After the proposal defense, several new question items were added to the questionnaire, including questions about participants' native languages, their genders, and

a question asking them to provide examples of their use of technology to implement formative assessment. It is believed that participants' native language and their gender could affect their use of technology. And asking for additional information about their actual work helped me triangulate my results. The IRB amendment was approved on November 20, 2019. As mentioned earlier, the web-based survey and a participant recruitment letter was first sent to the conference coordinator of CALICO. And then the survey was distributed to all CALICO members who have joined the mail-list on November 25, 2019.

On December 3, 2019, the participant recruitment email was sent specifically to three active members of CALICO Graduate Student SIG who had shown their interests in this research. In addition, these participants were also encouraged to help distribute the survey to other qualified language instructors.

The web-based survey powered by Qualtrics remained open for one month from November 25, 2019, through December 31, 2019. In total, 53 responses were recorded by Qualtrics. However, 23 of the survey returned were determined to be unusable because those surveys were mostly incomplete. The elimination of those 23 survey responses resulted in 30 valid survey responses.

Research Instrument

A Qualtrics online survey was used to collect both qualitative and quantitative data to address the research questions. The questionnaire developed by Goggin (2018) for his quantitative dissertation study on the implementation of formative assessment strategies in the classroom was chosen and adapted as the instrument of this research

(Appendix A). The permission to use and adapt the original questionnaire was sought via emails (Appendix B). The original questionnaire includes demographic questions, one open-ended question asking about teachers' definition of formative assessment and 15 close-ended questions. In the section of close-ended questions, participants will be asked about their frequency of implementing 15 different formative assessment strategies on a 5-point Likert scale. Participants were asked to rate the frequency of their use of each strategy based on a range between "Do Not Use" and "Daily." The 15 formative assessment strategies based on (Chappuis, 2009) have been, according to (Goggin, 2018), commonly accepted and used in professional development programs in the State of Ohio (Battelle for Kids, 2017; Snodgrass, 2010):

1. I post learning targets for what I am currently teaching.
2. I provide my students with learning targets that are in student-friendly language.
3. I provide my students with checklists and/or rubrics that are teacher- or commercially made.
4. I help my students develop checklists and/or rubrics.
5. I provide my students with models or examples of anonymous student work at various levels of quality.
6. I gather real-time evidence of student learning simultaneously from all of my students with quick- check techniques like clickers, ABC cards, white boards, and/or thumbs-up.
7. In my classroom, students act as instructional resources to each other.

8. I provide descriptive feedback to my students about their performance.

9. My students provide each other with descriptive feedback.

10. My students are provided the opportunity to self- assess and set goals.

11. My students are given time to revise their work based upon feedback that they received.

12. My students engage in self- reflection about the quality of their work.

13. My students monitor their learning over time, using recordkeeping techniques.

14. I adjust the sequence and pacing of my instruction, based upon information gathered from ongoing formative assessments.

15. I target my instruction to learning gaps, misconceptions, or other incomplete understandings identified through formative feedback.

Both the open-ended question about teachers' definition of formative assessment and the 15 close-ended questions about teachers' frequency of implementing 15 different formative assessment strategies were kept in the adapted questionnaire for this research. Below each question asking about the frequency of formative assessment practices, a follow-up question was added to inquire teachers' perceptions of the potential of technology to facilitate each specific strategy. Participants were also asked to explain how they would use technology to facilitate each formative assessment strategy or why they think certain strategy cannot be facilitated by the use of technology. At the end of the questionnaire, the participants were encouraged to upload an example of their actual use of technology for implementing formative assessment. They could choose to upload screenshots, pictures, or assessment documents.

Moreover, Chappuis' (2009) definition of formative assessment was quoted in the survey and showed both right after the open-ended question about participants' own definition of formative assessment. Because it was assumed that instructors could have inconsistent responses regarding their definitions of formative assessment. Therefore, it is believed to be beneficial to specify the definition before the participants answering the questions about their perceptions of using technology to facilitate each formative assessment strategy. And the open-ended question asking about participants' definition of formative assessment was also used as a tool to understand participants' survey results.

In addition, changes were made to the demographic questions because of the different focuses of the two studies. Firstly, the participants of this survey were only foreign or second language teachers instead of teachers of all subject areas. Therefore, questions asking about participants' roles as second language teachers or foreign language teachers were added to the demographic questions. For example, participants were asked about their students' language proficiency levels, and they were also asked whether they were teaching any the specific language skills such as listening, reading, speaking, or writing. Secondly, questions about teachers' confidence of technology use were added to obtain information for understanding participants' beliefs in using technology for formative assessment. Participants were first asked to scale their confidence of technology use from zero to 10 both at the beginning of the survey. And they were asked to choose their technology confidence level again from options including 'not confident at all', 'slightly confident', 'somewhat confident', 'fairly confident', and 'completely confident' at the end of the survey.

Reliability and Validity

According to Creswell and Plano Clark (2011), if an existing instrument is selected, evidence of past instrument use showing high validity and reliability should be identified. According to Goggin (2018), validity of this existing survey instrument was supported through content and construct validity. The key items of this survey are mostly adopted from (Goggin, 2018) using literature derived constructs, with slight changes on questions designed to collect demographic information of the participants. Content validity refers to how well the questions represent the total possibility of questions that can be asked about a specific content. Two experts in formative assessment were involved in the development of this existing survey. In addition, a small pilot and a larger administration of the questionnaire occurred, followed by the adjustments of the instruments again. The reliability of this existing instrument was tested through testing Cronbach's coefficient alpha during the data analysis phase of Goggin's research in 2018. And reliability of the questionnaire had a Cronbach's alpha of .76, which is higher than the acceptable level of reliability .7 suggested by Pallant (2010).

A small pilot was completed to further limit the threats to content validity for this research. The sampling strategy used was convenience sampling. The pilot sample included one second language teacher and one foreign language teacher who are both members of CALICO and have attended the CALICO conference at least once. And both of them scaled eight out of ten as their confidence level of using technology for educational purposes, which indicates they are both feeling confident using technology for educational purposes. In addition, the two of them were also encouraged to provide

feedback on the design of the survey, after the survey was sent to them via recruitment emails. And they both provided positive feedback towards the design of this survey after successfully completing the survey.

Both of them provided suggestions on the wording of some demographic question. For example, it was suggested that one of the demographic questions asking about class sizes should be rewritten as: “How many students are typically in your class?”. Moreover, they also helped review the settings of Qualtrics instrument. Two questions saying “Please check all that apply” were designed as multiple-choice questions with single answer by mistake. I fixed the “check all” questions according to their feedback. These changes were all implemented prior to dissemination of the survey to the participants for this dissertation study.

Data Analysis Procedures

Qualtrics is a platform where researchers can design, send, and analyze surveys online. After successfully collecting data through Qualtrics, Qualtrics survey software was used again to clean and analyze the results. Firstly, after Qualtrics generating a report of all 53 responses collected, a filter was used to detect incomplete data. In line with the research questions of this study, the key information was participants’ perceived use of technology for each strategy. Therefore, Qualtrics was set to filter all of the responses that did not provide any answers to any of those questions asking participants’ opinions on whether technology could be used to help with the formative assessment strategy presented above. Secondly, after filtering the data digitally, the participants’ responses to the demographic questions were screened manually to assure the participants’

appropriateness for the study. At this stage, one participant was considered as an unsuitable participant because she indicated that she did not have any second or foreign language teaching experience. In addition, because of her lack of background in language teaching, her survey response was also incomplete. Given thoughts to the purpose of this research, her response was manually selected and deleted. The removal of incomplete and inappropriate responses resulted in 30 valid responses to this web-based survey.

In the next section of this chapter, 30 Participants' demographic information was summarized and analyzed using the numbers of responses and percentages. After describing participants' demographic information, participants' descriptive responses of their definitions of formative assessment was analyzed through descriptive coding and frequency counts.

In order to answer the first research question of this study, quantitative data was collected and analyzed in this research. Participants were asked to choose whether they thought technology could be used to facilitate each formative assessment strategy. Participants' different choices were recorded and quantified separately. In order to better understand participants' choices, the reasons why participants believed that technology is useless for facilitating specific formative assessment strategies were also collected and summarized. A summary of this qualitative information can further help explain participants' choices and provide insights to answer the first research question of this study.

To answer the second research question, qualitative data were collected through open-ended questions asking how technology could be used to help with each formative

assessment strategies listed in the survey. Qualitative analysis procedures were used to analyze participants' responses and the teaching document they provided. A random number from 1 to 30 was assign to each participant for identifying participants' responses and quoting participants' qualitative responses to support the qualitive findings.

Since a large part of the data analysis work was qualitative, the qualitative data were read many times before, during, and after the open coding and content analysis process. The data were then explored inductively, guided by the research purposes and research questions. Salient themes and patterns were identified and summarized regarding instructors' perception of using different technologies to facilitate second or foreign language teaching.

For the purpose of establishing interrater reliability, one of the researcher's colleagues was trained and wrote an analytic memo for each of the five learning documents provided by the participants. It is worth mentioning that the other data rater was chosen because of her educational background and her knowledge of assessment in language education. Both raters have the same educational background and similar research interests. And they both took a language assessment course when they were completing their Masters in Linguistics.

In conclusion, using the guidelines provided in (Creswell & Plano Clark, 2007), both quantitative and qualitative data analysis methods were implemented in this research to provide a triangulated interpretation of how language instructors perceive themselves of using technology to support their implementation of formative assessment strategies.

Summary

Noticing the gap in the literature of language instructors' practices of formative assessment, this survey research first surveyed language instructors' practices of 15 formative assessment strategies. In addition, language instructors' perceptions of whether technology can be used to help with the implementation of formative assessment were collected through open-ended questions to explore how technology can be used to facilitate formative assessment in second or foreign language education.

Chapter 4: Results

As stated in earlier chapters, this survey research sought to explore college-level language instructors' perceptions about the role of technology in implementing formative assessment strategies. More specifically, this study explored what formative assessment strategies are better supported through the use of technology, and how technology can be used to facilitate the implementation of formative assessment strategies according to those language instructors who are interested in computer assisted language learning. Along with a summary of the procedures used for analyzing both quantitative and qualitative data, this chapter presents participants' demographic information, reported definitions of formative assessment, and the results of the guiding questions of this research:

1. What formative assessment strategies are supported by technology according to second and foreign language instructors? (QUAN)

2. How do language instructors who are interested in CALL perceive their use of technology to assess students' learning? (QUAL)

Participants

Participants' demographic information was collected through seven different survey questions regarding participants' genders, native languages, and the information about their teaching, including the languages they are teaching and the teaching contexts, their students' language proficiency levels, the specific language skills addressed in their teaching, the number of students that each participant services per day, and each instructors' technology confidence level of using technology for educational purposes.

According to Connelly (2013), researchers use demographic information to show participants' appropriateness for the study. For this study, the demographic information collected was used to ensure that all of the participants had a background in college-level language instruction and understood language education. Even though 30 participants completed this section, the number of responses to each question varied because some participants chose not to provide certain information.

Some of the participant's responses were quoted in the results narrative below. Brief information about some of these respondents is shown here:

Participant No. 1 is a foreign language instructor who is teaching English in China. On average, she teaches 50 students each day, and she teaches English comprehensively. Participant No. 12 teaches English as a foreign language, and he teaches comprehensive English to learners of all levels. On average, he teaches 45 students each day. Participant No. 16 is a female instructor who is teaching English as a second language to advanced learners, but her class can also be taken by native English speakers. On average, she teaches 30 students each day, and she indicated that she is extremely confident in the use of digital technologies in language learning. Finally, Participant No. 22 is also a female instructor who is teaching English as a second language. She teaches English comprehensively, and she teaches about 110 students each day.

Gender and Native Language

As shown in Table 5, most instructors who completed the survey were women, while only seven participants indicated that they were men. English was the native

language for the majority of participants. There were two participants whose native language was Spanish. Two participants' native language was Italian. There was also one native Portuguese speaker, one native Chinese speaker, and one native Indonesian speaker. In addition, one of the participants has both English and Bengali as her native languages.

Table 5

Gender and Native Language Information

Gender	Responses	Percentage
Male	7	23.33%
Female	23	76.67%
Total Responses	30	
Native Language(s)	Responses	Percentage
English	18	69.23%
Spanish	2	7.69%
Italian	2	7.69%
Chinese	1	3.85%
Indonesian	1	3.85%
Portuguese	1	3.85%
English and Bengali	1	3.85%
Total Responses	26	

Teaching Information

As indicated in Table 6, most participants involved in this study worked as teachers of foreign languages in countries where that language is not the native language or official language. For example, according to their descriptive answers, some of them were teaching French in the United States, and some of them were teaching English in Mexico or China. On the other hand, all reported second language teachers were English teachers who were teaching in an English-speaking environment. Moreover, seven participants chose “other” for this question because they were teaching English both as a second language and as a foreign language, teaching multiple languages, or teaching

English to both international and domestic students. Meanwhile, two participants indicated they had had language teaching experience before, but were working as language faculty trainers or developers.

Table 6

Teaching Contexts

Teaching Contexts	Responses	Percentage	Examples
Foreign Language Teaching	17	56.57%	Teaching French in the U.S.
Second Language Teaching	6	20.00%	Teaching English in the U.S.
Other	7	23.33%	ESL instructor and Spanish language instructor
Total Responses	30		

Other information on participants' teaching situation was also collected. As shown in Table 7, most language instructors who participated in this research taught advanced level second or foreign languages. Twelve participants indicated that their students' language proficiency level was advanced, while six participants indicated that they were teaching students whose language proficiency levels varied from elementary to intermediate. In addition, six participants chose all of the three language proficiency levels, and two participants who chose "other" specified that they had language teaching experience but were not serving as language teachers presently.

Table 7

Students' Language Proficiency Levels

Language Proficiency Levels	Responses	Percentage
Elementary	1	3.33%
Intermediate	2	20.00%
Advanced	12	40.00%
Elementary & Intermediate	6	20.00%
Intermediate & Advanced	1	3.33%
Elementary, Intermediate, Advanced	6	20.00%
Intermediate, Advanced, Other	1	3.33%
Other	1	3.33%
Total Responses	30	

As shown below in Table 8, most language instructors addressed more than one language skills in their teaching. Most participants were teaching languages comprehensively, including development of students' reading, listening, speaking, and writing skills. More instructors who completed the survey were teaching speaking and writing than reading and listening. A few participants indicated that they were teaching advanced-level language skills with a focus on cultural aspects and pragmatics.

Furthermore, on average, the participants of this survey taught 32 students per day. Eleven participants taught more than 32 students each day, and 19 participants fewer than 32 students each day.

Table 8

Language Skills

Language Skills	Responses	Percentage
Listening	1	3.33%
Writing	2	6.67%
Listening & Speaking	1	3.33%
Speaking & Writing	2	6.67%
Speaking & Other	1	3.33%
Reading, Listening, Speaking	1	3.33%
Reading, Speaking, Writing	1	3.33%
Reading, Writing, Other	1	3.33%
Reading, Listening, Speaking, Writing	14	46.67%
Reading, Listening, Speaking, Writing, Other	4	13.33%
Other	2	6.67%
Total Responses	30	

Technology Confidence

The participants of this research showed high technology confidence levels. Participants were asked to report their confidence of using technology for educational purposes before and after answering a series of questions on using technology for implementing formative assessment.

Participants were first asked to scale their technology confidence level on a basis of zero to ten. All 30 participants scaled their confidence level above eight with a minimum number as 8 and a maximum as 10. When they were asked to choose their technology confidence level from options including ‘not confident at all’, ‘slightly

confident', 'somewhat confident', 'fairly confident', and 'completely confident', nine participants chose 'fairly confident' while the remaining 16 participants all chose 'completely confident'.

Definition of Formative Assessment

The survey adapted for this research was developed based on Chappuis' (2009) definition as: "Formal and informal processes teachers and students use to gather evidence for the purpose of improving learning" (p. 5). According to Goggin (2018), this definition was segmented into two key parts, which are the collection of students' learning information and the use of that information to further guide teaching and learning. In his research, Goggin reviewed and quantified the participants' responses based on whether both these two parts were included in their definitions of formative assessment. This method of quantifying descriptive responses is adapted for analyzing the participants' definitions.

While Goggin recognized two aspects of the definition of formative assessment when analyzing participants' descriptive responses, this study originally focused on five aspects based on a review of the literature, including seeing formative assessment as a process, for the purpose of improving learning, involving both teachers and students, gathering learning evidence, and adjusting ongoing instruction. While analyzing the data, a sixth-code emerged as low-stakes tests or activities.

Table 1 of the present study laid out a summary of the five key points of formative assessment emphasized in the commonly accepted definitions. Firstly, formative assessment is a process of learning. Secondly, the purpose of formative

assessment is to improve students learning. Thirdly, formative assessment involves both teachers and students in its process. Fourthly, formative assessment involves gathering learning evidence through the interaction between teachers and students. Fifthly, data collected through formative assessment is used for adjusting ongoing instruction. While looking at the data, an extra term was added because it was frequently referred to by the participants. The participants mentioned that they regarded formative assessment as the opposite of the high-stakes tests. Therefore, participants' definitions of formative assessment were reviewed based on these six key points as presented below in Table 9.

Table 9

Definition of Formative Assessment

Definition Contains	Responses	Description Examples
A process	16	"knowledge checks throughout the semester"; "ongoing assessment"
For improving learning	10	"to find out what the learner needs to do in order to learn"; "to help students reach a desired learning outcome"
Involving both teachers and students	10	"guiding both teacher and learner"; "done by the learner himself – self-assessment, by his/her classmates – peer assessment and by the teacher"
Gathering learning information	14	"Part of a data feedback loop"; "to provide the instructor with information about students' process and instructional needs"
Adjusting ongoing instruction	8	"Assessment used to improve instruction"; "to suggest alternate learning strategies, materials, or interventions"
Low stakes tests/activities	10	"to assess students' learning without scores"; "anything that happens before we get to a high stakes test/activity"

Table 9 displayed an analysis of the participants' definitions of formative assessment. In total, 24 participants provided their own definitions of formative assessment. Generally, participants of this study had a good understanding of formative assessment. Most participants believed that formative assessment is an ongoing process measuring students' learning by describing formative assessment as an ongoing assessment or assessment throughout the semester. Fourteen participants mentioned collecting learning information through teacher-student interaction in their definitions. While most participants mentioned gathering students' learning information through

formative assessment, not as many participants mentioned using the learning information collected to further empower ongoing instruction. In addition, 10 participants regarded formative assessment as a way to “assess students’ learning without scores” or anything that happens before getting to the high stakes test. These 10 participants’ responses were summarized as an emergent category labeled as low stakes tests or activities.

Participants’ definitions of formative assessment were not only summarized to show their understandings of formative assessment but also used to help understand their answers to the questions regarding their use of technology for facilitating formative assessment strategies. More detailed information regarding specific participants’ definitions of formative assessment could be found in Chapter 5.

Research Question One

The first research question of this dissertation was, “What formative assessment strategies are supported by technology according to language instructors?” To answer this question, quantitative data were collected through 15 closed-ended questions. After reading a brief description of each formative assessment strategy, participants were asked to choose whether they thought technology could be used to facilitate each strategy. If the participants chose “yes,” the responses were recorded and quantified as "1." And if the participants’ answer was “no,” the responses were recorded and quantified as "2."

Moreover, participants were asked to provide their reasons for not regarding technology as useful for facilitating specific formative assessment strategies. A summary of this qualitative information is shown in Table 9, which further explains participants’ choices. If participants indicated that they believed certain formative assessment

strategies could be supported by technology, a follow-up question asking how technology could be used for these purposes was also asked to address the second research question of this study.

According to the survey results, all 15 formative assessment strategies were regarded by participants as more technology-supportable than technology-useless. In other words, all 15 listed formative assessment strategies received more choices as "Yes, technology could be used to help this strategy" over "No, technology cannot be used for this strategy." This indicated that, according to the surveyed foreign or second language instructors surveyed, all 15 formative assessment strategies had the potential to be supported by technology use.

As shown below in Table 10, among the 15 formative assessment strategies, some strategies were identified as more technology-supportable than other strategies by most participants. For example, 29 participants (96.67%) believed that technology could be used to help "gather real time evidence of student learning simultaneously from all my students with quick check techniques." Only one participant reported that using technology to facilitate this strategy was not appropriate for the advanced level foreign language that she taught. Twenty-five (96.15%) participants believed that technology could be used to help "students monitor their learning over time using record keeping techniques." One participant claimed that the learning management system (LMS) adopted by his organization had compatibility problems displaying languages other than English. Therefore, he could not foresee technology as useful to help "monitor his students' learning." In addition, 25 instructors (96.15%) agreed that technology could be

used for “posting their current learning targets.” Similarly, participants also believed that technology could be used to provide learning targets in student-friendly language. Moreover, most participants (95.24%) agreed that technology could be used to “target the instruction to learning gaps, misconceptions, or other incomplete understandings identified through formative feedback.” Furthermore, 27 language instructors (93.10%) believed that technology could be used to provide descriptive feedback, while two participants indicated that they would prefer providing descriptive feedback in person instead of using online software.

On the contrary, different results were obtained for the formative assessment strategy described as, “I adjust the sequence and pacing of my instruction, based upon information gathered.” Many participants noted that this was not a strategy that could be facilitated by the use of any type of technology. Indeed, as reported by one the participants, “It’s a matter of teachers’ pedagogical knowledge instead of technological skills.” In addition, several participants had concerns about using technology to provide opportunities for self-assessment and setting goals. According to those participants, it was “not necessary to use technology to set goals.”

Moreover, results indicated that when managing peer-assessment and self-assessment activities, language instructors would prefer face-to-face communication over computer mediated communication. For example, several participants considered technology as unhelpful when their students were asked to “act as instructional resources to each other” or “engage in self-reflection about the quality of their work.” These participants left similar comments such as, “in person is more effective,” “could do, but

again, if the class meets regularly, I would rather build community in the classroom," and "No, since they would be speaking to each other in class."

In conclusion, the results of the research survey revealed the wide potential to use technology to facilitate all of the 15 formative assessment strategies. More specifically, most participants agreed that technology could be used for gathering real time learning evidence from students, providing descriptive feedback, monitoring students' learning, targeting the instruction to identified learning gaps, posting learning targets, and also phrasing the learning targets in students friendly languages.

Table 10

Technology Use and Formative Assessment Strategies

Strategy	Technology perceived as supportive	Percentage	Technology perceived as unhelpful	Reasons why technology was perceived as not useful
I gather real time evidence of student learning simultaneously from all my students with quick check techniques.	29	96.67%	1	Inappropriate language proficiency level.
I provide descriptive feedback to my students about their performance.	27	93.10%	2	Preference of face to face communication.
My students monitor their learning over time, using record-keeping techniques.	25	96.15%	1	The LMS adopted is not user-friendly in the target language.
My students are provided the opportunity to self-assess and set goals (i.e. Stars and Steps)	22	84.62%	4	Not necessary to use technology; Better using class time for learning.
I post learning targets for what I am currently teaching.	25	96.15%	1	Not necessary to use technology.
My students are given time to revise their work based upon feedback they receive.	23	92.00%	2	Copying corrections was improving writing skills.
I provide my students with checklists and/or rubrics.	23	92.00%	2	Do not use rubrics
My students engage in self-reflection about the quality of their work.	23	88.46%	3	Preference of face to face communication.

Table 10 (continued)

Technology Use and Formative Assessment Strategies

Strategy	Technology perceived as supportive	Percentage	Technology perceived as unhelpful	Reasons why technology was perceived as not useful
I help my students develop checklists and/or rubrics.	19	90.48%	2	Do not use rubrics
My students provide each other with descriptive feedback	23	92.00%	2	Better done in person.
I provide my students with models or examples of anonymous student work at various levels of quality.	23	88.46%	3	Better done in person.
I adjust the sequence and pacing of my instruction, based upon information gathered.	17	80.95%	4	More about teachers' pedagogical knowledge.
Students act as instructional resources to each other.	19	82.61%	4	Better done in person.
I provide my students with learning targets that are in student friendly language.	19	95.00%	1	N/A
I target my instruction to learning gaps, misconceptions, or other incomplete understandings identified through formative feedback.	20	95.24%	1	Not a matter if medium.

Research Question Two

To answer the question, "How do language instructors who are interested in CALL perceive their use of technology to assess students' learning?" Qualitative information about language instructors' perceptions of using technology for different formative assessment strategies was collected through 15 open-ended questions. In addition, participants were also encouraged to upload one of their teaching documents involving the implementation of formative assessment strategies. In total, five participants uploaded their teaching documents. An analysis of these documents was conducted to better understand the qualitative findings and to correlate the results.

Questionnaire Results

After reading a brief description of each formative assessment strategy, participants were asked to choose whether they thought technology could be used to facilitate each assessment strategy. Then, if the participants chose "yes," they were asked to provide a short description of how technology could be used for that specific formative assessment strategy. Similarities in participants' responses were found. Participants' responses are summarized based on some repeated themes and displayed with examples of participants' responses in Table 11.

In Table 11, the 15 formative assessment strategies were ranked according to the percentages calculated earlier and shown in Table 10. In other words, the first few formative assessment strategies were considered as more technology-supportive than the last few formative assessment strategies. As shown in Table 11, participants of this study provided a variety of technology use suggestions for different formative assessment

strategies, yet some similarities regarding the use of technology emerged after analyzing participants' responses to the same strategy.

For example, 96.67 percent of the participants believed that technology could be used to help "gather real time evidence of student learning simultaneously from all my students with quick check techniques" (see Appendix A). Regarding specific technology use, most participants reported their use of clickers, i-clickers, or other forms of student response system software such as Kahoot or Mentimeter to gather real time information about students' learning. Some participants talked about their experience of using online survey tools to collect students' learning data, while some participants mentioned using the quiz feature of certain LMS or class management systems (CMS). For example, Participant No.12 reported that, "Some sites like Quizlet Live or Kahoot can be good if they are well prepared. Google forms can be great for getting almost instance open-ended feedback/answers." Participants provided various technology suggestions for this formative assessment strategy; however, it was also noted that organizational restrictions and the design of specific activities would affect the performance of technology use. As evidenced in the aforementioned quote, many participants emphasized the importance of technology-facilitated formative assessment activities being well designed and well prepared. In addition, Participant No.20 reported that, "Although [in] the college I teach have their own LMS that I MUST use, I use G suite tools extensively at an institution that I'm an adjunct faculty." This indicates that instructors' choices of certain technological applications are deeply affected by the requirements of their institutional affiliations.

When using technology to help "students monitor their learning over time using record keeping techniques," 96.15 percent of participants believed that tools such as learning management systems, e-portfolio flatforms, and blogging tools could be used to help with the implementation of this formative assessment strategy. For example, Participant No.1 claimed that language instructors could use e-portfolio "through learning management systems that we use for the class" to monitor and document students' learning. Most participants provided short answers regarding the technology use such as "LMS," "Canvas Helps," or "Gradebooks in LMSs." In addition, it was also indicated that language instructors' use of technology may be affected by their personal position or their personal teaching situation. Interestingly, Participant No. 22 reported that building e-portfolios through Google Sites is useful for monitoring students' growth. However, the participant also mentioned that, "I used to use Google Sites to do student portfolios. I eventually plan to move towards this again, but have been in a new position building my curriculum and have not had the time to do this yet." Claims like this reflect on the framework on UTAUT-2 and factors that could affect instructors' decisions on technology adoption and application.

In addition, 96.15 percent of the instructors surveyed agreed that technology could be used for posting learning targets for what they are currently teaching. However, participants provided different technology solutions for implementing this formative assessment strategy. As evidenced in the quotes shown in Table 11, most participants believed that the overall learning objectives of a language course could be included in a syllabus and posted through learning management systems such as Canvas and

Blackboard Learn, while day-to-day or unit-to-unit learning targets were presented on presentation slides before instruction. In the meanwhile, many participants provided other ways to acknowledge students with their current learning goals. For example, participants mentioned the use of messaging applications such as WeChat, blogs, online checklists, and other productivity applications. Similar to the idea of using online checklists, Participant No.12 mentioned using technologies like Google sheets, "you can create formulas that might show, for example, when students hit reading targets (e.g., a certain number of words read)." In addition, Participant No.12 also emphasized the use of online text analyzers to note the vocabulary level of those written learning targets in order to provide the learning targets in student-friendly language, which is shown as the fifth formative assessment strategy in Table 11.

Similarly, when using technology to help provide learning targets that are in student friendly language. Most participants mentioned the use of learning management systems. Some of them indicated that LMS or Microsoft Word could be used for providing learning targets in writing when videos could be recorded for explaining learning goals in speaking.

Additionally, participants of this study also provided similar technology solutions when to give oral or written feedback to students. Most participants mentioned using audio or video platforms such as VoiceThread, Viddler, and other screencast software to prepare and deliver individualized oral feedback. And instructors tended to give written in-depth feedback through online LMS, Microsoft Word, Google Doc, or emails. For example, Participant No.12 shared the insight of descriptive feedback as, "Saying

‘descriptive’ implies to me that students will receive either written or oral feedback. Tracking changes on writing (through Word) is one method I have used. In the past I've also used VoiceThread to give oral and written feedback on student work.” Other than the software mentioned above, this participant also questioned whether the use of an overhead projector is also a way to provide formative feedback for students in language classes.

After providing descriptive and formative feedback to students, instructors also tended to use different software to allow students to revise their work accordingly. Most instructors mentioned allowing students to resubmit their work through a learning management system when some participants also mentioned the use of other platforms to accomplish this strategy. For example, participant No.1 summarized how she would utilize technologies to complete the feedback loop as, “I could do this with authoring apps such as 360 Storyline, or other cloud application(s) such as VoiceThread, or Google doc, or Microsoft online. I design the tasks; students complete the tasks in the technology that I mentioned. I give feedback, and inform them that the feedback is available. Then they revise their work based on my feedback.”

Furthermore, most participants (95.24%) agreed that technology could be used to “target the instruction to learning gaps, misconceptions, or other incomplete understandings identified through formative feedback.” However, participants provided various perceptions of technology solution towards this formative assessment strategy. For example, two participants mentioned using adaptive learning systems to identify and aid students’ learning gaps, misconceptions, or incomplete understandings. Some

participants suggested using tracking electronic documents like Google Docs to track back through working and commenting collaboratively. In contrast, some other participants indicated they would still utilize their organizations' learning management systems. Nevertheless, most participants reported in their responses that technology is specifically useful for collecting learning information and making sense of data to guide further instructions.

Besides, even though a relatively low percentage of the participants of this study perceived technology as supportive for managing self-assessment activities for students, most participants who regarded technology as helpful for self-assessment agreed on using technologies such as online portfolios, online blogging, online journaling, or online surveys. According to these participants, different types of technologies could be used to have students "self-assess and set goals" and reflect on their own growth. It is also worth mentioning that for the instructors who were specialized in teaching language speaking skills, their technology use often involves having students listen to a recording of themselves and analyzing their speech using a given rubric or through answering reflection questions. For example, Participant No.16 documented the whole process of using various types of technologies to facilitate self-assessment as, "listen (Quicktime, Audacity, etc), use the rubric (document, CMS, survey with rubric items in it), analyze (choose which items to improve, go back into CMS and review materials, try again by making another recording)."

In conclusion, participants in this research provided various insights into using technologies to support the process of formative assessment. According to their

questionnaire responses, most participants would use different technologies contextually, whereas LMS or CMS were perceived as a master key to helping implement almost all types of formative assessment strategies.

Table 11

Technology Use

Strategy	Percentages	Technology Use	Quotes
I gather real time evidence of student learning simultaneously from all my students with quick check techniques.	96.67%	Classroom response system; Web survey system; Quiz modules in LMS	"i-clickers, survey platforms like Mentimeter or Qualtrics"
My students monitor their learning over time, using record-keeping techniques.	96.15%	LMS; online notebook (blogs) for daily journaling; E-portfolios;	"Canvas helps (LMS)."
I post learning targets for what I am currently teaching.	96.15%	LMS; Presentation tools; Social media; Productivity Applications.	"'Outcomes' or 'objectives' rubrics in LMS, slides in class."
I target my instruction to learning gaps, misconceptions, incomplete understandings identified.	95.24%	Adaptive learning systems; Classroom response system; Collaborative e-doc; LMS; Videos.	"For example, tracking back through a collaboratively created electronic doc and commenting"
I provide my students with learning targets that are in student friendly language.	95.00%	LMS; Social media; Text analyzers.	"LMS announcements, LMS syllabus, Video unit overviews, LMS feedback rubrics."
I provide descriptive feedback to my students about their performance.	93.10%	Audio and video oral feedback platform; Written feedback through e-doc, email, or LMS.	"I typically provide individualized feedback with the video platform Viddler or in screencast or written feedback in our online LMS."
My students are given time to revise their work based upon feedback they receive.	92.00%	E-doc to track changes; Resubmit through LMS; authoring apps.	"resubmitting through LMS."

Table 11 (continued)

Technology Use and Formative Assessment Strategies

Strategy	Percentages	Technology Use	Quotes
I provide my students with checklists and/or rubrics.	92.00%	LMS, E-doc, Online rubric-maker.	"Rubistar and other apps, rubrics in canvas"
My students provide each other with descriptive feedback	92.00%	Discussion board (LMS), E-doc, blogs, Survey.	"We use peer review functions in word and canvas."
I help my students develop checklists and/or rubrics.	90.48%	E-doc, LMS, Emails	"Class could collaborate on one doc (eg in Google Docs) to co-construct rubric"
I provide students with models or examples of work at various levels of quality.	88.46%	E-doc, LMS	"Projection, collaborative correction in a Google Doc."
My students engage in self-reflection about the quality of their work.	88.46%	E-portfolios, Online survey, LMS, Mind mapping tools, Recording and analyzing audio/video	"You could use FlipGrid to have students record themselves, have them write a blog post, etc."
Students are provided the opportunity to self-assess and set goals	84.62%	Blogging and journaling, Online survey, LMS, E-portfolio.	"by LMS quizzes, and rubrics, reflections."
Students act as instructional resources to each other.	82.61%	Online conferencing, Collaborative documents, Social media	"Online discussion via social media allow students to exchange their understandings more often."
I adjust the sequence and pacing of my instruction, based upon information gathered.	80.95%	Online quizzes, Clickers, Self-paced Interactive video, LMS	"Various online quizzes and tasks."

Document Analysis Results

To better understand the results of the online surveys, the researcher triangulated the survey responses by analyzing the teaching documents (see Appendix E) that five participants voluntarily provided along with their survey responses. Figure 2 presents a screenshot of one of the shared documents, which is the first document that was voluntarily uploaded to the web-based questionnaire by the participants.

Figure 2

A Screenshot of Document #1

3. **1. What is the main idea of the infographic?** *

4. **2. Without looking it up, can you guess what "mito" means based on context?** *

5. **3. Without looking it up, can you guess what "saludable" means based on context/a similar word you know (salud)?** *

To guide the analytic memo writing, six open-ended questions were asked. These analytic memo leading questions were guided by (Bryant & Charmaz, 2007, p. 251): (1) “What is this an example of?”; (2) “When and where does it happen?”; (3) “What language and which language skill is taught through this document?”; (4) “Which tools/media are used in this document?”; (5) “Which formative assessment strategy/strategies are implemented through the design of this document?”; and (6) “Under what conditions does it seem to occur? With what consequences?”.

Corresponding to the above questions, both the researcher and an inter-rater wrote one analytic memo for each of the five documents. The researcher continued to code the ten analytic memos separately, and then further summarized what these documents reflect.

The First document presented a quiz in the Spanish language via the web survey system Google Form. Most of the questions in this quiz are asked around an infographic found online in real life. One of the codes emerged in the analysis process as *authentic learning materials*. It is agreed that the skill taught from this document should be the ability to comprehend an authentic material using the context. And the document shows how web survey systems could enable instructors to use authentic materials in the target language to assess their language ability by gathering real-time evidence of student learning simultaneously from all of the students. This document supports the research results shown in the first row of Table 10.

The second document is a screenshot showing a teacher’s feedback note with rubrics for a student’s writing via E-doc. The screenshot shows a Google Doc file labeled

as the students' score and the topic of a writing task. The task was to type the description of a fruit without naming it. After checking this student's writing, the teacher used this rubric to evaluate students' work on ideas, sentence fluency, and vocabulary choices, and then gave him or her a score for grades. With the categorized rubrics, students will know where their works are exceeding, meeting, developing, or emerging the requirements. Code *collaborative* emerged when analyzing both raters' analytic memos of this document. As an online collaborative tool, E-doc provides opportunities for instructors to provide students with teacher-made or commercially made rubrics or checklists as their feedback. Therefore, it is more convenient for instructors to share and collaborate with students.

The third document presented individual feedback from the instructor to a Spanish student, concerning the student's midterm oral exam and his or her self-stated goals in Spanish speaking. It is agreed between the two raters that 3 different formative assessment strategies were implemented through the use of this Microsoft Word document. First of all, it is shown that the instructor provided descriptive feedback to the students about their performance. Second, the students were provided with the opportunity to self-assess and set goals. Third, it seems that the students were also provided with checklists or rubrics at the end. This document is an example of formative feedback delivered through a Word file. *Personalized learning* and *self-assessment* emerged as the codes of the third document since the application of technologies has made it more accessible to provide personalized learning observations and suggestions according to the different learning goals of students.

The fourth document provided is a screenshot of an online learning module delivered via a platform called ANVILL. It is noticed that the instructor posted learning targets for what he was currently teaching in the column of background. Moreover, code *multimedia* emerged when analyzing this document. With the use of online learning platform like ANVILL, language instructors could embed images, texts, and audio or video in the assessment materials, and acquire a better understanding of students' language reading and listening skills.

Finally, the fifth document presented a writing assessment material. It is a pre-writing activity for students to prepare for their upcoming writing tasks. With the activity shown in the document, it could enhance students' interest and motivation to write. In the Word documents, the instructor provided students with different models or examples of work to let students know the expectations of their writing assignments. In addition, even though the screenshot did not present the subsequent activity directly, students may need to share their work as discussion posts afterwards. Therefore, *peer assessment* may also play a role in this writing activity.

In conclusion, these five documents presented the implementation of different formative assessment strategies in college-level language teaching and provided the researcher with insights into how formative assessment strategies have been implemented in teaching through the application of different tools or digital platforms. First and foremost, the coding results of raters' analytic memos correspond with participants' self-reported survey results. Secondly, the codes that emerged from the analysis of the documents could be summarized into two themes, which are the materials of assessment

and the modes of assessment. In terms of assessment materials, using different technologies allows language instructors to incorporate digital multimedia authentic learning materials as the materials of their formative assessments. The use of technology may also influence the modes that teachers adopt in assessment design. By using technologies, they would embrace collaborative but personalized learning with opportunities for self or peer assessment in their design of the mode of formative assessment activities.

Overall Frequency of Implementing Formative Assessment Strategies

In the survey, I also collected information about the overall frequency with which teachers implemented formative assessment strategies because I wanted to know if there were strategies that were commonly used but did not have useful technical support, or if there were strategies that were less commonly used and how technology could be used to help implement them. Participants were asked to select the frequency with which they used each of the 15 formative assessment strategies. They could choose how often to use each strategy as "daily," "once or twice a week," "monthly," "semesterly," or "never." And each of these qualitative choices was coded as number one to five respectively for descriptive statistical analysis. Therefore, it is worth noting that the smaller the number shown as the average of the frequency of use, the more prevalent the use of the strategy. Instructors' overall usage of implementing the 15 formative assessment strategies is displayed in Table 12.

Table 12

An Average Frequency of Formative Assessment Strategies Used

Operational Categories	Formative Assessment Strategies	M	SD	Count
Where am I going? M=3.09	Post learning targets	2.48	1.40	27
	Provide learning targets in student-friendly language	2.46	1.37	26
	Provide checklists and/or rubrics	2.52	1.32	27
	Students develop checklists and/or rubrics.	4.22	1.10	27
	Provide models or examples	3.63	1.13	27
Where am I now? M=2.43	Gather real-time evidence of student learning	2.03	1.43	30
	Students act as instructional resources	2.00	1.18	26
	Provide descriptive feedback	1.93	0.78	29
	Students provide each other with descriptive feedback.	3.15	1.15	27
	Students self-assess and set goals	3.07	1.31	28
How can I close the gap? M=2.45	Students are given time to revise their work	2.30	1.12	27
	Students engage in self-reflection	3.15	1.24	27
	Students monitor their learning over time	2.93	1.53	28
	Adjust the sequence and pacing of instruction	2.00	1.19	27
	Target my instruction to learning gaps	1.85	1.08	27

Note: Daily = 1, Once or Twice a Week = 2, Monthly = 3, Every Semester = 4, Never = 5

In addition, a weighted grand mean for each operational category was also calculated based on the mean of each strategy. The average frequency of formative assessment strategies used by language instructors to help students understand the learning targets was 3.09. Comparing to the weighted grand mean of frequency of the other two categories (M=2.43, M=2.45), it is suggested that strategies under this category were less frequently used than strategies under the category of acknowledging students about their current learning status and how students can improve to achieve the learning goals.

Summary

In summary, instructors' qualitative responses were congruent with the results of the first research question. The results show that all 15 formative assessment strategies were considered to be more technology-supportable than technology-useless, especially after the innovative use of various educational online platforms and software.

Of the 15 formative assessment strategies listed in the survey, technology was found to be particularly useful when instructors intended to gather real time learning evidence from students, monitor students' learning over time, and post the current learning targets. To implement these three formative assessment strategies, participants mentioned a wide range of common instructional technology tools, such as learning management systems, classroom response systems, online survey systems, blogs, E-portfolio platforms, presentation tools, and social media tools. Although there were still many instructors reporting applying technology such as social media and online conferencing tools, relatively fewer instructors considered technology as useful when

they intend to let students act as instructional resource to each other. Instructors also indicated that they did not find technology useful when they felt the need to adjust the sequence and pace of instruction based upon information gathered. Some participants indicated that the completion of this formative assessment relied more on the teacher's experience and their pedagogical knowledge, but others suggested that tools such as self-paced interactive videos, online quizzes, and the use of learning management systems could also help with the implementation of this formative assessment strategy.

Moreover, the results of the document analysis regarding how participants were using technology to help with the implementation of certain formative assessment strategies corroborated and supported participants' survey results.

Finally, Table 13 shows a summary of the results regarding the student-driven strategies identified in this study, when Table 14 presents a summary of the results for all teacher-driven strategies in this study. Several intriguing points in the table are worth discussing.

Table 13

A Summary of the Results of Student-Driven Formative Assessment Strategies

Formative Assessment Strategies	Frequency of Use	Technology Percentage	Technology Solutions	Document Evidence?
Students develop checklists and/or rubrics.	4.22	90.48%		N/A
Students act as instructional resources	2.00	82.61%		N/A
Students provide each other with descriptive feedback.	3.15	92.00%	LMS (6), E-doc (4), Blogging (3) E-portfolios (3), Online survey tools (3) …	N/A
Students self-assess and set goals	3.07	84.62%		Document 3
Students are given time to revise their work	2.30	92.00%		N/A
Students engage in self-reflection	3.15	88.46%		N/A
Students monitor their learning over time	2.93	96.15%		N/A

Note: For calculating the frequency of use, Daily = 1, Once or Twice a Week = 2, Monthly = 3, Every Semester = 4, Never = 5

Table 14

A Summary of the Results of Teacher-Driven Formative Assessment Strategies

Formative Assessment Strategies	Frequency of Use	Technology Percentage	Technology Solutions	Document Evidence?
Post learning targets.	2.48	96.15%		Document 4
Provide learning targets in student-friendly language.	2.46	95.00%		N/A
Provide checklists and/or rubrics.	2.52	92.00%	LMS (8), E-doc (4), Clickers or i-clickers (3), Online survey platforms (2), Videos (2), Social media (2) …	Document 2 & 3
Provide models or examples.	3.63	88.46%		Document 5
Gather real-time evidence of student learning.	2.03	96.67%		Document 1
Provide descriptive feedback	1.93	93.10%		Document 3
Adjust the sequence and pacing of instruction	2.00	80.95%		N/A
Target my instruction to learning gaps	1.85	96.15%		N/A

Chapter 5: Discussion and Conclusion

Discussion of Results

The results showing in the chapter above allow us to draw some preliminary conclusions. First of all, the descriptive statistics indicates that all of the 15 formative assessment strategies could be supported by technology according to second and foreign language instructors. Among these 15 formative assessment strategies, technology was found particularly helpful in gathering real time learning evidence from students, monitoring students' learning over time, and posting the current learning targets, which happen to represent the three different operational categories of formative assessment strategies (Chappuis, 2009). In other words, the quantitative results of this study suggest that all of the 15 formative assessment strategies of three operational categories could be supported by the use of technology according to second and foreign language instructors.

The results from the qualitative parts of the questionnaire suggest that language instructors who are interested in CALL tend to be innovative in their use of different technology to assess students' learning. Instructors not only mentioned the creative use of platforms or applications that were not originally designed for teaching, such as social media, productivity applications, online survey software, and blogging and journaling platforms, but also repeatedly emphasized the important roles of learning management systems, class response systems, adaptive learning systems, and other educational technology tools in implementing formative assessment. However, it is also shown from the participants' responses that teachers' technology choices may be influenced by a variety of factors from school management and the work environment. In addition, five

instructional documents voluntarily provided by five survey respondents further corroborated the questionnaire results.

Together, these results suggest how language instructors might use different technologies to implement different formative assessment strategies, and further promote formative assessment in second or foreign language education.

In addition to these preliminary findings, some aspects of the survey results are worth discussing.

As shown in Table 12, strategies associated with the operational category “Where am I going?” were formative assessment strategies that were designed to help students understand the learning targets designed by the teacher. Similar to the results of (Goggin, 2018), the instructors surveyed in this study also used the first two strategies, which involved posting learning targets and posting the targets in a student-friendly way, more frequently. And the least frequently used strategy in the survey, which is about helping students develop checklist or rubrics, is also in this category. It is also worth noting that this result is consistent with Goggin’s findings in his 2018 study. It was reported that 52.4% of the participants in (Goggin, 2018, p. 65) “Do Not Use” this strategy, while 59.26% of the respondents of this current study said they “Do Not Use” this strategy. At the meantime, both studies found that teachers were more often to provide rubrics for their students themselves.

The strategies associated with the category Where Am I Now?" were designed to develop a mutual understanding of the current learning state of the students comparing to the learning objectives. Generally speaking, strategies within this category were found

more frequently used than strategies in the other two categories. For example, all surveyed instructors reported that they provide descriptive feedback to their students about their performance, and they normally implement this strategy daily (31.03%) or once or twice a week (48.28%). According to Table 12, in addition to the strategy of teacher providing descriptive formative feedback to students, there were the other two relatively frequently used strategies in this category. About once or twice a week, the instructors would collect real-time evidence of student learning and allow students to act as learning resources to each other. Again, in line with the findings of (Goggin, 2018), the latter two strategies in this category involving peer feedback and self-assessment were relatively infrequently used by the respondents of this study.

Finally, strategies in the last operational step “How can I close the gap?” were developed to guide students from their current state towards the intended learning goals. The most frequently used strategy in this category was identified as teachers targeting their instructions to the learning gaps, which was also the most frequently used strategy of all 15 strategies in this study. Another frequently used strategy was also an action taken by teachers, which involves adjusting the sequence and pace of the lesson based on the learning evidence gathered from the students. Comparing to these two teacher-driven strategies, the other three student-driven strategies were not as frequently used. As Goggin (2018) argues, it should be a coordinated effort between instructors and students to close the gap. The teacher's actions are designed to allow the students to play their role in this final step. Students are expected to revise their work based on feedback, monitor their learning over time, and reflect on their learning.

In conclusion, despite the differences in the survey population, this study and (Goggin, 2018) had very similar results regarding the frequency of implementing formative assessment strategies. Strategies that are used to help students understand the learning targets were less frequently used than strategies under the category of acknowledging students about their current learning status and how students can improve to achieve their learning goals. In particular, both studies found that student-driven formative assessment strategies were not as frequently used as teacher-driven strategies, raising concerns that students may lack an understanding of how they learn through self-assessment and how they can learn from each other in the process of learning.

Interestingly, given the characteristics of the participants in this study, we can see that being technologically proficient or at least interested in using technology in instruction did not lead them to use certain formative assessment strategies more frequently. We can interpret this finding in three different ways.

First, it may suggest that proficiency in using technology may not be a factor that influences teachers' implementation of formative assessment strategies. In other words, the use of technology was not a significant factor in teachers' implementation of formative assessment. Another perspective concerns the role of technology in formative assessment practices. Since the results also suggest that all strategies are considered to be supported by the use of technology, the role of technology in the implementation of formative assessment strategies may be to make the process more enjoyable and less time-consuming rather than to prompt teachers to implement the process more frequently. I personally prefer the third explanation, that each strategy has its own ideal frequency of

implementation. I would argue that each strategy has an ideal frequency of implementation, rather than conforming to the notion that more frequent is better. For example, an instructor may use E-doc or other cloud-based technology to collaboratively state weekly learning objectives with each student. In this case, the strategy of sharing learning goals is used on a weekly basis. At the meantime, the instructor may want to use different in-class and after-school activities to continually gather evidence of student learning. Thus, ideally this strategy could be implemented on a daily basis.

Student-Driven Formative Assessment Strategies

It is worth noting that within each operational category, the most frequently used strategy was teacher-driven and the least frequently used strategy was student-driven. In particular, instructors reported less use of self-assessment related formative assessment strategies in each operational category. For example, instructors reported that the average frequency of having students develop their own rubrics ($M = 4.22$, $SD = 1.10$), having students self-assess and set goals ($M = 3.07$, $SD = 1.31$), and having students engage in self-reflection ($M = 3.15$, $SD = 1.24$) was approximately once a month to once a semester. These values are each greater than the average value of the category to which they belong, which indicated that strategies related to self-assessment are relatively less frequently used at each operational stage of formative assessment.

Firstly, teachers are more likely to prepare the rubrics or checklists themselves than to allow students to take the leading role in the step of developing a mutual understanding of the desired learning objectives. This can be interpreted as the students may lack the skills to develop appropriate assessment criteria in the early stages of their

learning. However, 90.48% of the respondents in this study believed that technology could be used to help with this the implementation of this strategy. Technologies such as E-doc would allow the class to collaborate on constructing a student-developed rubric.

Secondly, instructors reported that they would have students serve as instructional resource for each other approximately once or twice a week, thereby promoting peer assessment during the operational step of developing an understanding of the current learning status of the students with respect to their learning goals. However, it is shown that instructors may tend to neglect the quality of these peer assessments because the strategy of students providing each other with descriptive feedback was much less frequently used.

In addition, instructors reported less use of the strategy of having students self assess their current learning status. However, Document 3 demonstrates that when students are given the opportunity to reflect on their pronunciation and set goals for improvement, teachers can provide personalized feedback, pinpoint each student's learning goals, and provide personalized suggestions for further progress. The use of technologies such as E-doc can make this process less time-consuming, which enables more effective documentation and feedback, as well as making formative assessment more time-sensitive.

Thirdly, in the stage of closing the gap between students' current learning status and their desired goals, instructors reported that they would encourage students to self reflection approximately once a month to once a semester. And on average, students were given between once or twice a week and once a month to revise their assignments and use

record-keeping technology to monitor their learning. As mentioned earlier, these strategies were used less frequently than the other two teacher-driven strategies of targeting the instructions to learning gaps and adjusting the instruction based the formative feedback gathered from students. However, it is worth mentioning that the teacher's actions at this stage are actually designed to allow students to perform their role in this final step. One possible hypothesis is that the teacher may not be aware of the importance of students being active learners, actively engaged in the process of monitoring, revising, and reflecting on their work.

As shown in Table 13, instructors mentioned the use of a LMS in six of the seven student-driven strategies. LMS was mentioned repeatedly in this study, and one reason for this may be that, as discussed in (Fageeh, 2015), instructors rely on the LMS to implement formative assessment because of its features such as immediate feedback and automatic grading. Therefore, both EFL student and faculty held positive attitudes towards the use of LMS as an assessment medium. It is also possible that LMSs are often compatible, allowing teachers to implement several formative assessment activities simultaneously on one platform. Nevertheless, several participants also commented that they were required to use the LMS that the university subscribed to. Therefore, this kind of administrative restriction has made instructors more dependent on the use of the LMS than before.

In addition, technologies such as e-docs, blogging and journaling tools, e-portfolio platforms and online survey tools used to facilitate collaboration and content sharing were mentioned as being used to facilitate more than one student-driven strategy.

However, in general, instructors tended to rely on educational technology software to support the implementation of student-driven strategies.

According to the latest issue of Horizon Report (EDUCAUSE, 2020), Colorado State University's C-ALT is delivering learning analytics using the U-behavior tool, which can deliver visual-form learning analytics to the students. It is believed that this kind of learner-centered formative assessment approach could potentially help students reflect on their study behaviors and promote learning (p, 23). It is reasonable to believe that more such educational tools will be developed and used in the near future to facilitate student-driven formative assessments.

Teacher-Driven Formative Assessment Strategies

Contrary to the lesser use of student-driven formative assessment strategies, the majority of participants' responses indicated that teacher-driven formative assessment strategies were implemented more frequently.

First of all, when discussing the use of technology to facilitate these eight formative assessment strategies, the respondents mentioned the use of the LMS as a technology solution for each of the eight strategies. This result indicates that instructors would use different modules and functions of the LMS to facilitate all of these instructor-driven strategies.

Secondly, the least frequently used formative assessment strategy in this category was teachers providing different models and examples to their students, which was used about once a month to once a semester. 88.46% of the participants believed that technology could be used to facilitate the implementation of this strategy. However,

overall, this was a strategy that was used less frequently and by fewer instructors who felt that technology could help implement this strategy. We might attribute this result to instructors' neglect to clarity and hierarchy in setting and sharing their instructional goals.

Thirdly, the strategy of teachers adjusting the order and pace of instruction based on the information gathered about student learning was one of the strategies found to be commonly used by the participants in this study, but perhaps lacked useful technological support. This strategy relied more on teachers' pedagogical knowledge and their styles of teaching, by its very nature. Even though 80% of the teachers suggested that online quizzes or clickers could be used to facilitate the implementation of this strategy, these tools often only assist teachers in receiving feedback on their teaching. Some respondents were also creative in suggesting the use of interactive video resources, a system that would be very dependent on the pedagogical experience and content mastery of the teacher and system designer.

Fourthly, the instructor also mentioned the application of the adaptive learning system in helping teachers provide guidance for identified learning gaps, misunderstandings, and incomplete understanding. The development and application of the adaptive learning system reflects the application of artificial intelligence in education. It is also a powerful tool in providing personalized learning experience for students. In addition to the application of adaptive learning systems, popular tools such as class response systems, learning management systems, electronic documents, and online video platforms were also mentioned as useful tools to support this strategy.

In general, teacher-driven strategies were perceived to be facilitated by more types of technology, whereas the technology solutions offered by participants for student-driven strategies were relatively homogeneous and relied more on systems and platforms created specifically for education. The LMS is, of course, still the primary technology-enabled solution for almost all strategies. The reasons for this should also be similar to those described earlier. However, it is clear to see that educators are being more creative in implementing teacher-driven strategies. In addition to the use of learning management systems, the participants of this study also mentioned using educational systems developed for specific purposes, such as the use of adaptive learning systems to address misunderstandings or misinterpretations, the use of text analyzers to simplify the wording of second language instructions, and the use of interactive audio or video feedback platforms to provide feedback on audio assignments. Furthermore, when used creatively, non-educational software or technology applications such as social media, presentation tools, online survey tools, video resources, email, have also been identified as useful tools for supporting teacher-driven formative assessment strategies.

Summary

The purpose of this research is to explore what formative assessment strategies are better supported using technology according to college language instructors, and how technology can be used to facilitate the implementation of formative assessment strategies. In this survey research, a web-based questionnaire was used as the primary data collection instrument to collect both qualitative and quantitative data regarding the perceived use of technology in implementing different formative assessment strategies. In

the end, 30 second or foreign language instructors who were interested in computer assisted language learning (CALL) completed a 42-item web-based questionnaire. The results indicate that for each of the formative assessment strategies, there were more participants who thought technology could be used to help than those who didn't think it could be used as a facilitation tool. Of the 15 identified formative assessment strategies, technology was found to be particularly helpful in collecting real-time evidence of student learning, monitoring student learning over time, and posting current learning goals, which happen to represent three different operational categories of formative assessment strategies (Chappuis, 2009). And the Learning Management System (LMS) seems to be the master key in most technology solutions.

Furthermore, this study and (Goggin, 2018) had very similar results regarding the frequency of implementation of formative assessment strategies, despite the different respondents. One possible explanation is that there is an ideal frequency of implementation of each strategy in practice, regardless of whether teachers use technology or not, rather than the more they use it, the better.

Implications

Research Implications

This exploratory research was an exploration of the perceived use of technology in implementing formative assessment strategies by instructors who are interested in computer assisted language learning. By adopting existing quantitative scales from a recent quantitative research on teachers' implementation of formative assessment strategies (Goggin, 2018) and adding corresponding open-ended questions about

instructors' perceived use of technology, this study used a web-based questionnaire to collect both qualitative and quantitative data concurrently.

Surveys have been considered by both qualitative and quantitative researchers as a convenient instrument to collect information from a large number of potential participants. Researchers like Rosenberg, Lewandowski, and Siegel (2015) in have also been discussing the feasibility of using survey as the primary data collection instrument when conducting mixed methods research. This research has shown how web-based surveys can be used for the collection of both quantitative and qualitative data to create a merged profile of how second or foreign language instructors could use technology to facilitate their implementation of either student-driven or teacher-driven formative assessment strategies.

Implications for Action

The primary idea for this research originated when I was attending a CALICO conference to present how language instructors can use some interactive presentation platforms to collect real-time feedback from students while teaching, thereby changing the sequence and pace of teaching to better enable students to improve their language reading, writing, and cultural understanding of the language. At that time, my whole presentation was not systematic and was only based on my own teaching experience. Therefore, I would use this survey to explore how technology could be used to facilitate formative assessment from the perspective of other language instructors who are also interested in computer assisted language learning.

One of the purposes of this research was to explore and establish a beginning point for a discussion about the role of technology in the implementation of formative assessment strategies in second or foreign language classrooms. Educators, especially language educators, can benefit from the information from this research by comparing it to their own practice and reflecting on how they themselves have implemented the various strategies of formative assessment and whether they feel they have made the use of technology use in their classrooms as effective as possible.

At the same time, I think this study can also provide insights for educational technology designers. When designing educational technology products to facilitate language assessments, designers should not only focus on the design of summative assessments, but also on the role of formative assessments in language learning and use strategies to facilitate the implementation of formative assessments.

Limitations and Future Research

This survey is limited. Subjects participated in the same educational organizations and the number of subjects was small. Also, some demographic information should have been collected differently. For example, according to Kessler and Plakans (2008), a relationship between ESL teachers' technology confidence level and their integrated use of technology was found when seven ESL teachers were identified as highly confident, contextually confident and less confident. It was found that teachers' high confidence level did not equal integrated technology use. The teachers who used technology frequently in both required and creative ways were those who were confident in technology in certain identified contexts, while highly confident ESL teachers not only

used technology less but also “displayed little consideration for the appropriateness of the technology” (p. 279). Therefore, when collecting participants’ confidence of using technology for educational purposes, an effort should be made to distinguish between contextually confident from simply high levels of confident.

A questionnaire was used to collect both qualitative and quantitative data for this study. While the non-experimental design did fit the purpose of this study and provided useful information, the findings of this study should not be overgeneralized. The focus of this study's exploration was on what language instructors have been doing or think they should be doing. It is recommended that more discussion should be generated around this conclusion.

As a result of this exploration research, I have several recommendations for future research. The first recommendation is to focus on timeliness. Technological innovations are changing rapidly, so technology-related research should also focus on technological developments in different times. The data revealed in this study were collected prior to the COVID-19 pandemic. After accommodating the "new normal," teachers may have developed a new understanding of the use of technology in formative assessment. Therefore, it would be interesting to replicate this study again, or further conduct a mixed methods research to explore how teachers implement formative assessment strategies in a fully online mode and how often they use the technologies mentioned in the results of this study after the pandemic.

The current study found that learning management systems play a leading role in facilitating the implementation of formative assessment strategies. Further research could

focus on how learning management systems can be used to effectively conduct formative assessment.

In addition, the scope of the study could also be expanded. The study could be extended from a specific group of people interested in CALL to all foreign language teachers and thus the results could be compared with the present results.

References

Airasian, P. W. (1996). *Assessment in the classroom*. New York, NY: McGraw-Hill.

Alzina, A. (2016). Using formative assessment to improve student learning outcomes: A study of the different types of formative assessments teachers use to drive instruction and their effects on student learning (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No.10014579)

Assessment Reform Group. (2002). Retrieved from http://www.hkeaa.edu.hk/DocLibrary/SBA/HKDSE/Eng_DVD/doc/Afl_principles.pdf

Battelle For Kids. (2017). What is FIP? In FIP Your School--Ohio. Retrieved from http://portal.battelleforkids.org/FIPOhio/what-is-fip

Beatty, I. D., Feldman, A., Leonard, W. J., Gerace, W. J., St. Cyr, K., Lee, H., & Harris, R. (2008). Teacher learning of technology-enhanced formative assessment. A conference paper accompanying a special symposium presented at the Annual International Conference of the US National Association for Research in Science Teaching (NARST), Baltimore, MD, Apr 01. Published in the Education Resources Information Center (ERIC), #ED502258.

Beatty, I. D., & Gerace, W. J. (2009). Technology-enhanced formative assessment: A research-based pedagogy for teaching science with classroom response technology. *Journal of Science Education and Technology, 18*(2), 146-162.

Black, P., & Wiliam, D. (1998). Inside the black box: raising standards through classroom assessment. Phi Delta Kappan, 92(1), 81-90.

Black, P., & Wiliam, D. (2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability (formerly: Journal of Personnel Evaluation in Education), 21*(1), 5-31.

Bloom, B.S., Hastings, J.T. & Madaus, G.F. (1971) Handbook on the Formative and Summative Evaluation of Student Learning. New York, NY: McGraw-Hill.

Brink, M.K. (2017). Teacher's perceived understanding of formative assessment and how this understanding impacts their own classroom instruction (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No.10264800)

Brown, H. D. (2004). *Language assessment: Principles and classroom practices*. NY: Pearson Education.

Bryant, A., & Charmaz, K. (Eds.). (2007). *The Sage handbook of grounded theory*. Sage.

Buyukkarci, K. (2014). Assessment beliefs and practices of language teachers in primary education. *International Journal of Instruction, 7(*1), 107-120.

CALICO. (2017). Retrieved 18 October 2019, from https://calico.org/home/about-calico/

Chandio, M. T., & Jafferi, S. J. (2016). Teaching English as a language not subject by employing formative assessment. *Journal of Education and Educational Development, 2*(2), 151-171.

Chang, A. (2012). UTAUT and UTAUT 2: A review and agenda for future research. *The Winners, 13*(2), 10-114.

Chappuis, J. (2009). *Seven strategies of assessment for learning*. Boston, MA: Pearson.

Chen, Q., May, L. A., Klenowski, V., & Kettle, M. A. (2014). The enactment of formative assessment in English language classrooms in two Chinese universities: Teacher and student responses. *Assessment in Education Principles Policy & Practice, 21*(3), 271- 285.

Cheng, L., Rogers, T., & Hu, H. (2004). ESL/EFL instructors' classroom assessment practices: Purposes, methods, and procedures. *Language Testing, 21*(3), 360-389.

Chevalier, J. (2011). Teachers' perception of handheld response systems as a tool for formative assessment in high school classrooms (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No.3481408)

Close, B. (2017). Faculty perception of formative assessment and implementation practices in pre-clinical medical education: A Q method study (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No.10270501)

Cohen, A. D. (1994). *Assessing Language Ability in the Classroom*.

Connolly, L. (2013). Demographic data in research studies. *MEDSURG Nursing, 22*(4), 269-270

Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Davis, V. (2017). Fantastic, Fast Formative Assessment Tools. Retrieved from https://www.edutopia.org/blog/5-fast-formative-assessment-tools-vicki-davis

Deno, S. L. (1985). Curriculum-based measurement: The emerging alternative. *Exceptional children, 52*(3), 219-232.

DiBiase, D. (2014). Formative assessment professional development: Impact on teacher practice (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No.3621976)

Eleventh Annual ESL Symposium to Focus on 'Formative Assessment'. (2019). Retrieved 18 October 2019, from https://news.uark.edu/articles/46263/eleventh-annual-esl-symposium-to-focus-on-formative-assessment-

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of research on Technology in Education, 42*(3), 255-284.

Fageeh, A. I. (2015). EFL student and faculty perceptions of and attitudes towards online testing in the medium of Blackboard: Promises and challenges. *The JALT CALL Journal, 11*(1), 41-62. Retrieved from http://journal.jaltcall.org/articles/11_1_Fageeh.pdf

FAST SCASS. (2008). Attributes of effective formative assessment: A work product coordinated by Sarah McManus, NC Department of Public Instruction, for the Formative Assessment for Students and Teachers (FAST) Collaborative. Washington, DC: Council of Chief State School Officers.

Feldman, A., & Capobianco, B. M. (2008). Teacher learning of technology enhanced formative assessment. *Journal of Science Education & Technology, 17*(1), 82-99.

Fuchs, L. S. (2004). The past, present, and future of curriculum-based measurement research. *School Psychology Review, 33*(2), 188-193.

Garcia Jr, E., & Maxwell, G. M. (2014). Rural South Texas curriculum coaches' perceptions of the use and effectiveness of formative assessment by classroom teachers in guiding instruction. *Journal of Instructional Pedagogies, 15*(1).

Giroux, D., Tétreault, S., & Landry, M. P., (2015). Evaluating adult's competency: application of the competency assessment process. *International Journal of Alzheimer's Disease, 2015*(2): 753873.

Goggin, S. E. (2018) A qualitative study of the implementation f formative assessment straitegies in the classroom (Doctoral dissertation). Retrieved from OhioLINK.

Heritage, M. (2007). Formative assessment: What do teachers need to know and do? *Phi Delta Kappan, 89*(2), 140-146.

Heritage, M., Kim, J., Vendlinski, T., & Herman, J. L. (2008). From evidence to action: A seamless process of formative assessment? *Educational Measurement: Issues and Practice, 28*(3), 1-16.

Herman, J. (2013). Formative assessment for next generation science standards: A proposed model.

EDUCAUSE. (2020). *2020 EDUCAUSE Horizon Report: Teaching and learning edition*. https://library.educause.edu/resources/2020/3/2020-educause-horizon-report-teaching-and-learning-edition

Jamieson, J., & Musumeci, M. (2017). Integrating assessment with instruction through technology. *The Handbook of Technology in Second Language Teaching and Learning*, 293-316.

Jenkins, M. (2004). Unfulfilled promise: Formative assessment using computer-aided assessment. *Learning and Teaching in Higher Education,1*(1), 67-80.

Johnson, R. B., & Christensen, L. (2017). *Educational research: Quantitative, qualitative, and mixed approaches* (6th ed.). Thousand Oaks, CA: Sage Publications.

Joshi, M., & Babacan, A. (2012). Developing a framework for the effective use of blogs in formative assessment. *Turkish Online Journal of Distance Education, 13*(3), 21-32.

Kent, D. (2019). Plickers and the pedagogical practicality of fast formative assessment. *Teaching English with Technology, 19*(3), 90-104.

Kessler, G., & Plakans, L. (2008). Does teachers' confidence with CALL equal innovative and integrated use? *Computer Assisted Language Learning, 21*(3), 269-282.

Ketabi, S., & Ketabi, S. (2014). Classroom and formative assessment in second/foreign language teaching and learning. *Theory & Practice in Language Studies, 4*(2).

Lake, W. (2013). The Difference Between ESL and EFL: Teaching English. Retrieved 9 November 2019, from https://www.brighthubeducation.com/esl-teaching-tips/127984-the-difference-between-esl-and-efl/

Leigh, I. W., Smith, I. L., Bebeau, M. J., Lichtenberg, J. W., Nelson, P. D., & Portnoy, S. (2007). *Competency assessment models. Professional Psychology: Research and Practice, 38*(5), 463-473.

Mauch, J., & Birch, J. W. (1993). *Guide to the successful thesis and dissertation*. New York: Marcel Dekker.

Mertler, C. A. (2016). *Classroom assessment: A practical guide for educators.* Routledge.

Miller, T. (2009). Formative computer-based assessment in higher education: the effectiveness of feedback in supporting student learning. *Assessment & Evaluation in Higher Education, 34*(2), 181-192.

Mitten, C., Jacobbe, T., & Jacobbe, E. (2017). What do they understand? Using technology to facilitate formative assessment. *Australian Primary Mathematics Classroom, 22*(1), 9-12.

National Research Council. (2002). Technology and assessment. [electronic resource]: Thinking ahead: Proceedings from a workshop. National Academies Press.

Pallant, J. (2010). *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using SPSS* (4th ed.). New York, NY: McGraw Hill.

Radford, B.W. (2014). The Effect of Formative Assessments on Language Performance. (Doctoral dissertation). Brigham Young University. Retrieved from https://scholarsarchive.byu.edu/etd/3978/

Rosenberg, B. D., Lewandowski, J. A., & Siegel, J. T. (2015). Goal disruption theory, military personnel, and the creation of merged profiles: A mixed methods investigation. *Journal of Mixed Methods Research, 9*(1), 51-69.

Ross, S. (2005). The impact of assessment method on foreign language proficiency growth. *Applied Linguistics, 26*(3), 317-342.

Sach, E. (2012). Teachers and testing: An investigation into teachers' perceptions of formative assessment. *Educational Studies, 38*(3), 261-276.

Saglam, A. L. G. (2018). The integration of educational technology for classroom-based formative assessment to empower teaching and learning. In Khan, A. A., & Umair, S. (Eds.), *Handbook of research on mobile devices and smart gadgets in K-12 education* (pp. 321-341). IGI Global.

Saldaña, J. (2015). *The coding manual for qualitative researchers*. Sage.

Seesaw. (2019). Retrieved from https://web.seesaw.me/

Shirley, M.L. (2009). A model of formative assessment practice in secondary science classrooms using an audience response system (Doctoral dissertation). Ohio State University, Columbus, OH.

Snodgrass, D. (2010). FAST handbook. Paper presented at the Cleveland State University, Cleveland, OH.

Venkatesh, V., Morris, M. G., & Davis, G.B. (2003) User acceptance of information technology: Toward a unified view, *MIS Quarterly, 27*(3), 425-478.

Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS quarterly, 36*(1), 157-178.

Wiliam, D., & Black, P. (1996). Meanings and consequences: A basis for distinguishing formative and summative functions of assessment. *British Educational Research Journal, 2*2(5), 537-548.

Wozney, L., Venkatesh, V., & Abrami, P. C. (2006). Implementing computer technologies: Teachers' perceptions and practices. *Journal of Technology and Teacher Education, 14*, 173–207.

Young, J. E. J., & Jackman, G. A. (2014). Formative assessment in the Grenadian lower secondary school: Teachers' perceptions, attitudes and practices. *Assessment in Education Principles Policy & Practice, 21*(4), 398-411.

Zhan, Y., & So, W. W. M. (2017). Views and practices from the Chalkface: Development of a formative assessment multimedia learning environment. *Technology, Pedagogy and Education*, 1-15.

Appendix A: Questionnaire: Language Teachers' Perceived Use of Technology for the Implementation of Formative Assessment Strategies

Welcome to the research study!
Ohio University Online Consent Form
Title of Research: Language Teachers' Perceived Use of Technology for the Implementation of Formative Assessment Strategies
Researcher: Yue Dong; Advisor: Greg Kessler
IRB number: 19-E-203

You are being asked by an Ohio University researcher to participate in research. For you to be able to decide whether you want to participate in this project, you should understand what the project is about, as well as the possible risks and benefits in order to make an informed decision. This process is known as informed consent. This form describes the purpose, procedures, possible benefits, and risks of the research project. It also explains how your personal information will be used and protected. Once you have read this form and your questions about the study are answered, you will be asked to participate in this study. You may print a copy of this document to take with you.

Summary of Study
We are interested in exploring what formative assessment strategies are commonly used by language teachers and how technology can be used to facilitate the implementation of formative assessment strategies. Your participation of this research will involve completion of a brief online survey.
Explanation of Study
For the purpose of this survey, formative assessment is defined as: "Formal and informal processes teachers and students use to gather evidence for the purpose of improving learning." (Chappuis, 2009). In this online survey, you will be presented with information relevant to 15 pre-developed formative assessment techniques that can be used to facilitate learning. You will be asked to answer some questions about it. Please be assured that your responses will be kept completely confidential. All of the online responses of this survey will be deleted before April 2024.
You should not participate in this study if you have no experience of language teaching or under the age of 18.
The survey should take you around 15 minutes to complete.
Risks and Discomforts
No anticipated risks or discomforts.
Benefits
This survey seeks to explore what strategies are used by language teachers for assessing students' learning in class. However, you may not benefit, personally by participating in this study.
Confidentiality and Records

Your study information will be kept confidential using an encrypted local folder by the researcher.
For maximum confidentiality, please clear your browser history and close the browser before leaving the computer.
Additionally, while every effort will be made to keep your study-related information confidential, there may be circumstances where this information must be shared with:

* Federal agencies, for example the Office of Human Research Protections, whose responsibility is to protect human subjects in research;
* Representatives of Ohio University (OU), including the Institutional Review Board, a committee that oversees the research at OU;

Compensation

As compensation for your time and effort to complete the survey, you will be eligible to win one of ten Amazon e-gift cards of 15 dollars. Your odds of winning one of the $15 Amazon e-gift cards will depend on the total number of participants who will have successfully completed the survey and opted in the prize drawing. For example, if a maximum of 1000 people could complete the survey, and 800 of you provide the email addresses for the prize drawing, your odds of winning an e-gift card are 1 in 80.
You will be prompted to indicate interest in being entered for a chance to win an e-gift card by providing an email address. To protect your privacy, you may enter any one of your email addresses by which you cannot be identified by the researchers of this study. The winner will be randomly selected.

Future Use Statement

Identifiers might be removed from data/samples collected, and after such removal, the data/samples may be used for future research studies or distributed to another investigator for future research studies without additional informed consent from you or your legally authorized representative.

Contact Information

If you have any questions regarding this study, please contact Yue Dong, Ph.D candidate of Instructional Technology, Ohio University, (740)591-7438 or yd707015@ohio.edu. Or contact Dr. Greg Kessler of the department of Educational Studies, Ohio University, kessler@ohio.edu.
If you have any questions regarding your rights as a research participant, please contact Dr. Chris Hayhow, Director of Research Compliance, Ohio University, (740)593-0664 or hayhow@ohio.edu.

By clicking the button below, you are agreeing that:

· you have read this consent form (or it has been read to you) and have been given the opportunity to ask questions and have them answered;
· you have been informed of potential risks and they have been explained to your satisfaction;
· you understand Ohio University has no funds set aside for any injuries you might receive as a result of participating in this study;
· you are 18 years of age or older;
· your participation in this research is completely voluntary;

· you may leave the study at any time; if you decide to stop participating in the study, there will be no penalty to you and you will not lose any benefits to which you are otherwise entitled.

Please note that this survey will be best displayed on a laptop or desktop computer. Some features may be less compatible for use on a mobile device.

Version Date: [05/17/2019]

A. I consent, begin the study
B. I do not consent; I do not wish to participate

Q1 Your gender is _____.
A. Male
B. Female
C. Other
Q2 Your native language is _____.
Q3 I am a(n) _____.
A. foreign language teacher - You are teaching a language in countries where that language is NOT the native language (e.g., teaching French in the U.S.). Please specify which language do you teach:
_____
B. second language teacher - You are teaching a language in countries where that language is the native language. (e.g., teaching English to speakers of other languages in the U.S.). Please specify which language do you teach:
_____
C. Other, please specify _____
Q4 I teach students in the following language proficiency level. (Please check all that apply.)
A. Elementary
B. Intermediate
C. Advanced
D. Other, please specify _____
Q5 I teach students about the following language skills. (Please check all that apply.)
A. Reading
B. Listening
C. Speaking
D. Writing
E. Other, please specify: _____
Q6 On average, how many students do you teach each day?
_____

Q7 From 0 to 10, please scale your confidence of using technology for educational purposes.

_____

Q8 Please briefly provide your definition of formative assessments.

_____

For the purpose of this survey, formative assessment is defined as: "Formal and informal processes teachers and students use to gather evidence for the purpose of improving learning." (Chappuis, 2009).

Different teachers implement some formative assessment techniques more frequently than other formative assessment techniques. Please indicate how often you implement each of the following formative assessment techniques.

Q9 I gather real time evidence of student learning simultaneously from all of my students with quick check techniques like clickers, ABC cards, white boards and/or thumbs-up.
A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use
Q10 Do you think technology can be used to do this?
Yes. If yes, how? _____
No. If no, why? _____

Q11 I provide descriptive feedback to my students about their performance.
A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use
Q12 Do you think technology can be used to do this?
Yes. If yes, how? _____
No. If no, why? _____

Q13 My students monitor their learning over time, using record-keeping techniques.
A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use
Q14 Do you think technology can be used to do this?
Yes. If yes, how? _____
No. If no, why? _____

Q15 My students are provided the opportunity to self-assess and set goals (i.e. Stars and Steps)
A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use
Q16 Do you think technology can be used to do this?
Yes. If yes, how? _____
No. If no, why? _____

Q17 I post learning targets for what I am currently teaching.
A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use

Q18 Do you think technology can be used to do this?
Yes. If yes, how? _____
No. If no, why? _____

Q19 My students are given time to revise their work based upon feedback they receive.
A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use
Q20 Do you think technology can be used to do this?
Yes. If yes, how? _____
No. If no, why? _____

Q21 I provide my students with checklists and/or rubrics that are teacher or commercially made.
A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use
Q22 Do you think technology can be used to do this?
Yes. If yes, how? _____
No. If no, why? _____

Q23 My students engage in self-reflection about the quality of their work.
A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use
Q24 Do you think technology can be used to do this?
Yes. If yes, how? _____
No. If no, why? _____

Q25 I help my students develop checklists and/or rubrics.
A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use
Q26 Do you think technology can be used to do this?
Yes. If yes, how? _____
No. If no, why? _____

Q27 My students provide each other with descriptive feedback.
A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use
Q28 Do you think technology can be used to do this?
Yes. If yes, how? _____
No. If no, why? _____

Q29 I provide my students with models or examples of anonymous student work at various levels of quality.
A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use
Q30 Do you think technology can be used to do this?
Yes. If yes, how? _____
No. If no, why? _____

Q31 I adjust the sequence and pacing of my instruction, based upon information gathered from ongoing formative assessments.

A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use
Q32 Do you think technology can be used to do this?
Yes. If yes, how? _____
No. If no, why? _____

Q33 In my classroom, students act as instructional resources to each other.
A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use
Q34 Do you think technology can be used to do this?
Yes. If yes, how? _____
No. If no, why? _____

Q35 I provide my students with learning targets that are in student friendly language.
A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use
Q36 Do you think technology can be used to do this?
Yes. If yes, how? _____
No. If no, why? _____

Q37 I target my instruction to learning gaps, misconceptions, or other incomplete understandings identified through formative feedback
A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use
Q38 Do you think technology can be used to do this?
Yes. If yes, how? _____
No. If no, why? _____

Q39 Please choose your confidence level of using technology for educational purposes.
A. Not confident at all
B. Slightly confident
C. Somewhat confident
D. Fairly confident
E Completely confident

Q40 Could you share an example of materials or procedures that you use technology in teaching related to formative assessment (i.e. a screenshot or picture of your use of technology for formative assessment)

Thank you very much for your participation! Please leave an email address here if you are interested in being entered for a chance to win an e-gift card. You may enter any one of your email addresses by which you cannot be identified.

_____

Appendix B: Questionnaire: Permission to Use and Adapt the Questionnaire

Ms. Dong,

Good afternoon. Your topic sounds very interesting. You absolutely have my permission to cite and adapt my questionnaire. Good luck and I would look forward to hearing what your research brings.

Best Regards,

Dr. Scott Goggin
Superintendent
Westlake City Schools

WESTLAKE
City Schools

Appendix C: IRB Approval Letter

Project Number	19-E-203
Project Status	APPROVED
Committee:	Office of Research Compliance
Compliance Contact:	Robin Stack (stack@ohio.edu)
Primary Investigator:	Yue Dong
Project Title:	Formative Assessment and the Use of Technology
Level of Review:	EXEMPT

The Ohio University Office of Research Compliance reviewed and approved by exempt review the above referenced research. The Office of Research Compliance was able to provide exempt approval under 45 CFR 46.104(d) because the research meets the applicability criteria and one or more categories of research eligible for exempt review, as indicated below.

IRB Approval:	05/20/2019 11:01:50 AM
Review Category:	2

Waivers: Waiver of signature on consent document.

If applicable, informed consent (and HIPAA research authorization) must be obtained from subjects or their legally authorized representatives and documented prior to research involvement. In addition, FERPA, PPRA, and other authorizations / agreements must be obtained, if needed. The IRB-approved consent form and process must be used. Any changes in the research (e.g., recruitment procedures, advertisements, enrollment numbers, etc.) or informed consent process must be approved by the IRB before they are implemented (except where necessary to eliminate apparent immediate hazards to subjects).

It is the responsibility of all investigators and research staff to promptly report to the Office of Research Compliance / IRB any serious, unexpected and related adverse and potential unanticipated problems involving risks to subjects or others.

This approval is issued under the Ohio University OHRP Federalwide Assurance #00000095. Please feel free to contact the Office of Research Compliance staff contact listed above with any questions or concerns.

The approval will no longer be in effect when the Primary Investigator is no longer under the auspices of Ohio University, e.g., graduation or departure from Ohio University.

Appendix D: Participant Recruitment Email

[Calicomembers] FW: CALICO, Graduate Research Survey
calicomembers-bounces@groups.txstate.edu on behalf of

Horn, Esther L <ec06@txstate.edu>

Mon 11/25/2019 5:12 PM

To: calicomembers@groups.txstate.edu <calicomembers@groups.txstate.edu>

Dear Colleague,

This is Yue Dong from Ohio University. I am conducting a survey for the research (IRB number: 19-E-203.) to explore how technology can be used to facilitate the implementation of formative assessment strategies. You are kindly requested to participate in this survey. Your participation will last approximately 15 minutes.

You may get some useful information about formative assessment strategies through taking the survey. More importantly, your participation can make the opinions known for the benefit of the entire education. Your participation is very important and greatly appreciated.

No risks or discomforts are anticipated from your participation in this study.

Your participation in the study is voluntary, and you have the right to withdraw at any point during the survey for any reason and without any prejudice.

The participant should be 18 years of age or older and should have experiences of serving as a college level foreign or second language instructor. If you are eligible, please kindly use the following link to access and complete the survey

https://ohio.qualtrics.com/jfe/form/SV_aV0fnc4icnMqBN3

As compensation for your time and effort to complete the survey, you will be eligible to win one of ten Amazon e-gift cards of 15 dollars. Your odds of winning one of the $15 Amazon e-gift cards will depend on the total number of participants who will have successfully completed the survey and opted in the prize drawing. For example, if a maximum of 1000 people could complete the survey, and 800 of you provide the email addresses for the prize drawing, your odds of winning an e-gift card are 1 in 80.

If you have any questions regarding this study, please contact Yue Dong, yd707015@ohio.edu and (740)591-7438 or the advisor: Dr. Greg Kessler, kessler@ohio.edu.

Thank you in advance for your participation!

Best regards
Yue

Appendix E: Documents Analysis

1. **Document One**
    a. What is this an example of?
    It seems like a quiz in Spanish language.
    b. When and where does it happen?
    It should be an online quiz via Google Form. The quiz should happen after students learned some basics in Spanish.
    c. Who are the target audience/students of these teaching materials? (What language and which language skill is taught through this document?)
    The target audience/students should be Spanish leaners. Based on the quiz questions, the skill taught from this document should be the ability to comprehend an *authentic material* by using the context.
    d. Which tools/media are used in this document?
    This assessment used Google Form to create a quiz.
    e. Which FA strategy/strategies are implemented through the design of this document?
    Gathering real-time evidence of students' learning simultaneously from all students.
    f. Under what conditions does it seem to occur? With what consequences?
    To my understanding of the document, it looks like an authentic assessment, in which students read an *authentic material* in the target language so as to assess their ability to understand it. The assessment result can reflect students' mastery of the comprehension skills by using the context.

2. **Document Two**
    a. What is this an example of?
    This document should be an example of a teacher's feedback note with rubrics for a student's writing via Google Doc (E-doc).
    b. When and where does it happen?
    It might be happened after students took and submit the assessment and it could happen after class as homework assignment.
    c. Who are the target audience/students of these teaching materials? (What language and which language skill is taught through this document?)
    The target audience/students of this teaching material should be English language students who are writing to improve English writing skills.
    d. Which tools/media are used in this document?
    This assessment materials used online *collaborative* tool (Google Doc) so as to share and collaborate with students.
    e. Which FA strategy/strategies are implemented through the design of this document?
    Providing students with checklists and/or rubrics.
    f. Under what conditions does it seem to occur? With what consequences?

This could happen after the assessment were given to students with the rubrics provided to students. After checking this student's wiring, the teacher used this rubrics to evaluate students' work and gave him or her a score for grades. With the categorized rubrics, students will know where they exceed, or meet, or need development, or did not meet the criteria so as to improve later on.

3. **Document Three**
    a. What is this an example of?
    It is individual feedback from instructor to a student regarding to the student's oral exam and his or her *self-assessment*.
    b. When and where does it happen?
    It should be given after the student completed a mid-term oral exam and self-assessment.
    c. Who are the target audience/students of these teaching materials? (What language and which language skill is taught through this document?)
    The target audience/students should be Spanish language learners.
    d. Which tools/media are used in this document?
    The feedback report given by an instructor was on Microsoft Word document. It might be sent to the students via e-mail (E-doc) or handed in to students in hard copy report.
    e. Which FA strategy/strategies are implemented through the design of this document?
    Providing descriptive feedback to students about their performance; Providing students with checklists or rubrics; Providing students with the opportunities to self-assess and set goals.
    f. Under what conditions does it seem to occur? With what consequences?
    From this document, the student was provided chance to reflect his or her pronunciation and set goals to improve and in this feedback report, the teacher analyzed and summarize each student's improvement, and provided *personalized* recommendations to make further progress.

4. **Document Four**
    a. What is this an example of?
    This document seems like an example of reading and listening activities on an online learning platform.
    b. When and where does it happen?
    It happened on an online learning platform called ANVILL after asking students to read and get to know about some knowledge.
    c. Who are the target audience/students of these teaching materials? (What language and which language skill is taught through this document?)
    The target audience/students should be English language learners.
    d. Which tools/media are used in this document?
    It used online language learning platform with *multimedia* (image, text, and audio).

e. Which FA strategy/strategies are implemented through the design of this document?
   Posting learning targets for what I'm currently teaching.
f. Under what conditions does it seem to occur? With what consequences?
   To my understanding, it could be an assessment task for higher level of English language learners focusing on reading and listening comprehension.

5. Document Five

a. What is this an example of?
   This is an example of a description of a writing assessment.
b. When and where does it happen?
   It should happen before giving students the real writing assignment, from which I can see it's probably aims at beginner learners who have learned some basic verbs and grammar to express daily activities.
c. Who are the target audience/students of these teaching materials? (What language and which language skill is taught through this document?)
   The audience/students of the material should be a second language learners, probably Spanish learners.
d. Which tools/media are used in this document?
   It used E-doc and possibly LMS or E-portfolio because it mentioned the requirement for students to upload drawings/pictures as discussion posts.
e. Which FA strategy/strategies are implemented through the design of this document?
   Providing students with models or examples of work at various levels of quality.
f. Under what conditions does it seem to occur? With what consequences?
   This is a pre-writing activity for students to prepare for their upcoming wiring task. With this step, it could enhance students' interest and motivation to write by using the target language to describe their daily activities. Peer assessment activities may or may not come after the discussion board posts.

Thesis and Dissertation Services