2018-01-01

Technological Literacy Across Disciplines: Examining Graduate Instructors' Experiences

Sidouane Patcha Lum

University of Texas at El Paso, patchasidouane@gmail.com

Follow this and additional works at: https://digitalcommons.utep.edu/open_etd

Part of the Instructional Media Design Commons, Other Communication Commons, and the Rhetoric Commons

Recommended Citation


https://digitalcommons.utep.edu/open_etd/144

This is brought to you for free and open access by DigitalCommons@UTEP. It has been accepted for inclusion in Open Access Theses & Dissertations by an authorized administrator of DigitalCommons@UTEP. For more information, please contact lweber@utep.edu.
TECHNOLOGICAL LITERACY ACROSS DISCIPLINES: EXAMINING GRADUATE INSTRUCTORS’ EXPERIENCES

SIDOUANE PATCHA LUM
Doctoral Program in Rhetoric and Composition

APPROVED:

Beth Brunk-Chavez, Ph.D., Chair

Lucia Dura, Ph.D.

William Robertson, Ph.D.

Charles Ambler, Ph.D.
Dean of the Graduate School
Dedication

I dedicate this dissertation to God Almighty for his constant love and support for me all the days of my life, and for making me attain this milestone. To Him be all the Glory!
TECHNOLOGICAL LITERACY ACROSS DISCIPLINES: EXAMINING GRADUATE INSTRUCTORS’ EXPERIENCES

by

SIDOUANE PATCHA LUM

DISSENTATION

Presented to the Faculty of the Graduate School of The University of Texas at El Paso in Partial Fulfillment of the Requirements for the Degree of

DOCTOR OF PHILOSOPHY

Rhetoric and Composition
THE UNIVERSITY OF TEXAS AT EL PASO
December 2018
Acknowledgements

I wish to thank my advisor Dr. Beth Brunk-Chavez for her continuous support, encouragement and very careful supervision of my work. Thank you for believing in me. I remain grateful! Special thanks also go to my committee members Dr. Lucia Dura and Dr. William Robertson. I appreciate your invaluable coaching and contributions which helped me reach this milestone. Thank you!

I acknowledge and I’m thankful for my interview participants and colleagues who willingly dedicated their time to participate in this study. Without you this would not be possible.

I am also thankful for my classmates who diligently participated in this study.

A hearty appreciation to my parents Mr. and Mrs. Patcha Valentine, my family and friends who have been a great source of support throughout this journey. Thank you my beloved Oluwaseye Michael Owoseni, your love, support and encouragement made this possible.
Abstract

This dissertation critically examines graduate instructors’ technological literacy across disciplines in a four-year university in order to explore avenues through which their challenges teaching with classroom technologies can be met. It also investigates the possibility that non-resident instructors and resident instructors’ difference in cultural orientations (patterns, norms and ways of doing) influence instructors’ ability to use technology for their specific functions. For this purpose, multi (modal) literacy theories and the TPACK framework (technological, pedagogical and content, knowledge) are used as theoretical underpinnings which foster a better understanding of instructors’ technological literacy, while grounded theory developed by Glaser and Strauss (1967) and modified by Charmaz (2006, 2014) is used as a methodology and method for data analysis through processes of coding, categorizing, memo-writing and saturation. Data collected through surveys and follow-up interviews reveal that instructors find it challenging to integrate technology into their functions for reasons such as little or no knowledge of instructional technologies required by the institution prior to their enrollment, unfamiliarity with a technology-supported pedagogy, lack of skills, training, institutional support and ineffective campus workshops. Also, contrary to scholarly findings in the literature on non-resident graduate student teaching and use of technology, results of this study showed that all instructors (both resident and non-resident) have similar challenges integrating technology into their instructional functions. This research emphasizes the need for instructors to think “multimodally and semiotically” in ways that allow for proper planning and preparation of how to integrate technology into content and pedagogy, rather than treating it as an “add-on” pedagogical tool. It also stresses the importance for institutions to test, assess and support graduate student’s technological literacy in the best possible ways. Lastly, using a positive deviance approach (Singhal et al., 2009) to find best practices of
instructors who excel in their use of technology without access to any special resources, this research foregrounds local solutions to technology integration that can be amplified to improve all instructors’ technological literacy
# Table of Contents

Dedication ........................................................................................................ iii  
Acknowledgements ............................................................................................. v  
Abstract ................................................................................................................ vi  
Table of Contents ............................................................................................... viii  
List of Tables ........................................................................................................ xi  
List of Figures ........................................................................................................ xii  

Chapter 1. Introduction ..................................................................................... 1  
  1.1 Research Problem ....................................................................................... 5  
  1.2 Purpose of Study ......................................................................................... 9  
  1.3 Significance of the Study .......................................................................... 10  
  1.4 Literature Review ...................................................................................... 11  
    1.4.1 Introduction to Technological Literacy ............................................ 11  
    1.4.2 Defining Literacy .............................................................................. 11  
    1.4.3 Technological Literacy .................................................................. 15  
    1.4.4 Technological Literacy and Culture ............................................. 19  
    1.4.5 Considering Graduate Student’s Experiences with Technology ... 22  
    1.4.6 Background to International Student Teaching in the United States 26  
    1.4.7 International Teaching Assistants’ (ITA’s) Experiences with Technology 28  
  1.5 Outline of Chapters .................................................................................... 30  

Chapter 2. Research Theoretical Foundations ................................................. 33  
  Overview ........................................................................................................ 33  
  2.1 Multimodality and Multi(modal) Literacy Theories .................................. 33  
    2.1.1 What is multimodality? .................................................................... 33  
    2.1.2 Multi(modal) Literacy Theories ....................................................... 37  
    2.1.3 Multimodal Literacy ...................................................................... 40
2.2 Technological Pedagogical and Content Knowledge (TPACK) ........................................43
   2.2.1 Overview of Framework .........................................................................................43
   2.2.2 Why TPACK? Implications for Teachers .............................................................45
   2.2.3 Components of TPACK Framework .................................................................49

Chapter 3. Using Grounded Theory to Examine Graduate Instructors Technological Literacy
   Overview ......................................................................................................................57

3.1 Methodology ............................................................................................................57
   3.1.1 Grounded Theory- Background .........................................................................57
   3.1.2 Controversies Surrounding Grounded Theory ....................................................60
   3.1.3 Grounded Theory Designs ..................................................................................61

3.2 Methods ..................................................................................................................63
   3.2.1 Research Context ...............................................................................................63
   3.2.2 Research Design- Mixed Methods ......................................................................65
   3.2.3 Participants and Sampling ..................................................................................67

3.3 Grounded Theory Methods .....................................................................................73
   3.3.1 Data Analysis ......................................................................................................73
   3.3.2 Coding ................................................................................................................74
   3.3.3 Categorizing ........................................................................................................79
   3.3.4 Memo-Writing ....................................................................................................80
   3.3.5 Theoretical Sampling .........................................................................................82
   3.3.6 Theoretical Saturation .......................................................................................83
   3.3.7 Ethical Considerations .........................................................................................83
   3.3.8 Research Limitations .........................................................................................84
Chapter 4. Interpreting Data: Discussions on Graduate Instructors’ Technological Literacy

4.1 Survey Analysis ................................................................. 86
4.2 Interview Analysis ............................................................. 102
4.3 Recommendations for improvement in technological literacy ........................................... 121
4.4 Role of Assumptions in Pedagogy ........................................................................... 125

Chapter 5. Fine – Tuning Graduate Instructors’ Technological Literacy .................... 129

5.1 Overview .............................................................................. 129
5.2 Research Summary ................................................................ 129
5.3 Research Findings ................................................................... 131
5.4 Theoretical Framework ................................................................... 134
  5.4.1 Multi (modal) Literacy Theories ................................................... 134
  5.4.2 Technological Pedagogical Content Knowledge (TPACK) ................... 138
5.5 Implications of Research Findings ................................................................. 143
  5.5.1 Technological Knowledge of Graduate Instructors .............................. 143
  5.5.2 Discussions on Recommendations for Technology Integration by Graduate
       Instructors ........................................................................... 147
  5.5.3 Research Limitations ................................................................ 149
  5.5.4 Research Contributions ................................................................... 150
  5.5.5 Open Spaces for Further Research ...................................................... 152

References ...................................................................................... 153

Appendix 1: Consent Form ..................................................................... 175
Appendix 2: Recruitment Email ................................................................ 178
Appendix 3: Survey Questions ................................................................... 179
Appendix 4: Interview Questions .............................................................. 182
Vita ...................................................................................................... 183
List of Tables

Table 4.1: Participants Colleges/Departments ................................................................. 86
Table 4.2: Instructor Awareness of Technologies to be used prior to enrollment as TA’s/Al’s .. 90
Table 4.3: Specific Uses of Technologies by Graduate Instructors ........................................ 93
Table 4.4: Table 3: How Instructors Overcome “Hacks” When Using Technology ............... 100
Table 4.5: Instructors Suggestions for Improvement in their Technological Literacy ............. 101
List of Figures

Figure 2.1: The TPACK Framework and Its Knowledge Components (Adapted from Koehler & Mishra, 2008) ................................................................. 49
Figure 3.1: Graphical representation of grounded theory Marey-Pérez et al. (2014) .......... 58
Figure 3.2: Research Sample Size ............................................................................. 68
Figure 3.3: Survey Participant Size ............................................................................ 70
Figure 3.4: Initial Coding Sample .............................................................................. 76
Figure 3.5: Focused Coding Sample ......................................................................... 78
Figure 3.6: Category Sample .................................................................................... 80
Figure 4.1: Graduate Instructors’ Years of Working Experience .............................. 88
Figure 4.2: AI/TA Specific Functions ........................................................................ 89
Figure 4.3: Sources of Information About Use of Technology Prior To Enrollment as Graduate Instructors .......................................................... 91
Figure 4.4: Technologies Used by Graduate Instructors .............................................. 92
Figure 4.5: Graduate Instructor’s Level of Technological Literacy ............................ 95
Figure 4.6: Graduate Instructors Level of Preparedness to Integrate Technology into Their Functions ................................................................. 96
Figure 4.7: Do you feel you had adequate training when you started using these technologies? 97
Figure 4.8: Areas Where Instructors Feel Challenged with Technology .................. 98
Figure 4.9: How Instructors Get Technical Assistance to Use Technology .............. 99
Figure 4.10: Graduate Instructors’ departments ....................................................... 103
Figure 4.11: Duration of Graduate Instructor’s AI/TA Experience ......................... 104
Figure 4.12: Instructors’ Knowledge/Use of Technology .......................................... 104
Figure 4.13: Graduate Instructors’ Status ................................................................. 105
Figure 5.1: The TPACK Framework and Its Knowledge Components (By Koehler & Mishra, 2008) ........................................................................... 139
Figure 5.2: (Dis)connection between Instructor’s TPACK Knowledge Components (Modified to represent findings for this study) .......................... 140
Chapter 1. Introduction

In the United States, it is common to find that graduate students teach undergraduate courses at many universities, often including courses in Liberal Arts, Education, Science, Technology, Engineering, and Math. Among these graduate student teachers are international graduate students who also contribute greatly to the objectives of American universities (Finder, 2005, Anderson 2010). As Crumley (2010) argued, it is becoming a ‘trend’ in American higher education for universities to increasingly use the assistance of both international and US students as teaching assistants (TAs) or assistant instructors (AIs) who assist in grading, conducting labs, and teaching undergraduate courses. In all these, the role of technology in facilitating class instruction cannot be overlooked (Selfe & Selfe, 2002). Besides its usefulness in facilitating class instruction, technology also contributes towards preparing students for life in the workforce after graduation in our ever-growing global village. It is not surprising, then, that there exist very broad discussions of technology integration in pedagogy and how it facilitates students’ learning processes (Roschelle, Pea, Hoadley, Gordin, & Means, 2001; Schacter, 1999; Bransford, Brown, & Cocking, 2000; Davis, Preston, & Sahln, 2008; Chandra & Lloyd, 2008; Earle, 2002; Lawless & Pellegrino, 2007). Following former U.S. President Clinton’s call for schools in America to be “connected to the information super-highway, with computers and good software, and well-trained teachers” (State of the Union Address, 1997), the technological culture of academia took a radical turn.

As far back as nineteen years ago, Anson (1999) observed that the academy is a great supporter and consumer of electronic technology although at the time, faculty used technology as “individual consumers” rather than as “collective producers.” Technology in this light was used for personal purposes like writing and reading emails as opposed to having conference calls and collaborating with other faculty and students via shared online documents. The collective use of technology in
schools all started with the integration of microcomputers into schools, to facilitate classroom instruction in several ways. Blended learning (F2F and online) (Picciano, 2009), independent study and distance learning (Anson, 1999), remain strong benefits of this innovation revolution. As Desmet and Evans (2004) suggested, technologically mediated teaching and learning, when compared to face-to-face learning, has proven to be satisfactory for students—it is now dubbed the “no significant difference” phenomenon. Their research, which sought to compare learning outcomes between undergraduate students in both online and face-to-face versions of an English composition class concluded that besides the “no significant difference phenomenon,” and contrary to the belief that instructor’s behavior largely determines student satisfaction in a course, there is an even greater role on the technology and how instructors use it to facilitate teaching, student learning and participation. Blended learning on the other hand, which according to Picciano (2009) represents different generations of students and acknowledges their different learning styles, further calls on teachers to have multiple and creative approaches to instructional design, which include the use of online technologies and teaching strategies for face-face learning.

Teaching strategies for face-face learning are usually facilitated by institutionally supported classroom technologies (Crumley, 2010) like Vista, Blackboard, and WebCT, which West and Graham (2007) referred to as a Course Management System (CMS). These management systems are arguably the most used technologies in education (Arnone, 2002; Pollack, 2003; West & Graham, 2007) along with other classroom technologies well used and incorporated in pedagogy like Microsoft Office and web-based technologies like Google Docs, Weebly, WordPress, iMovie, Movie Maker, and others, largely used for multimodal projects and digital editing in Humanities courses.
With the advancement of technology at an unprecedented rate, new teaching methods and learning practices affect graduate teachers and students in varying ways. They are faced with the challenge to be proficient in computer-based aspects of communication and presenting information. Moreover, with the belief that technology integration in schools would contribute positively to student learning, the US government became a strong supporter of programs that integrate these technologies. As of 2003, according to Quality Education Data (2004), over $7.87 billion was spent on technology equipment for the 2003-2004 academic year (qtd in Hew & Brush, 2007). However, in 2010, the U.S department of education further stressed on the notion that, “educators do not have an understanding of, and do not all use (emphasis mine) technology that is part of the daily lives of professionals in other sectors. The same can be said of many of the education leaders and policymakers in schools, districts, and states and of the higher education institutions that prepare new educators for the field” (U.S. Department of Education, 2010, p. viii).

According to Hennessy, Ruthven and Brindley (2005), technology integration was assessed by the productive ways that teachers used and relied on technology to carry out class activities (Hew & Brush, 2007). Overtime, these assessments showed that technology integration was and is still an issue in academia. Concerns about the need for teachers to effectively integrate technology into their course work prompted leaders of higher education to emphasize preparation programs and professional development opportunities for pre-service and in-service teachers, to boost their use of technology (U.S. Department of Education, 2010; Pellegrino, Goldman, Bertenthal, & Lawless, 2007).

This vision of integrating technology into academia, which significantly altered human ways of working and learning, still lags in education (Mishra & Koehler, 2006; Hofer & Swan, 2008; Pflaum, 2004; Polly et al., 2010) because technology is used more as “efficiency aids and extension
devices” (McCormick & Scrimshaw, 2001, p. 31) rather than as tools that can “transform the nature of a subject at the most fundamental level” (p. 47). Some factors hindering the successful implementation of technology in pedagogy include lack of access, training, skills, time, practice (Hicks et al., 2002; Cuban, Kirkpatrick & Peck, 2001; Diem, 1997; Llorens, Salanova, & Grau, 2002; Angeli & Valanides, 2005; Niess, 2005), and the fact that some teachers do not recognize the need to use technological resources for teaching (Zhao, 2003; Ottenbreit-Leftwich et al., 2010). Contextual and other social factors also affect how teachers use technologies, given that institutions are often “unsupportive of teachers’ efforts to integrate technology use into their work” (Koehler and Mishra, 2009, p. 61). It is also argued that some teachers began their career at a time when educational technology was not at its peak. Hence, the notion that they do not value technology or have an interest or teaching with it is persistent (Koehler and Mishra, 2009).

In a bid to examine how education programs should prepare teachers to integrate technology in their classroom instruction, Hew and Brush (2007) examined topics on technology integration, comparing it to the ways in which teachers used it to facilitate teaching and learning practices. Results of their study showed that effective technology training for teachers had three characteristics: “(1) focused on technology skills and experiences within an educational context, (2) provided opportunities for “hands on” work with the particular technology resource, and (3) the training was consistent with specific and authentic needs and problems teachers faced in their professional contexts” (Ottenbreit-Leftwich et al., 2012). Like Polly et al. (2010) also contended, teachers, especially pre-service teachers, would be left with technology skills and little knowledge of how to implement them in their classrooms if they do not have opportunities to learn “first hand” how to practice using these technologies (Wang, 2002; Beyerbach et al., 2001; Andersson, 2006). Professional development programs which usually offer a “one size-fits-all approach” to all
teachers have however, also proven to be ineffective (Koehler & Mishra, 2009). All these contentions honor the idea that teaching with technology is an “ill-structured task,” which occurs in unique classroom settings (Koehler & Mishra, 2009) and which needs deep crucial attention. It also indicates the expectations for graduate instructors to be knowledgeable and flexible with how they integrate technology into their functions.

1.1 Research Problem

Although the role and contributions of technology in academia is admissible, that is acknowledging its usefulness in transforming writing classes to several learning centers, the call for critical insight and sensitivity to the political and social dangers which computers bring should not be overlooked (Hawisher & Selfe, 1991). To effectively facilitate classroom instruction, there is the expectation for graduate students to know how to use classroom technologies, and very often there is not ample preparation for this type of work. Part of this problem stems from the fact that instructors do not carefully plan out how to incorporate technology into their classrooms—more specific to the field of Rhetoric is the argument that many in the profession are yet to realize that unless technology is “considered carefully and used critically, it can and will support any one of a number of negative pedagogical approaches that also grow out of our cultural values and our theories of writing” (Selfe & Selfe, 2002, p. 56).

Moreover, despite the provision of computers and opportunities for graduate instructors to improve and work on their use of classroom technologies, it seems that they still have difficulties of effectively using these technologies in the classroom (Crumley, 2010, Richardson, & Tuson, 2000; Moxley & Meehan, 2007; Selber, 2004; Anson, 1999; Brush & Hew, 2007). Over the years and especially in recent times, technological literacy has proven to be an essential component of pedagogy across several disciplines. Although my observation of how teachers use technology in
the classroom has been limited to the four walls of composition classes, scholarly research proves that challenges faced by these instructors are not limited to composition classes (Moxley & Meehan, 2007; Mishra & Koehler, 2006; Schrum, 1999), and like Selber (2004) argued, their user experiences need to be given more attention such that they become effective instructors at the college-level.

Drawing from the field of Rhetoric and Composition, which focuses on writing especially at the United States college level, there has been a growing interest in research that looks at how to facilitate classroom instruction with technology. This is considering that the Council of Writing Program Administrators (WPA), which is a “a national association of college and university faculty with professional responsibilities for (or interests in) directing writing programs,” includes in its Outcomes Statement that teachers should encourage “collaborative and social aspects of writing processes, where students learn to give and to act on productive feedback to works in progress, adapt composing processes for a variety of technologies and modalities, reflect on the development of composing practices and understand how these (emphasis mine) practices influence their work.” This explains why over the years, Rhetoric and Writing scholars have emphasized that faculty employ technologies appropriately to meet this objective. What this implies is the need for teachers to be technologically literate. Their limitations in this area, go a long way to indicate that more needs to be done to bridge the gap between the theory and practice. Without limiting the need for technologically-mediated instruction to Rhetoric and Writing faculty, this study also notes how instructors across other disciplines effectively use technology in their classrooms. Moxley and Meehan (2007) explained in their article “Collaboration, Literacy, Authorship: Using Social Networking Tools to Engage the Wisdom of Teachers” that unlike
faculty, graduate students are less likely to learn how to integrate and use multimodal technologies in the classroom primarily because of time constraints.

With all this insight on the potential and limitations of technology integration, Mishra and Koehler (2007) however contended that there is no “perfect solution” to integrating technology in curriculum. For example, institutions are usually challenged in managing the divide between the digital natives (people who grow up surrounded by digital technology) and the digital immigrants (people who “migrate” into technology later in life). As Selfe and Selfe (2002) equally noted, the expectations of a growing technological culture are challenged by a gap between “technological haves and have-nots” which continues to widen both within and outside the U.S. These different groups of people have different understandings, access, and use of technology and so, will therefore also require different ways of learning how to integrate technology into curriculum. For example, specific to international graduate students are arguments that, upon arrival at U.S universities, international teaching assistants (ITA’s) make ineffective instructors for reasons (Crumley, 2010) such as their “nonnative like pronunciation” which made it difficult for students to understand their speech. Students and their parents persistently complained to institution heads about this limitation (Crumley, 2010; Gravois, 2005; Finder, 2005). As Tyler (1989) maintained, unsuccessful ITA’s were those who did not consistently relay their ideas well or made effective connections between them. It is in consideration of such discourse that in this study, I explore graduate instructors’ technological literacy and investigate the possibility that experiences, or constraints faced by non-resident graduate students are different from that of U.S resident graduate students. To fully examine instructors’, use of technology for pedagogy and other related functions such as grading, conducting labs, and tutoring, this research particularly considers instructors who
are hired to work in such capacities. It doesn’t consider instructors who are hired to do research only (research assistants), like in the sciences and engineering.

This research is important in helping us understand better how PhD graduate instructors (both resident and non-resident) in the United States use technology in their academic job functions. I am familiar with these challenges based on my personal experience as a first-time composition instructor at a Midwestern University. I had limited knowledge of how to use classroom technologies to facilitate teaching, talk less of teaching students how to work with them for their class projects. I felt the need to seek help from other international students who I assumed would better understand my challenges or who I thought would know better. It was even more frustrating when I realized that the few international students, I sought help from equally had the same challenges. Another interesting insight was the fact that no one wanted to present themselves as ignorant or lacking the necessary skills needed to facilitate teaching. It was a need and an anxiety that we all held inside. All through my first two years of teaching, I believed that only international students had these challenges perhaps because a good majority of those I have come across are from countries which have little or no use of technology in their classrooms. However, my recent engagements with US students on this issue made me realize that challenges teaching with technologies in the classroom is not an “international student problem.” After listening to and observing some of these constraints, it became pressing for me to probe more into these concerns, which I believe will lead to better pedagogical practices not only for composition teachers but also for teachers across other disciplines. Although my knowledge of how to navigate these resources has greatly improved over my four years of teaching now as a PhD student in a different program, I find this worth considering because teachers’ lack of technical expertise in the classroom affects their teaching abilities and this also reflects on students’ learning processes, especially with
multimodal/visual argument projects. It is in consideration of these, that I pose the following research questions.

- What technological literacies do institutions expect graduate instructors to bring to the classroom? Are these expectations the same across disciplines?
- What technological literacies do graduate instructors bring to the classroom? And how useful/not useful are these literacies in facilitating pedagogy?
- Are there any graduate instructors who enter with low or deficient technological literacies but who manage to become proficient without access to special resources? What are some of the “hacks” that students use to navigate obstacles? And how can these be adopted by other students in similar situations?
- Are international graduate instructors likely to use technology across majors in similar ways to resident graduate instructors?

1.2 Purpose of Study

My work thus seeks to examine the technological literacy and pedagogical experiences of graduate instructors within a Texas state university to explore avenues through which their challenges teaching with classroom technologies can be met. Secondly, it considers that not much research has been conducted on the intersections of technological literacy and intercultural communication. The term technological literacy as used here refers to the practices and skills necessary for working in electronic environments (Selfe, 1999), while with intercultural communication I make reference to the “symbolic, interpretive, transactional, contextual process in which the degree of difference between people is large and important enough to create dissimilar interpretations and expectations about what are regarded as competent behaviors that should be
used to create shared meanings” (Lustig & Koester, 2003, p. 51). Also, considering the vast and complex ways in which culture is defined and constantly modified, following Appadurai (1996), I contextualize culture here as a way of marking difference in patterns/norms amongst graduate students from different nationalities. However, mindful of how technological literacy and culture mix and mesh in pedagogy, I critically examine how cultural orientations influence the way graduate instructors teach with technology in their classrooms. Here I probe into the possibility that some of the issues which instructors face teaching with technology are because of how they have been influenced by their cultural orientations.

1.3 Significance of the Study

Findings of this research, I believe, will expose some of the constraints that graduate instructors face in the classroom and will also enable other instructors to emulate good examples of how technology is used. Shedding light on this further exposes the need to create or improve upon outreach programs, seminars or workshops that facilitate composition teachers’ use of technology in the classroom. Moreover, considering that technology has increased the intensity of literate environments and plays a great role in classroom instruction in the 21st century, the quality of technologically driven instruction is crucial to the undergraduate students in these classes. This is considering how such instruction prepares students to engage with technology and its potential to facilitate collaboration in classroom projects and accommodate diverse learning styles to name a few, which in the long run prepares students to work with others in digital spaces, global contexts and equips them with the tools necessary to make it through college and other related work-spaces.
1.4 Literature Review

1.4.1 Introduction to Technological Literacy

In the first line of her book, Technology and Literacy in the Twenty-First Century, Cynthia Selfe (1991) stated, “Literacy alone is no longer our business. Literacy and technology are. Or so they must become” (p. 3). Selfe’s (1991) statement, although 27 years old, still carries significant weight in academia because of the increasing need to integrate technological-mediated instruction in school curricula. Today, there is still the growing need for literacy to be meshed with technology. It seems obvious that putting together the terms “literacy” and “technology” accounts for a definition of “technological literacy.” Perhaps, but if not, what exactly is literacy? or technological literacy?

1.4.2 Defining Literacy

The definition of literacy has been constantly redefined in the last three decades to suit new and emerging composing practices other than reading and writing, and to consider the use of new media and information technologies (Yancey, 2004, 2009; Baron, 1999; Lunsford, 2006). Over a decade ago, Lunsford (2006) in her keynote address to the Computers and Writing Conference at Stanford University expanded the definition of literacy from traditional forms of reading and writing of alphabetic texts to include “epistemic, multivocal, multimodal, and mediated practices in the computers and writing classroom” (p.169). Quoting from Shankar’s dissertation, Lunsford (2006) noted some of the reasons why literacy and its practices evolved. Shankar found that “when children are released from the representational strictures of paper and pencil to compose language, they do not just talk their words, they sing their words…They sing pure sound and rhythm, words, advertisements, school songs, popular songs and television theme songs with equal abandon” (p. 292). She emphasized that besides just composing with pencil and paper, students
also perform. Hence the idea that literacy goes beyond composing with pencil or writing on paper. It involves other practices, which are covered under modern definitions of literacy.

In what Lunsford (2006) termed “secondary literacy,” she made reference to “a literacy that is both highly inflected by oral forms, structures, and rhythms and highly aware of itself as writing, understood as variously organized and mediated systems of signification” (p. 170). Her definition of literacy reflects the changing notions of traditional literate practices, and this also has implications for the way teachers teach writing. Lunsford encouraged “classroom experiences that allow students to compose in “the most compelling discursive modalities of their generation” (p.169). She advocated for writing instruction that will enable students to work well in media spaces and considers the need for technology to be incorporated in class work. It is for such reasons that she argues that teachers have had to “re-invent” themselves and their discipline (p. 170).

Baron (1999) who also explored changing trends of literate practices, showed especially how new media and technology like the computer and telephone challenged old forms of literate practices. In great contrast to the computer, Baron (1999) argued that tools such as the pencil are advanced technologies because of their ability to facilitate composing processes. As an example, he noted how in the past, it was easier for artists to revise their works because pencil markings could be erased. However, the relative ease of using such tools for writing or communicating became challenged with the coming of the World Wide Web. Despite the challenges of adapting to literate practices that came with the World Wide Web, it was gradually embraced once people became more comfortable using it. Such changes in literate practices influenced the way people communicate, given that they moved from word processing with pencils to new ways, which include graphics, animations, videos and sound. Moreover, with the coming of technologies such as the telephone, people moved from face-to-face communication to one that lacked visible or
physical gestures. Today, telephones are not only used to communicate but are also incorporated in the classroom as tools to facilitate pedagogy (Monty, 2015). This example is quite reflective of Baron’s (1999) introspection that “the computer will be put to communication uses we cannot now even begin to imagine, something quite beyond the word processing…” (p. 15). In the same way that telephones have become mobile and used to facilitate teaching, so too have computers become useful in classroom instruction.

As Baron (1999) anticipated, the computer has evolved in so many ways that have greatly impacted practices of literacy today. It is therefore no wonder that Yancey (2009) challenges definitions of literacy that focus on print only and rather calls for “available means of expression beyond pencil, beyond pen, beyond earlier imagination” (p. 4). Yancey (2009) contended that the 21st century “marks the beginning of a new era of literacy, a period we might call the age of Composition, a period where composers become composers not through direct and formal instruction alone (if at all), but rather through what we might call an extracurricular social co-apprenticeship” (p. 5). To Yancey (2009), composers should be able to learn beyond direct instruction in ways that involve different rhetorical skills. According to Yancey (2004), definitions of literacy are contextual (“deictic”), that is, how literacy is defined depends on different contexts, and these are not limited to the use of print or word processes. Literacy as Baron (1999) also argued, “is in the midst of a tectonic change” (p. 298).

What this implies is that definitions of literacy are constantly changing, as evidenced by new definitions that include audio and visual aspects of composing, what is contemporarily referred to as multimodal forms of composing. With this perspective of what constitutes literacy, changes in the way we communicate is evidenced with the use of internet chat rooms and other communication genres such as e-mail, blogs and instant messaging (Baron, 1999). These means
of communication she noted are useful to both students and faculty alike. With regards to teaching, Baron (1999) posited that teachers move to communication modes that require digital literacy. He suggested that teachers engage in teaching practices, which address changing forms of literacy. Composition teachers could also heed to Yancey’s (2009) call “to help our students compose often, compose well, and through these composing, become the citizen writers of our country, the citizen writers of our world, and the writers of the future” (p. 4).

Wysocki and Johnson-Eilola (1999) made a case that literacy goes beyond reading and writing to include other skills and attributes that propel one in society. They posited that reading and writing is only “a useful set of skills amongst other skills and practices and behavior attributes which we all need to flourish in our present culture” (p. 367). Their approach to literacy considered that there is much more to reading and writing that will facilitate one’s learning experiences. Like the previous scholars discussed here, Wysocki and Johnson (1999) admit to the influence of technology in our communication practices, not just as tools to communicate, but also as something that we experience (p. 364). Since technology influences both the way we communicate and how we relate with it, technological literacy is to be seen not as a skill, but as a “process of situating and resituating representations in social spaces” (p. 367).

While Palmeri (2012) acknowledged traditional forms of literacy as important, he emphasized that composition scholars be open to learning other forms of literacy. As he stated, the point is not “to choose one pedagogy over another, but rather to consider how we can recombine them—remix them—in ways that can enable us to develop a more nuanced and complex view of what it means to teach composition in the contemporary digital moment” (p. 15). This changing notion of literacy also suggests how we can communicate in more-remixed ways that include texts, as well as audio-visuals. For even as Selfe suggested “if our profession continues to focus solely
on the teaching of alphabetic composition – either online or in print – we run the risk of making compositions studies increasingly irrelevant to students engaging in contemporary practices of communicating” (qtd in Palmeri, p. 4). What these scholars emphasize is the idea that, contemporary ways of communicating involve more than alphabetic composition. Moreover, for this to be taught, teachers are encouraged to embrace different ways of teaching, which include different styles of technology integration in instruction.

Changing trends in literacy have a direct relationship and impact on communicative and teaching practices. The incorporation of more technologically advanced ways of learning have greatly contributed to the changing notions of literacy far beyond the walls of academia into other socio-economic and even political spheres. As Yancey (2004) noted, “writers in the 21st century self-organize into what…we might call a series of newly imagined communities, communities that cross borders of all kinds - nation, state, class, gender, ethnicity” (p. 301). These new literate practices have also promoted different teaching approaches across American Universities.

1.4.3 TECHNOLOGICAL LITERACY

Technological literacy as used in this study relies strongly on how Selfe and Selfe (2002), and Selfe (1999) conceptualize it. In Selfe’s article “Technology and literacy: A story about the perils of not paying attention,” she defined technological literacy as “computer skills and the ability to use computers and technology to improve learning, productivity, and performance, and as fundamental aspects of a person's ability to navigate through society as traditional skills like reading, writing and arithmetic” (p. 411). Technological literacy is therefore not limited to the use of computers “for the purposes of calculating, programming, and designing, but also for the purposes of reading, writing, and communicating” (Selfe, 1999, p. 417). Estes (2017) also defined technological literacy as “the ability to effectively use technology to access, evaluate, integrate,
create and communicate information to enhance the learning process through problem-solving and critical thinking” (p. 19). Both definitions emphasize one’s ability to effectively use technology to engage in literate practices.

Worth noting is the fact that terms like digital literacy, computer literacy and other genres could equally fit or even contest this definition. R. Selfe (2005) replaced the term “technology literacy” with “digital literacy” and explained that, while “technology literacy…was meant to link computing technologies and literacy at fundamental levels of both conception and social practices” (p. 6), digital literacy on the other hand is the “sociocultural context for discourse and communication as well as the social and linguistic products and practices of communication, and the ways in which electronic communication environments had become essential parts of our cultural understanding of what it meant to be literate” (p. 6). Similarly, according to Jenkins et al., (2009) digital literacy which is built out of traditional forms of literacy, also gives room for individuals to learn in multiple ways which require skill and enable efficient use of digital devices. Also, digital literacy is defined as a situated practice which entails being able to communicate effectively through digitally mediated processes (Hague & Payton, 2011). Without overlooking their differences, for this study, I focus on areas where these definitions intersect—the connections between technology, literacy and related socio-cultural contexts.

Selfe and Selfe (2002) also differentiated technological literacy from computer literacy on grounds that while computer literacy refers to individuals’ understanding of what computers are and how they are used, or their basic familiarity with the mechanical skills of keyboarding, storing information, and retrieving it,” technological literacy on the other hand is:

the direct linking of technology and literacy at a fundamental level of both conception and practice so that technological contexts for communication become an essential part of our
cultural understanding of what it means to be literate and to practice literate behaviors, the
reading and writing and exchange of texts of various kinds” (p. 350).

In other words, technological literacy includes one’s ability to "read" our technocentric culture,
which entails having skills necessary to function in computer mediated environments and using
the World Wide Web efficiently enough for activities including but not limited to reading, writing
and exchanging texts (Selfe & Selfe, 2002). Selfe and Selfe (2002) argued, “if students cannot
write to the screen--if they cannot design, author, analyze, and interpret material on the Web and
in other digital environments- they may be incapable of functioning effectively as literate citizens
in a growing number of social spheres” (p. 642). Students’ ability to function as literate citizens
goes beyond just knowing how to use a computer interface. In a similar manner, teachers’ inability
to teach as “literate citizens” equally hinders students from learning how to engage in social
spheres. Several factors, other than being tech savvy, account for teachers or students become
technologically literate. What this translates to is the importance of also understanding the culture
surrounding technology, which includes beliefs, experiences, ideologies and other factors (Selfe
& Selfe, 2002).

The notion that education will expose and give students access to new communication
technologies, and that this exposure will allow students better function as literate citizens in an
ever-increasing technological world, exemplifies a cultural belief. Such cultural beliefs are evident
with several calls for the inclusion of technology in pedagogy. It is no wonder that scholars like
Lunsford (2006) expanded “the definition of writing to include epistemic, multivocal, multimodal,
and multimediated practices in the computers and writing classroom” (p. 170) or that Clark (2010)
argued for the replacement of traditional essayistic literacies by ones which emphasize the civic
importance of education” (p. 27), such as e-portfolios, digital stories, online games and blogs.
These examples reflect Selfe and Selfe’s (2002) conception of technological literacy as one grounded in cultural and historical values/conditions that shape and influence its related practices. For “technological practices” are informed by “social, cultural and historical understandings of how values are de-signed into computers as manufactured artifacts” (p. 365). From this lens, it becomes clearer to see how

Technology relates to and helps shape the cultural formations of science, education, poverty, racism, sexism; how the skills of technological literacy are taught and learned in the U.S; how access to and use of technology benefit citizens differentially according to power, race, gender, and socioeconomic status; and why techno-logical systems are constructed as they are and distributed as they are within the country and around the world. (p. 366)

Such underpinnings to technological literacy somewhat offer a relationship between technology and culture, or rather how the use of technology is influenced by culture, which in this context is used loosely to represent societal norms, values and ideologies. For example, the choice of using Skype for online conference calls, as opposed to a WhatsApp video call is a decision informed by professional communication etiquette, or the decision to chat with friends through text messages as opposed to email for convenience purposes, is another of such decisions. However, the concept of culture elaborated upon in this study refers specifically to values, norms or patterns (Selfe & Selfe, 2002) of difference (Appadurai, 1996) in the way that classroom technologies are used by US graduate students and international graduate students. This approach allows for a critical insight to how technology is integrated and used in academia by graduate instructors.
1.4.4 Technological Literacy and Culture

Comparing computer interfaces to linguistic contact zones, Selfe (1999) draws on Pratt to define them as "social spaces where cultures meet, clash, and grapple with each other, often in contexts of highly asymmetrical relations of power, such as colonialism, slavery, or their aftermaths as they are lived out in many parts of the world today" (p. 482). Computer interfaces in this sense, are sites deeply ingrained with “ideological and material legacies of racism, sexism, and colonialism are continuously written and re-written along with more positive cultural legacies” (p. 484). Examples of the “ideological” in this context are teachers’ persistent beliefs about technology integration. As Pajares (1992) observed, teachers’ beliefs are more influential than teacher knowledge because of their potential to “predict, reflect, and determine their actual teaching practice (Kim et al., 2013). For example, one teacher may believe that course management systems help organize course material while another teacher may prefer to build a website for his class content. Although both teachers value using technology to manage their classes, their belief about the value of the technology does not explain how or why they choose one technology over another. What this implies is that, teachers’ fundamental beliefs about technology integrations varies and depends on how they envision their teaching and learning goals. This however, is not without implications for students’ learning processes.

An important take-away from the discourse on technological literacy is that it is influenced by cultural patterns of difference and is also socially situated. As Funkhouser and Mouza (2013) insisted, “even if teachers develop the knowledge and skills to use technology, they are not likely to do so if they cannot envision uses that align with their own pedagogical beliefs (p. 272). This notion lays the foundation from which my work is developed. First, to say that technological literacy is culturally situated is to admit that it is infused with personal values, biases, limitations and preferences. While some instructors would prefer to teach with Google Docs, Blackboard or
other social media services, others might find it a daunting task based on their preferences or limitations. Such limitations/preferences, which influence pedagogical practices in different ways, are deeply ingrained in patterns, norms and ways of operating which according to Appadurai (1996) are markers of a people’s culture.

Also, in tracing cases where culture, race, sex and class hinder one’s technological literacy, Selfe (1999) argued that “technological literacy functioned not as the mythical answer to social inequities, but rather as another way of reproducing them” (p. 479). It was the case that poor students, and students of color had lesser access to technology in schools and at home. The effects of limited access to technology translated to several issues; first, technology was introduced into schools with little or no preparation or professional development for teachers, and secondly, access to computers fell along lines of race, class and gender. Selfe (2009) reiterated the fact that Black employees and Hispanic employees were “much less likely than white employees to use a range of computer applications in their workplace environments” (p. 458). Moreover, the national project in charge of expanding technological literacy did not only fail to reduce illiteracy of its related social problems, but rather changed the “official criteria for both "literate" and "illiterate" individuals, while retaining the basic ratio of both groups (p. 422), leaving the “illiterate” population with little or no power to effect a change in the system.

In the long run, students who remain technologically illiterate end up in low paying jobs that require little or no technological skills, but to avoid this, Selfe (1999) advised that “teachers need to understand as much as possible about the broad cultural link between technology and literacy” (p. 21). When teachers begin to identify “effects of domination and colonialism associated with computer use, they will become able to establish new discursive territories within which to understand the relationships between technology and education” (Selfe and Selfe, 1994,
Armed with little training, it becomes almost impossible to avoid the challenges that teaching with classroom technologies bring—understanding these patterns of difference among teachers is a good starting point. Like Takayoshi and Selfe (2007) suggest, critical and reflective pedagogies should be created to reflect the digital and global society in which we live, and where “knowledge, experience, skills, strategies” are crucial to how we learn, work and interact with one another, since ableist, classist, racist, and sexist power structures stand the chance to negatively influence people's abilities to access and use digital technologies.

To demonstrate the importance of situating technological literacy within specific cultural, educational, material and familial contexts, Hawisher, Selfe, Moraski and Pearson (2004), used literacy narratives of Melissa Pearson, and Brittney Moraski who learned how to use computers almost generations apart. Melissa is an African American woman born on 25 August 1970, Jackson, South Carolina, into a middle-class Baptist family, while Brittney Moraski, is a white woman born on 28 August 1986, into a Catholic family in the rural Upper Peninsula of Michigan (p. 643). Their experiences with technology reiterate the idea that social contexts, education, values, cultural and ideological factors like race, class, gender, experiences, family practices, material conditions, political and economic conditions amongst many others, affect one’s ability to be technologically literate. In what the authors refer to as “cultural ecology,” they make reference to the complex “web” where humans exist alongside technology, and which is the heart of all communication. This ecology is characterized by some of these factors; literacies have life spans, people can exert agency in and around technological literacy, people do not only learn how to use technology from school, teachers only understand little out of the wealth of practices that exist in several digital environments (p. 644).
Melissa and Brittany, although raised and educated in cultures which gave much value to alphabetic and print literacies, they like many other teachers in recent times, “remain unsure of how to value new media literacies, unsure of how to practice these new literacies themselves, and unprepared to integrate them at curricular and intellectual levels appropriate for these particular young people” (p. 671). This example highlights the importance of Monty’s (2015) research on the use of devices for transnational students (students who attend college in the U.S. but who regularly travel to Mexico for a range of personal and professional reasons throughout the academic semester) in composition classrooms. Understanding that the use of mobile phones in this instance is particularly important to these students who fluctuate between different service providers and Internet connections, so they don’t miss out on class projects and announcements, Monty (2015) made the case that our pedagogical practices need to be able to support students’ lived writing experiences. Also, rather than seeing mobile devices as intrusive to writing, he suggests that instructors should consider the “material and lived realities of their students” (p. 129). As observed, while the “material and lived realities” of students, teachers and users of technology influences how technology is used, the efficient use of technology also binding upon these same values. It is in consideration of this discourse, that I proceed to examine graduate instructors’ experiences with technology in their teaching responsibilities. In accessing how similar/differently international graduate students and US students integrate and teach with technology in their classrooms, this research will better explore inequalities in technological literacy and instruction and explore further how to curb challenges faced by graduate instructors at large.

1.4.5 CONSIDERING GRADUATE STUDENT’S EXPERIENCES WITH TECHNOLOGY

According to Hughes (1989), “the literature on computers and composition instruction is filled with advice about ways to use computers in teaching writing, but the literature has included
little about training teachers” (p. 66). Interestingly, Hughes’ (1989) statement has remained accurate over the years. For example, Hawisher and C. Selfe (1991) argued that “instructors who hope to function effectively in electronic classrooms must assess ways in which the use of computer technology might shape, for better and worse, their strategies for working with students” (p. 55). They encouraged the need for teachers to carefully plan how to use technology in their classrooms and be mindful of the negative outcomes of using these technologies. Quoting Foucault (1984) these authors make a case that “technology cannot ‘guarantee’ any behavior alone ‘simply by its nature’ (p. 245)—in essence, the users of technology equally have a role to play. As Shrum (1999) found, challenges which instructors face with technology implementation stem from internal tensions, such as the fear of looking foolish when unsure about how to use a certain technology, or external tensions such as lack of access to computers, or knowledge about them. Some of “internal tensions” could also stem from technological deficiencies in students different professional and educational histories. Considering that not all graduate students enter doctoral programs as “digital immigrants,” it remains worth bearing in mind that their different levels of proficiency with technology come from different levels of academic, professional and other expertise Graupner and Blair (2009).

Barriers such as lack of technology knowledge and skills has been identified as one of the most common reasons given by teachers for using little or no technology in their classrooms (Snoeyink & Ertmer, 2001; Richardson, & Tuson,2000; Hew & Brush, 2007), and their unfamiliarity with the pedagogy of using technology, or rather, a “technology-supported-pedagogy” which is useful for a successful planning and integration of technology into teaching. As noted previously, another major barrier to technology integration is teacher attitudes and beliefs towards technology (Hermans, Tondeur, Valcke, & Van Braak, 2006). Simpson et. al (1994),
define attitudes as “specific feelings that indicate whether a person likes or dislikes something” (Hew & Brush, p. 229). In other words, teachers choose to integrate different kinds of technology in their classes based on their values and how useful (or not) they believe it to facilitate teaching. Beliefs on the other hand, defined as contexts within which something is accepted to be true, also accounts for teachers’ educational beliefs about teaching and learning (Ertmer, 2005; Windschitl & Sahl, 2002), and these beliefs determine a person’s attitude (Bodur, Brinberg, & Coupey, 2000; Hew and Brush, 2007).

Selfe (1999) also argued that teachers of composition pay little attention to issues of technology, they think of computers as simple tools which can be used or ignored, and rather focus on the theory and practice of language, which they believe to be the real intellectual and social “stuff.” Such attitude toward technology she emphasized, is deeply ingrained in the history of humanities professions. Giving heed to this attitude derails teachers from the crucial issues surrounding the use of technology. Composition teachers understand technology as “just another instructional tool” that they can choose to use or to ignore, in other cases, they often feel the need to include technology in their class work, regardless of its usefulness (Brush & Hew, 2007, p. 232), and this attitude towards pedagogy is not constructive.

Moreover, of the few classes that educate college level teachers of composition, students take course work in technology studies and more, if lucky, get a chance to be introduced to computer technologies used for teaching during orientation (Picciano, 2009). These measures, however, also barely exposes teachers to a few software programs used for teaching in the classroom, allowing for minimal hands-on practice with different software (Picciano, 2009, p. 496). It leaves them with little careful thought about the implications of using technology in their classrooms. From an inter-disciplinary perspective, often, there is also the challenge of limited
personnel in charge of supporting teachers in using different technologies in class or through technology workshops, and so sometimes they get overwhelmed by teacher requests and this limits prompt responses to some crucial issues (Cuban et al, 2001).

Besides the issue of limited personnel, traditional professional development workshops which are tailored towards improving instructor’s use of technology has been strongly opposed by Schrum (1999) in her article “Technology Professional Development for Teachers” published in Educational Technology Research and Development. Schrum (1999) argued that traditional workshops are not effective approaches for technology professional development. “Brief exposure,” she writes, “does not provide sufficient training or practice to incorporate technology into the classroom” (p. 85). In her opinion, workshops on how to use technology are not quite effective because attendance is mandatory regardless of teacher-preparedness, and so some teachers are less likely to learn from it. Also, differences in learning are not taken into consideration.

Moreover, these workshops which are often held in labs, distance teachers from their comfort zones, such trainings tend to be “just in case” learning and not “just in time” learning (p. 85). What Schrum (1999) suggested is that these trainings do not consider the material and lived realities of the people involved. Schrum (1999) indicated the importance of having teachers identify their limitations/needs, so that trainings can be tailored to meet them. As such, trainings should encourage “diversified instructional strategies.” For Hew and Brush (2007), a professional development workshop should have three phases; first it should address the needs of teachers in classroom practice, it should give teachers a chance to engage in active learning and should also focus on “technological knowledge/skills, technology-supported pedagogy knowledge/skills, and
Technology-related classroom management knowledge” (p. 233). Technology integration cannot occur when teachers lack the knowledge to operate computers or related software (p. 238).

Twelve years later, Palmeri (2012) also suggested the need for collaborative workshops that will promote the use of technologies in classrooms. He was, however, keen to note that the choice of such technologies should also be flexible enough to accommodate instructors with varying levels of expertise, and instructors should in turn strive to gain extensive experience with composing persuasive multimodal texts for diverse audiences and purposes. Palmeri’s (2012) stance on equipping teachers to engage fully in classroom technology use is a valuable recommendation. Teachers will only be better at teaching with technology when they are fully equipped to do so. Also, Hughes’ advice (1989) for what he called “computer aided instruction” recommended that “good training in computer-aided composition instruction should, first, provide teachers with information – about possible uses of computers in writing instructions and about different types of computer programs” (p. 66). He proposed giving teachers some time to practice and question the technologies they are using, so that they can better understand its influence on pedagogy.

1.4.6 BACKGROUND TO INTERNATIONAL STUDENT TEACHING IN THE UNITED STATES

For this research, International Student Teaching Assistants (ITA’s) also referred to as non-resident instructors, are in-service graduate teaching instructors who are non-resident aliens. That is, they have been issued a non-resident F visa for academic study (most common category for international students), J visa for cultural exchange, or M visa for vocational training (USCIS, 2018). Like full-time resident instructors, these categories of instructors are enrolled to teach or assist in facilitating undergraduate classes alongside their own course work. Historically, teaching assistants simply assisted professors who taught courses with tasks such as grading and helping to
prepare class materials (Fox, 1991). It was not common to find them teaching. However, with the increase of university enrollment in the 1960’s and 1970’s, which led to bigger class sizes, universities felt the need to let graduate students facilitate discussion groups as lecturers and eventually as instructors fully in charge of teaching undergraduate classes (Nyquist et al., 1991; Crumley, 2006, Fox, 1991). Thus, the dramatic increase in the number of International students in the United States over the last couple decades (Pae, 2001) was such that they can contribute to vast and growing instructional practices.

Currently ITA’s role at universities fosters division of labor among faculty making it possible for large classes to have smaller units (Smith et al., 1991) In some large research institutions, ITA’s are almost as many as faculty members (Monaghan 1989), while in others they account for about 25% of faculty (Fox, 1991). ITA’s also generally give relevant contributions to broader academic conversations through seminars, conferences, publications and eventually become professors of the field. TA’s experiences account significantly for their teaching and professional experiences (Nyquist et al., 1991).

Despite the rise in the number of ITA’s alongside their positive contributions to academia, there has also been a negative reaction to their contributions in the field. For example, the perception that a good number of them are not well prepared for their responsibilities as teaching assistant (TA’s) upon their arrival in the United States and that undergraduate students are dissatisfied with the classes they teach (Crumley, 2006; Bailey, 1984; Williams 1992; Gravois, 2005; Finder, 2005). As a result, in the late 1970’s some parents threatened not to have their students enroll in colleges and universities that had ITA’s (Smith et al., 1992), while others advocated for teaching assistantships at state universities to be awarded only to residents of the state (Bailey, 1984). As a result, several resources have been developed over time to accommodate
issues of ITA’s especially non-native speakers, including but not limited to instructional support centers, ESL programs and other departmental resources (Nyquist et al., 1991; Syverson and Tice, 1993; Smith et al., 1992).

1.4.7 INTERNATIONAL TEACHING ASSISTANTS’ (ITA’S) EXPERIENCES WITH TECHNOLOGY

Despite the wealth of literature on ITA’s experiences in US institutions, there has been a significant dearth of research investigating their how they integrate technology in their class instruction (Lam, 2000; Crumley, 2006). Lam (2000) noted, that the focus on technology use in the classroom largely centered on students and how they were affected by technology. While this in a way addressed why teachers should or should not technology, it paid no attention to how they used these technologies or why they do or do not use these technologies. As Lam (2000) and Crumley (2006) noted, the literature on technology integration specifically by ITA’s in recent times, still yields much significant research on how to teach ITA’s to use classroom technologies, how ITA’s navigate culture and language barriers in the classroom, language skills as a “foreign teaching assistant problem, and relatively old research (over 20 years) on the future of ITA’s in the U.S. When the U.S. Department of Education’s National Education Technology Plan (U.S. Department of Education, 2004) noted that "teachers have more resources available through technology than ever before but have not received sufficient training in the effective use of technology to enhance learning" (p. 40-41), it followed that scholarly research in this area paid attention to instructors’ experiences teaching with technology, however making broad reference to TA’s and not necessarily ITA’s. Crumley (2006) argued:

Given the importance of ITAs to US universities, the argument that technology in higher education is not delivering as hoped and the variety of pedagogies with which technology
is approached in language education, the unexplored area of technology in ITA programs is emerges as relevant and worth investigating. (p. 38)

Crumley’s argument supports Romano’s (1993), Kolko’s (1995, 1998) and Takayoshi’s (1996, 2000) arguments that computer users do not effortlessly become empowered once a new technology is launched. Noting that ITA training programs usually offered at universities often seek to provide English support, pedagogical skills and help ITAs integrate into the institutions’ systemic culture, Crumley’s (2010) follow up study sought to explore “what instructional and technology resources and practices are currently being used to train and equip ITAs at U.S. universities (p. 410). His work revealed that ITA programs are increasingly making a greater use of digital and online resources, also that these resources are used in “pedagogically eclectic ways” and finally, that several factors are associated with the comfortable and effective use of technology by ITA’s. Some of these factors include “awareness of resources, administrative advocacy, the presence of technology support personnel, and availability of funding” (p. 409).

Other factors associated with the discomfort and ineffective use of technology by ITA’s include lack of knowledge about the equipment, lack of access to the equipment, insufficient professional development opportunities and personal attitudes and beliefs towards technological innovations (Lam, 2000). Lam (2000) argued that merely providing ITA’s with technology or persuading them to use them is not enough—rather, that teachers should be involved in the implementation process, so that they better understand why, and how to use these technologies, and not feel ‘alienated’ from it. This view resonates with Egbert et al., (2002) who argued that a course on technology could change ITA’s attitudes and confidence with technology and provide them with new technological skills. Such support has potential to improve graduate students’ technological literacy, as well as the quality of instruction which undergraduate students receive.
When instructors are well equipped to integrate technology into their classrooms, students in-turn become able to understand how to relate with and use these technologies in different ways. They also tend to value being savvy enough to communicate through different means. Technological literacy is important tool for teaching, as it is for learning.

1.5 Outline of Chapters

In chapter 1, I introduced my research inquiry on technological literacy across disciplines, carefully noting how graduate instructor’s experiences with twenty-first century literacy practices influence how they teach in the classroom. With the expectation for graduate students to effectively teach with classroom technologies, I considered contentions which hold that they are often ill equipped to do so based on their level of digital literacy. I explored some of the challenges that they experience and questioned the possibility that the experiences, or constraints, faced by international graduate students are different from that of resident students. Later in this chapter, I introduced my research questions: What digital literacies do graduate instructors bring to the classroom? How does graduate instructors’ technological literacy influence their pedagogical practices? Are International Graduate Instructors likely as Resident GTA’s/AI’s to teach with technology in similar ways? Following an extant literature on intersections of culture and graduate student’s technological literacy practices, I proceed to chapter two of this study.

multimodal pedagogy (Selfe 1991, 1996,1999), The New London group (1996) and Lauer (2009). These are useful to examine the semiotic resources used by instructors. In the second part of this chapter, I shed light on the Technological Pedagogical Content Knowledge (TPACK) framework by Koehler and Mishra (2009), Angeli and Valanides (2009), Harris et al. (2009), Manfra and Hammond (2008) which has potential to help students and faculty pay attention to the interaction of technology, pedagogy and content.

Chapter three of this study “Using a Grounded Theory approach to examine graduate instructors Technological Literacy”, is also divided in two parts. The first part addresses the use of grounded theory as developed by Glaser and Strauss (1967) and modified by Kathy Charmaz (2006, 2014) as a methodology used for this study. The second part of this chapter looks at the research contexts, research design, participant sampling, participant recruitment, data collection and explains data analysis methods using grounded theory. Grounded theory methods allow for a critical understanding of instructors’ digital literacy and individual experiences teaching with technology.

Chapter four “Interpreting Data: Discussions on Graduate Students’ Technological Literacy”, details the paradigms and methods of my research process. Here, I offer interpretations to the information retrieved from instructors’ lived experiences in the classroom and echo their voices as new sources of knowledge. I present the major themes obtained from my research interviews and show how they relate to one another. Here again, I reiterate my research questions, carefully showing how the data responds or offers new insights to the research inquiry. I offer graphical presentations of data collected at various stages of my research, and show how participant’s responses form patterns, which are categorized under subheadings, and further used
to explain the data. Essentially, this chapter presents participants insights as standpoints into new sources of knowledge.

In chapter five “Fine – Tuning Graduate Instructor’s Technological Literacy”, I make a case for the digital literacy of graduate instructors and the challenges they face in their specific functions as AI’s and TA’s. Here I summarize my research and show how the findings demonstrate how it both aligns and challenges the research problem, existing literature and methodology in very critical ways. The research findings reveal the (ir)rationality of the arguments driving my research, it also creates a space for further research in this area and provides possible solutions to be incorporated or adapted graduate students to improve their technological literacy. This chapter concludes with the benefits of this research to academia, graduate instructors and students—some of which include creating orientation/workshops that specifically meet their challenges, learning from improved and better practices of instructors who have a relatively better performance with classroom technologies. I close this chapter by shedding light on spaces where further research in this context will be useful.
Chapter 2. Research Theoretical Foundations

Overview

The two parts of this chapter expound on the theoretical framework used for this study. The first part sheds light on multimodality and multi(modal) literacy theories which argue for the use of multiple modes (video, audio, text) in effective communication. This theory is an important foundation for this research because it acknowledges that teaching is first and foremost a multimodal activity given how instructors combine oral/written texts and gestures, as well as other audio-visual texts when working with technology. The theory thus has potential to examine how graduate students understand and apply these different modes in their instruction. The second part draws from the technological pedagogical content knowledge framework (TPACK) which bridges knowledge of technology, pedagogy and content by teachers. Like multimodality and related literacy theories, TPACK unveils the competencies needed by teachers to teach effectively with technology.

2.1 Multimodality and Multi(modal) Literacy Theories

2.1.1 What is Multimodality?

Multimodality theory looks at how people use multiple modes (textual, aural, linguistic, spatial, visual) to interact, compose messages and communicate with each other (Kress, 2009). It examines how people interact with each other and also communicate through writing, speaking, using gestures, gaze, and other visual forms (modes) (Kress, 2009). Multimodality treats communication as more than language. It considers many different modes that people use to communicate with each other and how they express themselves—multimodality argues that each mode of communication contributes to meaning and carries its own meaning.

The “term” multimodal was coined by members of the New London Group, including Kress (2003), Cope and Kalantzis (2000), Kress and Van Leeuwen (2001) and made its way into
the field of composition through the numerous writings of Cynthia Selfe. These scholars argued that “communication is not limited to one mode (such as text) or realized through one medium (such as the page or the book)” (Lauer, 2009, p. 227). On the contrary, as Kress and Van Leeuwen (2002) posit, modes “can be operated by one multi-skilled person, using one interface, one mode of physical manipulation, so that he or she can ask, at every point: Shall I express this with sound or music? Shall I say this visually or verbally?” (p. 2). According to Kress and van Leeuwen (1996), multimodal approaches to representation and communication are based on two central assumptions “(a) that communication is always and inevitably multimodal; and (b) that each of the modes available for representation in a culture provides specific potentials and limitations for communication (as qtd. Kress, 1996). What these suggest first is that modes are active in communication, and second, that modes carry specific meanings in different settings. In other words, meaning is closely tied to social and ethical values, at cultural, political, social and technological levels (Kress, 1996).

How modes are configured for teaching and learning with new technologies is the grounds for multimodal research (Kress, 2003). Bezemer (2012) and Kress (2009) define mode as a socially and culturally “shaped resource for making meaning.” According to Bezemer (2012), “in order for something to ‘be a mode,’ there needs to be a shared cultural sense within a community of a set of resources and how these can be organized to realize meaning (para. 4).” This is considering that “resources” get fully acknowledged and accepted by a majority after their long existence and success in specific functions. Modes are not generally recognized as a unified form of communication because people have different views, uses and understandings of them. It is then argued that uses of modes be observed (Kress, 2000; Jewitt & Kress; 2003). Examples of modes include semiotic elements such as video, audio, written text used by designers to compose
multimodal texts (Ball, 2004). As Kress and van Leeuwen (1996) emphasized, “modes are shaped by both the intrinsic characteristics and potentialities of the medium and by the requirements, histories and values of societies and their cultures.” For example, the use of videos to facilitate teaching is validated in a good majority of composition classrooms. However, it may not be the case for other disciplines for several reasons such as the lack of a shared sense of the use/value of visual modes in student projects across disciplines. Different communities define, through social interactions, how modes are understood and how they should function. Hence it suffices to say that modes and the interactions between them are culture subjective.

With the increasing use of multimedia software and technology tools in the world today, it is not surprising to find that people employ different modes across several genres including but not limited to writing, music, dance and art. In learning to use new technologies, teach with new technologies, read across genres while also trying to understand how to use different modes to communicate across genres, we all consciously or unconsciously practice multimodality. To better understand the relationship between multimodal pedagogy and learning, Jewitt (2008) posed the following questions about the effect of modes of representation on learning: “What does it mean for learning to have all these modes operating in the classroom? What mode is best for what? How does the move between modes impact shapes of knowledge? What does all this mean for cognitive load and learning? What forms of communication are students being expected (often implicitly) to understand? alternatively and more specific to this research is the question (emphasis mine) of how students can be taught the skills to make and interpret multimodal texts?” (p. 9). In classrooms, teachers' use of a combination of modes to facilitate teaching and learning makes us understand that teaching in the 21st century is multimodal. For example, to facilitate classroom instruction, teachers often use pictures, videos and sound to add variety to traditional teaching
styles which initially relied on strict alphabetic texts. Doing so enables them to practice teaching in more modern ways that prepare students to meet up with the world’s value for technology use. The move beyond teaching solely with alphabetic text has greatly validates the theory of multimodality.

Multimodality makes use of digital and electronic media by meshing together modes comprising images, speech, video, layout and writing. In his book, *Multimodality: A Social Semiotic Approach to Contemporary Communication*, Kress (2010) uses social semiotic theory (a theory based on meaning, social context, and cultural context) to understand multimodality. Like Jewitt (2008), he argued that to realize the full potential of multimodal research, understanding how “micro social interactions of the classroom inflect, reflect and connect with the concerns of macro educational and broader social policies” (p. 9) is a major concern for teachers to take up. Moreover, in integrating multimodality into composition curricula, scholars in the New London Group (1996), Kress and vanLeeuwen (1996, 2001), Kress (2003), Cope and Kalantzis (1999) argued that the use of modalities for expression (sound, animation, image) are reliant on the material and rhetorical contexts in which they were designed and distributed (Anderson et al., 2006). These authors also argued that a single modality does not embody the full meaning of a text because sign-makers (authors/readers of the text) shape and are in turn shaped by the semiotic resources which they access (Anderson et al., 2006).

As Kress (2005) also noted, “technologies of representation and those of communication and/or dissemination are everywhere bound up with the larger, wider changes in the (global) economy, in social and political changes, and in accompanying ethnic and cultural changes” (p. 6). This means that technology is complex, and its use is embedded in social and political spheres. Relating these contentions to pedagogy, one already begins to see the need to pay attention not
only to technological tools, but also the social, cultural and technological contexts in which teachers facilitate classroom instruction. Moreover, when we understand mode as “a culturally and socially produced resource for representation, and medium as the culturally produced means for distribution of these representations as meaning, that is, as messages” (Kress, 2005, p. 7), then we can better appreciate and explore how communications media shapes our current pedagogy.

2.1.2 Multi(modal) Literacy Theories

Multiliteracies

In consideration of the future of literacy pedagogy, the New London Group met in the mid-nineties and published an article-long manifesto (New London Group, 1996), and then a book (Cope and Kalantzis, 2000), where they outlined an agenda for what was called “a pedagogy of multiliteracies” (Cope & Kalantzis, 1999, p. 1). One fundamental goal of this pedagogy was to create learning conditions which support the growth of people “flexible enough” to navigate through different social domains, and who can enact their identities across different media (Cope & Kalantzis, 1999). The New London Group (1996) argued that “literacy educators and students must see themselves as active participants in social change, as learners and students who can be active designers—makers—of social futures” (p. 65). The New London Group (1996) made impactful connections between computer literacy and related skills, asking that people focus on individual literacy growth and civic engagements (Anderson, 2008).

The New London Group (1996) also emphasized that in a pedagogy of multiliteracies, “all forms of representation including language, should be regarded as dynamic processes of transformation rather than processes of reproduction” (p.10). What this implies is that meaning makers are not only users of information, but also “fully makers and re-makers of signs and transformers of meaning” (p.10). In making or re-making or transforming meaning, it is observed
that some users are more comfortable using some modes over others given it comes easiest to them, or that it is what they have become accustomed to. For example, an instructor may prefer teaching with a bullet point list of instructions as opposed to graphical representations or mind mapping. The ability to make conscious rhetorical choices on how to switch modes enhances good teaching and a powerful learning as well. There is evidence that people learn well when they feel motivated to learn and understand how to functions with what they are learning. (The New London Group, 1996). People operate as users of technology or feel motivated to “re-make” signs when they understand how useful/not the technologies are to their work.

While the terms “multiliteracies,” “new media,” “multimedia,” and “digital media” are defined and broadly used by Selfe (2007) and Wysocki (2004), other scholars like Lauer (2009), make it clear the that the difference between multimodal and multimedia lies largely in the difference between “modes” and “media.” Modes are ways of representing information or the semiotic means of composing text (Kress & Van Leeuwen, 2001), while media are the “tools and material resources” used to produce and disseminate texts (p. 22). Some examples of modes include sound, still and moving images, animation while examples of media include books, radio, television, computers and even the human voice. Although quite different, modes and media are “independent of and interdependent with each other” meaning, that media influences the ways in which one realizes meaning through words. For example, the mode of sound is affected differently by the limitations and affordances of a cellphone versus the medium of a radio.

Lauer (2009) noted that the term “multimodal” is valued by composition instructors specifically because it emphasizes the design process, whereas terms like “multimedia” are more valued in the public sphere because of its emphasis on deliverable text (p. 225). She encouraged the use of both terms in academia because despite “multimodal” being more “theoretically accurate
to describe the cognitive and socially situated choices students are making in their compositions, “multimedia” arguably works as a gateway term for instructors and scholars to interface with those outside of academia in familiar and important ways” (p. 225). Hofstetter (2000) defined multimedia as “the use of a computer to present and combine text, graphics, audio, and video with links and tools that let the user navigate, interact, create, and communicate” (p. 2). His definition emphasizes the technological literacy of users which Cooper (2007) admits is a concern that teachers worry about, because of the uncertainty of not knowing how to teach these skills or that doing so will take up so much time, “time that should be devoted to teaching “content” rather than skills” (p.181). Moreover, teaching such skills is not a matter of simple instruction but one demanding close attention to students’ learning strategies, literacy practices and values.

In facing concerns regarding technology application in the classroom both by teachers and students, Selber’s *Multiliteracies for a Digital Age* meshes humanities education and technological literacy. Quoting Selber, “Computers are here to stay, so the time and energy of teachers is therefore best spent not deploring computers but learning how to use them in ways that align with, and productively challenge, the values of the profession” (p. 8). This highlights Takayoshi and Selfe’s (in thinking about multimodality) call that, people’s literacy practices need to change to reflect digital communication environments. This, however, has not been an easy task for teachers. To make this practice easier, Selber focuses on the technological aspects of literacy by splitting multiliteracies into three categories; Functional, Critical and rhetorical literacy.

Functional literacy focuses on computers as tools and how students can become effective users of it. By not limiting functional literacy to “the technical aspects of software applications, hardware components, and operating systems” (p. 32–33), he also involved the cultural dimensions of computers as students learn to use them. Students understand how to use social conventions to
manage their online presence, manage technological problems and attain their class objectives. With critical literacy, Selber portrays computers as cultural artifacts which students should be able to critique. He encourages that students be able to critique design, examine contexts and investigate representation. The goal of critical literacy he asserts, is to explore how “students might be encouraged to recognize and question the politics of computers” (p. 75). Lastly rhetorical literacy, which promotes an understanding of persuasion in design, encourages students to engage in critical assessments of design as a technical action. Students should become proactive in their engagement with technological tools. Selber’s approach to functional, critical and rhetorical approach to multiliteracy involves student’s active participation and critical awareness of the technologies they use. This approach equally applies to teachers who in a sense are responsible for teaching students to navigate technological conventions.

2.1.3 Multimodal Literacy

Multimodal literacy as proposed by Jewitt and Kress (2003) seeks to understand the different ways of knowledge representation and meaning making. It investigates how semiotic resources such as language, gesture, images and sound are used across modalities such as visual and aural, and how their interaction and integration construct a message (Fei et al., 2015). In the same way that a “multimodal literate” student must be able to make effective rhetorical choices in the construction and presentation of information, so too should a teacher be able to teach students to engage in such rhetorical decisions. Making effective rhetorical choices in this sense involves making careful and thoughtful decisions about how to present statistics on financial data in banking and finance programs, how to build charts, graphs or diagrams that best represent a lab test result in engineering or determining which sound or voice over technique to use for news reporting communications, as well as composition and conference presentations at large. These examples
amongst others, suggest the inter-disciplinary way in which teachers and students exhibit “multimodal literacy.” Hence, technological literacy or multimodal literacy as explained in this context is a crucial must-have for teachers. As Selfe (2004) insisted, “if our profession continues to focus solely on teaching only alphabetic composition---either online or in print—we run the risk of making composition studies increasingly irrelevant to students engaging in contemporary practices of communicating” (Selfe, 2004, p. 72). Although Selfe (2004) made specific reference to the field of rhetoric and composition, her call however is not and should not only be limited to composition studies because education in entirety as at the 21st century is almost completely multimodal, since teachers as well as students almost unavoidably engage in multimodal practices. Wysocki (2003) maintains that “to be responsible teachers, we need to help our students (as well as ourselves) learn how different choices in visual arrangement in all texts (on screen and off) encourage different kinds of meaning making and encourage us to take up (overtly or not) various values (p. 186).

While it is a primary concern that graduate students across disciplines learn how to communicate with local and online publics using multimodal tools, it is even more important that they know how to design their curriculum, lessons and projects in ways that have impact on their audience, which in this case would be students (Gee, 2004). Such an approach also demands their familiarity with Web 2.0 media tools to teach, grade assignments, conduct labs, and facilitate student collaboration in online group spaces. Web 2.0 refers to the “next generation” of Internet services such as blogs, vlogs and social networking sites which are constantly being remodeled to suit modern environments. The constant updating of Web 2.0 tools promotes multimodality through the mixing of images, videos, music and print texts (Doering et al., 2007). For example, in responding to students’ needs of becoming technologically literate, teachers in composition and
communication fields often observe how students communicate across genres. For example, in visual argument assignments, students are often asked to construct the same story across different media—like building storyboards using PowerPoint. It is important to note, however, that different media have affordances that facilitate different ways of thinking. As Doering et al. (2007) argued, “how we think when we write can differ with how we think when we talk, draw, paint, or write soft-ware” (p. 4). Recognizing that such thought processes reflect teachers from different disciplines across arts and sciences, it remains a responsibility for all teachers to encourage students to draw on social and genre knowledge which help them explore different modes for their academic work. Teachers have the task of thinking “multimodally and semiotically… that is, they need to think about which media and modality best represents their ideas” (Doering et al., 2007, p. 43). Teachers across disciplines are continuously faced with the task of recognizing how pedagogical practices have moved to incorporate web 2.0 tools, and to constantly find better ways to use and teach these.

Multimodality and associated literacy concepts speak to my research because of their capability to question multimodal teaching, learning practices as well as their potential to examine how these practices influence teachers’ and students’ work. They question socially constructed realities, the value of technology and the tech-savviness of technology users in composition classrooms (emphasis on instructors). They also question how instructors teach and how students learn multimodal genres and other semiotic resources of communication. To understand instructors constructed realities about the value of using technology in the classroom, instructors’ subjective experiences are then considered. Their multiple socially constructed realities of technology become an integral way of examining how technology is used in the classroom. Facts about how technology is used by different instructors are said to be context dependent because of the varied
situations in which they find themselves (different classrooms, disciplines and contexts). Thus, teachers’ actions and teaching processes, which are sometimes based on their interpretations of situations, are some of the contentions which my research highlights.

2.2 Technological Pedagogical and Content Knowledge (TPACK)

2.2.1 Overview of Framework

Technological Pedagogical and Content Knowledge (TPACK) initially referred to as TPCK (Technology, Pedagogy, Content, Knowledge) (Voogt et al., 2013) is a synthesized form of knowledge with the purpose of integrating technology into classroom teaching and learning. It is grounded in core constituents such as Content Knowledge (CK), pedagogical knowledge (PK), and the technological knowledge (TK) and pays attention to the interactions between and among them. The intersection of these types of knowledge gives rise to the integrations of pedagogical content knowledge (PCK), technological content knowledge (TCK), technological content knowledge (TPK) and TPACK. Scholars (Angeli & Valanides, 2009; Harris et al., 2009; Koehler & Mishra, 2009; Manfra & Hammond, 2008) describe TPACK as “situated, complex, multifaceted, integrative and/or transformative” forms of knowledge (Chai, Koh & Tsai, 2013, p. 32). This framework, built out of Shulman’s (1986) theory of pedagogical content knowledge (PCK), was modified to emphasize the usefulness of situating technology knowledge to content and pedagogy because of the growing influence of technology on teaching and learning (Abitt, 2011). In 2003, TPACK formally emerged in the “Journal of Research of Technology in Education” (Chai, Koh & Tsai, 2013).

One major ground for TPACK is the notion that technology doesn’t merely drive or deliver information but rather fosters the acquisition of cognitive tools which maximize students’ cognitive processes (problem solving, critical thinking) and enables an understanding of users’
thinking processes as well (Jonassen, 2000; Linn & Muilenburg, 1996; Jacobson & Archodidou, 2000, Kramaski & Michalsky, 2010). As such, TPACK focuses on the design and evaluation of teacher knowledge useful to student learning in different content areas. As an analytical theoretical framework which guides and explains how teachers think about technology integration for purposes of teaching and learning, it is arguably useful in looking at what knowledge teachers need to have to integrate technology into teaching, and how teachers need to develop this knowledge (Schmidt et al, 2009). Since it offers a description of the kinds of knowledge needed by teachers to teach with technology (Mishra & Koehler, 2006), TPACK also serves as a model of how technology integration emerges (Abitt, 2011, p. 295).

Mishra and Koehler (2008) reiterated Myers’ (1995) argument that knowledge required for teaching is “more than just the ability to use sign systems to communicate some conventional meaning, because… literacy should be reserved for some state of agency in which one can control, even manipulate, how signs are used” (p. 583). Literacy in this sense related to TPACK, adopts a “new form”—one embodied by the development of skills, knowledge and competencies which go beyond specific knowledge of techniques and technologies required for disciplines. Mishra and Koehler (2008) support this approach to teacher knowledge on the following grounds:

First,…that teachers manipulate signs and symbols (of various kinds, language, equations, images, video, and so on). Second, this definition emphasizes the importance of teacher agency—the conscious manipulation of signs for educative or communicative purposes. Third, teachers are able to subvert these signs, implying that the sign systems are not sacrosanct, but rather are human constructions that teacher can design and redesign for their particular context. Fourth, this definition emphasizes the value of teacher expertise since subversion is not possible unless the teacher knows the rules of the game and are fluent enough to know which rules to bend, which to break, and which to leave alone. Fifth, this definition emphasizes teacher creativity. As we know the wicked problems (Rittel & Webber, 1973) of teaching with technology demand creative solutions. Most technological tools we use (Office software, blogs etc.) are not designed for teachers, and we have to re-purpose (subvert) them for their needs. (p. 11)
Teachers’ use of technology as a “new literacy” suggests their role as designers and not only consumers of technology. Thus, when teachers can flexibly navigate content, pedagogy and technology, they in a sense become efficient in managing classroom instruction (Mishra & Koehler, 2008). This approach suggests that to effectively teach with technology, teachers don’t simply add technologies into existing structures, but they also must make a shift in existing pedagogical and content domains (Mishra & Koehler, 2006). This understanding shows that teaching with technology moves well beyond “isolated knowledge of specific hardware or software” and is introduced into contexts (Mishra & Koehler, 2006, p. 3).

Teaching is a context-bound activity, and so when teachers use technology to design and facilitate student’s learning experiences, their activities are usually tailored for specific pedagogies, content and contexts (Mishra & Koehler, 2006, p. 3). TPACK allows for the integration of knowledge about subject matter, the knowledge of teaching and learning as well as the development of technology. The integration of these different domains is what supports teachers’ integration of technology in their courses (Niess, 2005). Successful technology integration is also strongly dependent on how institutions influence what teachers do and what students learn (AACTE Committee on Innovation & Technology, 2008).

2.2.2 Why TPACK? Implications for Teachers

Drawing from a vast literature on how technology is integrated into curricula, a good number of scholars argue that the lack of theory and conceptual frameworks which inform research on teaching with technology is one major weakness (Valanides & Angeli, 2002; Angeli & Valanides, 2005; Koehler & Mishra, 2008; Mishra & Koehler, 2006; Niess, 2005; Selfe, 1990). As Selfe (1990) argued, “until we share some theoretical vision of this topic, we will never glimpse the larger picture that could give our everyday classroom efforts direction and meaning” (p. 119).
In responding to this lack of a sound theoretical framework which guides teacher orientation and preparation for technology integration in classroom instruction, Angeli and Valanides (2009) reported that five years prior, several research efforts were made in a bid to develop theory and models upon which to ground teacher knowledge about technology integration (Niess, 2005; Angeli & Valanides, 2005; Mishra & Koehler, 2006). It is from all this rigorous work that these researchers advocated the need to develop a new body of knowledge, one that extended Shulman’s pedagogical content knowledge (PCK) to include teaching with technology (Angeli & Valanides, 2009).

The TPACK framework has been widely used in different research areas including online teaching and learning (Doering, Scharber, & Miller, 2009; Archambault, 2008), uses of the World Wide Web (Lee & Tsai, 2010), building communities of practice (Sun & Deng, 2007), and uses of digital video in K–12 classrooms (Hofer & Swan, 2008). It has also been used to conceptualize factors that influence technology integration like confidence beliefs and self-efficacy (Graham et al., 2009) (qtd. Abbitt, 2011). In their study, Koehler and Mishra (2006), investigated in-service teachers’ beliefs about teaching and technology using surveys. The results showed that graduate teachers were able to benefit from deeper understanding of factors that foster technology integration (Shin et al., 2009). Shin et al., (2009) who sought to explore if teachers’ understanding of TPACK would be altered if they take an intense educational course on technology integration in pedagogy, observed that it positively influenced teachers’ approach to teaching with technology. Others like Schmidt (2009) in their study of how teachers develop TPACK knowledge found that introductory technology courses provide useful platforms for introducing technology to students.

These scholars argue that TPACK, when used as a frame for course material has potential to help both students and faculty to pay attention to the interaction of technology, pedagogy and
content. Also, Keating and Evans (2011) who used grounded theory to interpret interview and survey data of a small group preservice teachers to “get a sense of how teaching with technology fits into [their] student teachers ‘evolving pedagogical content knowledge” (p. 1672), concluded that TPACK “extends beyond proficiency with technology for personal use to an understanding of how technology can be integrated with subject matter in ways that open new avenues for understanding of the subject matter and the technology itself” (p. 1671).

Considering the uniqueness of teaching in different contexts, technology, pedagogy and content interact in different ways, leaving teachers with many decisions as to what content, technology or pedagogy design to employ in their classes. As Mishra and Koehler (2006) emphasized, there is not a “one-size fits all solution to the problem of teaching.” Worthy of note also, is the idea that merely introducing technology in schools or classrooms does not yield desirable outcomes, because technology on its own does not drive change, but is a tool meant to be used by its users. This, as Mehan (1989) clearly noted, “is what people do with the machine, not the machine itself that makes a difference” (p. 19). Mishra and Koehler (2006) encourage that the development of TPACK should begin with teachers using familiar technologies, before they gradually move to much more advanced ones (Mishra & Koehler, 2006, p. 6)

Enabling teachers to recognize the interactions between and among bodies of knowledge in TPACK in their specific contexts (disciplines/classrooms), equips them on how to integrate technology into the classroom in more meaningful and authentic ways (Koehler and Mishra, 2006). Planning for technology instruction Harris and Hofer, (2011) argue, “must occur at the nexus of curriculum requirements, students’ learning needs, available technologies’ affordances and constraints, and the realities of school and classroom contexts” (p. 211). For example, teachers enact TPACK when drawing a course map for their class instruction. Such planning is usually
organized and communicated primarily by class activities and course objectives (Yinger, 1979; John, 2006). Hence, for technology to be successfully integrated in pedagogy, it has to be rooted primarily in content-related learning processes, curriculum content and secondarily in the effective use of educational technologies (Harris, Mishra, & Koehler, 2009).

TPACK potentially impacts the kinds of professional development experiences and training for teachers, given its usefulness in understanding the knowledge and skills which teachers lack and what specific professional development is needed to systemically foster better technological integration in teaching. Such professional developments are, however, recommended to be flexible and inclusive of different teaching styles, philosophies and approaches, considering that teachers’ TPACK come from a variety of disciplines. With much emphasis on what teachers need to know about pedagogy, content and their intersections (Mishra & Koehler, 2006; Mishra & Koehler, 2009; Kim et al., 2013, Harris et al., 2009), in re-thinking teacher-preparation practices we become able to find and propose more effective workable solutions to constraints faced by teachers when integrating technology into their teaching.
2.2.3 COMPONENTS OF TPACK FRAMEWORK

As shown in Figure 2.1, the outer dotted circle represents the notion that TPACK is grounded in specific contexts and so does not exist in a vacuum (Koehler et al., 2014).

Content (C)

Refers to the subject matter to be taught or learned. Content varies between subjects. For example, the content to be covered in chemistry is different from the content in physics (Polly et al., 2010).

Technology (T)

Applies to standard or “low-tech” technologies such as book, chalk and pencil as well as advanced or high-tech technologies like computer, internet and podcasts, as well as the modalities which they have for presenting information (Koehler & Mishra, 2008; Polly et al., 2010).
**Pedagogy (P)**

Broadly refers to the practice and process of teaching and learning often including the “purpose(s), values, techniques or methods used to teach, and strategies for evaluating student learning” (Polly et al., 2010, p. 864). Of relative importance, is the relationship between technology and pedagogy and content knowledge. Their interactions in different educational contexts has implications for educational technology integration. The interactions between these different knowledge components are explained in the section below.

**Pedagogical Knowledge (PK)**

Pedagogical Knowledge (PK) is “knowledge about the processes and practices or methods of teaching. It includes knowledge about classroom management skills, teaching strategies, evaluation techniques, and the nature of target audience” (Shin et al, 2009, p. 4143). According to Mishra and Koehler (2008), pedagogical knowledge comprises of planning lessons, managing classroom activities and knowledge about strategies for teaching including but not limited to target audience and evaluating student understanding. Teachers with deep pedagogical knowledge are said to better understand how students build knowledge and make meaning of their learning processes. Pedagogical knowledge necessitates understanding the “cognitive, social and developmental theories of learning and how they apply to students in their classroom” (Mishra & Koehler, 2008, p. 6).

**Technology Knowledge (TK)**

Technology knowledge largely refers to knowledge about standard and advanced technologies. TK knowledge requires that teachers understand how to effectively use technology to facilitate teaching and to apply it in their daily lives (Harris et al., 2009). It therefore also requires a proper understanding and application of technology for communication, problem solving, and encourages
a continuous adaptation to changes in technology (Mishra & Koehler, 2006; Koehler & Mishra, 2008, Shin et al., 2008). Knowledge on how to operate technological systems as well as the ability to use standard hardware, install, upgrade, maintain and stay up-date with technological advancements all count towards technological knowledge (Koehler & Mishra, 2008, Abitt, 2011). Technology knowledge evolves as technology is constantly changing. It is argued that teachers often learn about technology in a manner quite unconnected to the subject matter (Niess, 2005).

**Content Knowledge (CK)**

Content knowledge is knowledge specific to a discipline, subject matter or educational context. It is knowledge about a specific subject to be learned or taught (Shin et al., 2009). For example, core concepts and principles of rhetoric and writing studies would differ from that of history or literature. Teachers are required to have a mastery of the content they teach (Mishra & Koehler, 2006). As Shulman (1986) posited, “content includes knowledge of concepts, theories, ideas, organizational frameworks, methods of evidence and proof, as well as established practices and approaches toward developing such knowledge in a particular discipline” (p. 397). Such knowledge plays an important role in determining how teachers relate in the classroom (Hughes, 2005). Understanding this as well as factors which boost or affect changes in their process is therefore important (Fives & Buehl, 2008). Content knowledge is developed over time, usually after years of learning and self-instruction about the subject.

**Pedagogical Content Knowledge (PCK)**

Pedagogical Content Knowledge (PCK) was first derived from Shulman’s idea of “knowledge of pedagogy that is applicable to the teaching of specific content” (Shulman, 1986). “The central idea of PCK is that learning to teach a particular subject matter requires not only understanding the content itself but also developing appropriate instructional strategies and skills that are appropriate
for learners” (Koehler et al., 2014, p. 102). An inquiry into PCK would ask the following questions: “How did you decide how to teach the content that this unit addresses?” “How, if at all, did these decisions change the content (e.g., scope, depth, or nature of the content)?” (Harris & Hofer, 2011, p.217). Pedagogical Content Knowledge acknowledges that different content requires different methods of teaching. It is knowing what teaching methods better fit the content to be taught, and how the content can be designed for better teaching (Shin et al., 2009). For example, while math’s teachers would prefer illustrating examples with graphs, charts and statistics, Art teachers would perhaps use more of hand-craft (statues) or encourage students to take excursions to museums. Effective teaching in this sense, would require more than just knowledge of content, but also how to facilitate pedagogy (Mishra & Koehler, 2006). PCK thus emphasizes how important it is for teachers to understand the learning experiences of their students, and how to make use of their teaching environments (Cochran, DeRuiter, & King, 1993; Fives & Buehl, 2008, Shin et al., 2009).

**Technological Content Knowledge (TCK)**

Technological Content knowledge refers to the “reciprocal relationship between technology and content” (Mishra & Koehler, 2006, p. 4). It is knowledge about the way in which content and technology meet, mesh and influence one another (Shin et al., 2009). When planning for instruction, content and technology should not be considered separately. The kinds of technologies available for use by teachers impacts the content which they teach. In a similar way, the content knowledge also determines the kinds of technologies best suited for instruction (Mishra & Koehler, 2006). As Harris et al., (2009) rightly contend, “technology is not neutral with regard to its effects upon cognition. Different technologies (or media) engender different mindsets or ways of thinking” (p. 399) (Mishra, Spiro, & Feltovich, 1996). For example, a teacher’s choice of teaching with TEDTalks as opposed to YouTube would greatly depend on the content being taught.
Understanding the impact of technological content knowledge of teachers in different disciplines is crucial to developing appropriate tools necessary for effective instruction.

**Technological Pedagogical Knowledge (TPK)**

Like TCK, Technological Pedagogical Knowledge considers the reciprocal relationship between technology and pedagogy. It looks at how teaching and learning change when specific technologies are used (Shin et al., 2009). “This knowledge makes it possible to understand what technology can do for certain pedagogic goals, and for teachers to select the most appropriate tool based on its appropriateness for the specific pedagogical approach” (Mishra & Koehler, 2006, p. 4). By implication, technology can influence where teaching is carried out as well as how it should be done. For example, to facilitate collaboration in classes, it is commonplace that technologies such as Google Docs or discussion boards on course management systems like Blackboard are used instead of face-to-face meetings, a shift that possibly saves students time and money.

Online learning and hybrid courses are also examples of teaching/learning that require teachers to be selective with the kinds of technologies they use. Harris et al., (2009) critique the idea of integrating technology into classrooms, without content knowledge or the context in which the technology is needed. This lack of emphasis on content and pedagogy is a “superficial” form of TPK. For example, when IT of campus tech services assists teachers to teach blogging, build websites and other visual assignments, there is often the assumption that what they teach would work within any content area, or classroom, and so what they teach rarely gets changed to meet the needs of specific classrooms, as well as the specific learning processes of the students. Essentially, teachers ought to be equipped with knowledge about different kinds of technologies, such that they can pick out of these varieties, what’s most useful in their classrooms.

**Technological Pedagogical Content Knowledge (TPK)**
Technological Pedagogical Content Knowledge encompasses all the categories of knowledge discussed above. Quality teaching for Shin et al., (2009) requires having a good understanding of three core sources of knowledge: technology, pedagogy, content and how they operate in given contexts (Koehler & Mishra, 2008; Mishra & Koehler, 2006). TPACK is broad and synthesized knowledge of technology, pedagogy and content used for the design of class instruction by teachers. Its major focus is how technology is crafted for pedagogy and how specific content can be taught in given contexts. “The TPACK framework also functions as a theoretical and a conceptual lens for researchers and educators to measure pre-service and in-service teachers’ readiness to teach effectively with technology” (Mishra & Koehler, 2006, p. 4). Mishra and Koehler (2008) add that TPACK offers an understanding of how to constructively teach content using pedagogical techniques well represented by technology. It also helps teachers to build on existing knowledge of these core areas and how to develop strategies to strengthen old methods of teaching. It is for such reasons that several researchers have used this framework to design a range of heuristics, both qualitative and quantitative to measure TPACK.

TPACK “allows teachers, researchers, and teacher educators to move beyond oversimplified approaches that treat technology as an ‘add-on’ instead to focus again, and in a more ecological way, upon the connections among technology, content, and pedagogy as they play out in classroom contexts” (Mishra and Koehler, 2009, p. 67) For example, when confronted with a situation where students find it difficult to do class assignments, Teacher A may assume that the class instruction could have been facilitated better or that the assignment prompts were not explicit enough, and so may decide to re-write the prompts in clearer terms or explain his/her expectations further. Teacher B on the other hand, may understand the issue as student’s inability to write good research papers and so choose to upload student samples and videos of how to do such
assignments, or even create discussion forums for students to share their ideas. What all these scenarios highlight about teachers is their flexible role as class content managers and designers, and how they respond to contextual challenges (link to research). This emphasizes the notion that instructional situations are unique, and a result of the meshing TPACK components. Teachers need to develop fluency and cognitive flexibility not just in each of these key domains—content, technology, and pedagogy—but also in the manners in which these domains interrelate, so that they can effect maximally successful, differentiated, contextually sensitive learning” (Harris et al., 2009, p. 401). In more succinct terms, TPACK is “the whole knowledge and insights that underlie teachers’ action with technology in practice” (Voogt et al, 2016, p. 38). As a body of knowledge TPACK is best understood in terms of the competencies needed by teachers to adequately teach with technology (Angeli & Valanides, 2009).

In conclusion, a major take-away from the literature on multimodality and multimodal literacy is the fact that they are not concepts which should be limited to the field of rhetoric and composition because across disciplines students and teachers alike engage in multimodal practices. Graduate teachers outside rhetoric and composition are equally active designers of effective technological, communication and teaching practices. Moving forward, it becomes clear to see how putting together multimodality, multi(modal) literacy concepts and a TPACK theoretical framework connects, enriches and facilitates the inquiries driving this research. For example, when this research asks “what technological literacies do graduate instructors bring to the classroom? And how useful/not useful are these literacies in facilitating pedagogy?” it first admits that teaching in the 21st century is a multimodal activity and that teachers choose some modes and media over others for their classroom instruction. A TPACK approach on the other hand questions teacher’s knowledge of the technologies they are expected to integrate into their classrooms.
Also, the questions “are there any graduate instructors who enter with low or deficient technological literacies but who manage to become proficient without access to special resources? What are some of the ‘hacks’ that students use to navigate obstacles? And how can these be adopted by other students in similar situations?” equally get at the heart of research on technology integration. With different views, uses and understanding of how to teach multimodally, noting best strategies used by students (positive deviants) to navigate ‘hacks’ of teaching with technology remains an invaluable finding for this research.

Lastly, when examining the digital literacies which institutions expect graduate instructors to bring to the classroom, and interrogating whether international graduate instructors are likely to teach with technology across majors in similar ways to Resident GTA’s/Al’s? this research gets at the micro-social interactions of the classroom and how this reflects concerns of macro curricula and broader educational policies. In other words, it examines “external” factors affecting technology integration by teachers in their classrooms. Survey and follow-up interview questions are also specifically generated to facilitate more data collection in this regard and gets at more specific details on technological literacy and integration in pedagogy.
Chapter 3. Using Grounded Theory to Examine Graduate Instructors Technological Literacy

Overview

Part I of this chapter explains the use of grounded theory developed by Glaser and Strauss (1967) and modified by Charmaz (2006, 2014) as a methodology used for this study. Part II elaborates on the research contexts, research design, participants and sampling, procedures for participant recruitment and data collection. It also discusses grounded theory as a method used to analyze data through processes of coding, categorizing, memo-writing and saturation. In very succinct terms, to mark a distinction between methodology and methods, I draw on Harding’s (1987) definition of “methodology” as a theory or analysis which directs research, while “method” looks at procedures and techniques necessary for gathering data in a research study. Likewise, Creswell (2003) notes that a methodology is a “strategy or plan of action that links methods to outcomes” (p. 5).

3.1 Methodology

3.1.1 Grounded Theory- Background

The origin of grounded theory can be traced back to the book titled The Discovery of Grounded Theory written by Barney Glaser and Anselm Strauss in 1967. This theory emerged out of Glaser and Strauss’s sociological research on dying in hospitals, which aimed at discovering a theory to adequately represent data and be applicable in the real world (Charmaz, 2000; Strauss & Corbin, 1990; Glaser & Strauss, 1967). Grounded theory spread quickly and was widely accepted especially in the health field. As Glaser and Strauss (1967) argued, grounded theory methods are useful in several disciplines including but not limited to nursing, education, organizational studies and evaluation research (Charmaz, 1996; Chenitz & Swanson, 1986; Martin & Turner, 1986).
Figure 3.1: Graphical representation of grounded theory. Adapted from Charmaz (2006)

Drawing from Creswell (1998), Dey (1999) offers the following concise definition of grounded theory:

1. The aim of grounded theory is to generate or discover a theory.
2. The researcher has to set aside theoretical ideas to allow a ‘substantive’ theory to emerge.
3. Theory focuses on how individuals interact in relation to the phenomenon under study.
4. Theory asserts a plausible relation between concepts and sets of concepts.
5. Theory is derived from data acquired through fieldwork interviews, observations and documents.
6. Data analysis is systematic and begins as soon as data is available.
7. Data analysis proceeds through identifying categories and connecting them.
8. More data collection is retrieved from emerging concepts.
9. These concepts are developed through constant comparison with additional data.
10. Data collection can stop when new conceptualizations emerge.

11. Data analysis proceeds from ‘open’ coding (identifying categories, properties and dimensions) through ‘axial’ coding (examining conditions, strategies and consequences) to ‘selective’ coding around an emerging storyline.

12. The resulting theory can be reported in a narrative framework or as a set of propositions. 

   (Dey, 1999, p 12).

Unlike other qualitative approaches which stress the importance of collecting huge amounts of data before engaging in analysis, grounded theory asks that researchers use emerging theoretical categories from the data to structure their analysis into a more systematic analytical processes of coding, memo-ing and developing theory (Charmaz, 1990). The notion of constantly comparing results to data is at the core of grounded theory, as this process helps the researcher evaluate categories to see that they are exactly reflective of the data. Researchers begin with general research questions rather than preconceived hypotheses. Hence the “groundedness” of the theory stems from the researcher’s commitment to analyzing exactly what is found in the field and paying close attention to recurrent themes. In the process of data collection, researchers pay attention to emergent categories which they later use to conceptualize the data, make commonsense understandings of the data and offer other theoretical interpretations of the data (Charmaz, 1990).

Several other publications emerged, which elaborated upon, further developed and debated over the theory (Glaser & Strauss 1967, Glaser 1978, Strauss 1987, Strauss & Corbin 1990, Strauss & Corbin 1994, Glaser 1998). With grounded theory, the researcher focuses on an area of study and gathers data from a wide range of sources including field observations and interviews. Once data is gathered, the researcher analyzes data through coding and theoretical sampling procedures, which are explained at the end of this chapter.
3.1.2 **CONTROVERSIES SURROUNDING GROUNDED THEORY**

Arguably, grounded theory does have its limitations. These include a premature commitment to a set of categories, or what (Lofland, 1971) described as a lack of “familiarity” with data, determining when data is said to have saturated and a clear definition of key theories that emerge out of the data. However, one fundamental issue surrounding grounded theory is when the researcher should consult literature. While some researchers believe that an initial review of literature is important because it allows readers to access relevant background information in a researcher’s project (May, 1986), originators of this theory Glaser and Strauss (1967) disagreed over the need to conduct or write out an early review of literature. They argued that grounded theory researchers should not have any pre-conceived assumptions of a theoretical framework guiding data, so that such knowledge does not distort the research results. Glaser (1978) however emphasized that, if grounded theorists must “borrow” concepts from the literature they need to see that these concepts are representative of their analysis (in Charmaz, 1990)

Some years later, Strauss and Corbin (1990) began advocating for the need to review literature prior to conducting research. They did so on grounds that literature review boosts theoretical sensitivity, acts as a secondary source of data, provokes questions, fosters theoretical sampling and validity of research (Haig, 1995). In all these however, Haig (1995) added that reflexivity is needed by grounded theorists to prevent prior knowledge from distorting their perceptions of the data. The advantages of reviewing literature as Strauss and Corbin (1990) mentioned are vital to this study in the ways that it “stimulated secondary data” which was used to stimulate research questions. Different characteristics of grounded theory methods according to (Charmaz, 1983, 1990; Glaser, 1978, 1992; Glaser & Strauss, 1967; Strauss, 1987) include

1. Simultaneous involvement in data collection and analysis phases of research;
2. creation of analytic codes and categories developed from data, not from preconceived
hypotheses; (3) the development of middle-range theories to explain behavior and processes; (4) memo-making, that is, writing analytic notes to explicate and fill out categories, the crucial intermediate step between coding data and writing first drafts of papers; (5) theoretical sampling, that is, sampling for theory construction, not for representativeness of a given population, to check and refine the analyst's emerging conceptual categories; and (6) delay of the literature review. (Charmaz, 1996, p. 28)

3.1.3 Grounded Theory Designs
The divide in grounded theory approaches has fostered three designs for building theory. These include “the systematic procedure allied with Strauss and Corbin (1998); the emerging design, associated with Glaser (1992); and the constructivist approach espoused by Charmaz (1990, 2000)” (Creswell, 2003, p. 397). The systematic procedure supported by Strauss and Corbin involves “open, axial, and selective coding, development of a logic paradigm and a visual presentation of a theory” (Creswell, 2003, p. 397). Glaser’s (1992) emerging design criticizes the former for its “rules and procedures, preconceived framework for categories, and theory verification rather than theory generation” (Creswell, 2003, p. 401). The emerging design by Glaser supports that “theory emerge from data rather than using preset categories” (Creswell, 2003, p. 401). The purpose of this design is to “generate categories by examining the data, refining the categories into fewer and fewer categories, comparing data with emerging categories, and writing a theory of several processes” (Creswell, 2003, p. 402).

The constructivist approach to grounded theory propelled by Charmaz (1990, 2006, 2014), leans on a philosophical position which pays more attention on the meanings ascribed by participants in a study” (Creswell, 2003, p. 402). Charmaz’s (2008) constructionist approach, holds unto the following assumptions:
(1) Reality is multiple, processual, and constructed—but constructed under particular conditions; (2) the research process emerges from interaction; (3) it takes into account the researcher’s positionality, as well as that of the research participants; (4) the researcher and researched coconstruct the data—data are a *product* of the research process, not simply observed objects of it. (p. 402)

Charmaz emphasizes participants’ lived experiences, positions and gives the researcher room to build categories. A social constructionist approach to grounded theory prompts the researcher to ask the following questions “*How*”; “*Why*”; “*Under which conditions?*”; “*With which consequences?*” “How do people construct beliefs? How do they manage their ices? Why do they think, feel, and act the way that they do? Under which conditions do they think, feel, and act that way? What are the consequences of their beliefs, feelings, and actions?” (Charmaz, 1990, p. 1165). In attending to these questions, researchers explore new pressing topics in the discipline, engage in a theoretical analysis of the data and ultimately compare this analysis with the extant literature on the topic (Charmaz, 1990).

Charmaz’s approach to grounded theory is what is used in this research study. This is because of its potential to treat participants’ contributions as primary data out of which research conclusions can be reached. More specifically, it fosters a close examination of graduate instructors’ experiences teaching with technology and allows room for growth and improvement.

**Benefits of Using Grounded Theory**

- Grounded theory enables researchers to develop, refine, revise and transcend concepts within disciplines.
- The theory’s use of building categories and constant comparison keeps the researcher’s ideas grounded in data.
• Strategies of grounded theory are few and flexible and make it easier for researchers to adapt it to their studies.

• The transparency of grounded theory methods enables researchers to create a relationship with their data.

3.2 Methods

3.2.1 Research Context

This research was conducted at a public university in El Paso Texas. The student population at this university is diverse, with most students speaking more than one language, and are actively enrolled in very different intellectual options. The diversity of this college made it easy to identify and compare the digital literacy of instructors across disciplines, to find solutions to challenges which they face working with technologies such as Blackboard, Microsoft Office and web-based technologies like Google Docs, Google maps, iMovie, Moviemaker, WordPress, Wix and Weebly. Secondly, it considered intersections of technological literacy and culture to examine the potential of instructors’ different cultural backgrounds to influence how they learn and use different technologies. Lastly, using a positive deviance approach, instructors who excelled in circumstances where others failed were also observed, so that their practices, or what they do differently can be emulated by other instructors. This research inquiry is based on the following grounds:

• Higher education institutions expect that graduate students know how to use technologies for academic purposes—yet graduate students are underprepared and so do not carefully plan out how to incorporate technology into their classrooms.

• Faced with these challenges in such social contexts, other issues such as different beliefs, goals, and objectives brought together by the diversity of teachers, students and technology
assistants of how technology should be used/not used, often meet and clash (Kim et al., 2013; Ertmer, 1999).

- The divide between the digital natives (people who grow up surrounded by digital technology) and the digital immigrants (people who “migrate” into technology later in life) in institutions, allows for different understandings, access, and use of technology by graduate instructors. Hence the need for different methods of how to integrate technology into curriculum (Mishra & Koehler, 2007).

- Lastly, the argument that upon arrival at U.S universities, international teaching assistants (ITA’s) make ineffective instructors (Crumley, 2010; Gravois, 2005; Finder, 2005).

This study thus explored a wide range of technological tools used by graduate instructors in the classrooms, noted the instructors’ readiness and savviness to efficiently use these technologies, and sought to understand how these are influenced by their cultural backgrounds. To this end, the study used a mixed methods design, to find answers to the following research questions:

- What digital literacies do institutions expect graduate instructors to bring to the classroom? Are these expectations the same across disciplines?

- What digital literacies do graduate instructors bring to the classroom? And how useful/not useful are these literacies in facilitating pedagogy?

- Are there any graduate instructors who enter with low or deficient technological literacies but who manage to become proficient without access to special resources? What are some of the “hacks” that students use to navigate obstacles? And how can these be adopted by other students in similar situations?

- Are International graduate instructors likely to teach with technology across majors in similar ways to Resident GTA’s/AI’s?
3.2.2 Research Design - Mixed Methods

For my research study, I make use of a mixed methods approach to doing research, which involves collecting and analyzing both qualitative and quantitative data through survey responses and face-face interviews. As Kirsch (1992) argued, qualitative and quantitative research methodologies offer valid research insights which complement each other in each research study. As Creswell (2003) defined it, “a mixed methods study involves the collection or analysis of both quantitative and/or qualitative data in a single study in which the data are collected concurrently or sequentially, are given a priority, and involve the integration of the data at one or more stages in the process of research” (p. 171). Also, In The Journal of Mixed Methods Research, Tashakkori and Creswell (2007a) define mixed methods research as one where “the investigator collects and analyzes data, integrates the findings, and draws inferences using both qualitative and quantitative approaches or methods in a single study or a program of inquiry” (p. 4).

This study sought to gather two types of information: 1) demographic details which include specific disciplines and the total number of graduate instructors enrolled and 2) detailed explanations of how participants use and adapt different technologies to their academic functions. This statistical information, together with more detailed survey and interview responses provided rich data for this research study. Using a mixed methods approach was therefore necessary to get a better understanding of the numerical data such as how many graduate students teach or use technologies in their roles as assistant instructors or research assistants, and to understand deeper cognitive processes of how they integrate technology into curriculum. For example, this method afforded me the chance to critically explore the challenges which participants experienced using technology in their specific work functions. Other benefits of using mixed methods research included its potential to strengthen the study (Greene & Caracelli, 1997) by neutralizing or totally cancelling out the limitations of using just one method. For example, the added details in
Qualitative data may not often be included in data collected through quantitative methods like surveys (Jick, 1979). Also, considering the complexity of social phenomena, the mixing of methods facilitated an understanding of the complex data gotten from participants. (Creswell et al., 2003; Greene & Caracelli, 1997). In the quantitative data collection phase (survey administration), the questions asked sought to confirm the research hypothesis, after which the responses were further examined in the qualitative data collection phase (interviews).

As such, to gather data necessary for this research, I started by conducting an online survey via university-supported survey software, Qualtrics, with all graduate instructors at my institution. At the end of the survey, participants interested in participating in face-to-face interviews were asked to write out their emails for further contact. To ensure the richness of this data, these interviews were conducted in focus group settings, comprising both resident and international graduate instructors and assistants. With IRB permission, and participant consent, the interviews (phone, face to face, skype, Gmail chat) were recorded to facilitate data collection. By letting the quantitative data precede qualitative data, my intention as Creswell (2003) suggests was to first explore data by using large samples to test variables, and then to do more in-depth examinations with fewer cases at the qualitative phase.

Grounded theory was useful in critically examining qualitative data (face-face interviews) and analyzing graduate instructors’ perceptions about their experiences teaching with technology. Analyzing their perceptions was helpful in closely examining graduate assistants and instructors’ multimodal literacies as well as their technological pedagogical content knowledge in a 21st century. Grounded theory offered a systematic way of analyzing data through a close observation of repeated ideas, common patterns or themes and how they are further categorized and tagged with codes. As Charmaz (2006) indicated, these patterns of finding data enable the researcher to
understand issues “as our research participants do--from the inside” (p. 14). Grounded theory allowed for a critical understanding of Instructors digital literacy and individual experiences teaching with technology.

3.2.3 PARTICIPANTS AND SAMPLING

Choice of participants

As Lauer and Asher (1988) suggested, when a researcher can determine a population size, it becomes easier to carve out “the size and type of sample by considering the question of feasibility: the number of units from which they can carefully collect good data and which they can adequately analyze” (p. 58). Thus, at the initial stage of my research, I considered narrowing down my research population size to examine specific technological literacies of graduate instructors who only teach in the classroom. And so, to target these specific groups of people, I sent emails with a brief description of my research purpose to 24 doctoral program directors of eight academic colleges at the institution where this research was conducted, asking them to help distribute my survey to those concerned. Of the six responses I received, three of these directors indicated not having graduate teaching instructors in their departments. With the low email response rate, it was also difficult to determine which departments have graduate teaching instructors. At this stage of my research, a member of my committee suggested that I include all full-time graduate teaching assistants to widen my participant sample and allow for a critical examination of how both AI’s and TA’s use different technologies in their work. Determining which departments had TA’s and AI’s was equally challenging, as there are no consolidated public records of this.

However, the goal remained to recruit all full-time PhD AI’s and TA’s. This was facilitated through an open access request for the total number of AI’s and TA’s and their respective
departments from the Office of Human Resources. It took approximately 3 weeks for the data to be retrieved. This data showed that 27 graduate programs (as opposed to 24 on the school’s website) had AI’s and TA’s with the least being one and the maximum being 36. At this point, the total participant outreach stood at 284 research participants. This data was not accurate because it included departments such as Art, Graduate School, Center for Space Exploration and Technology Research (CSETR), and Carbon mono material research centers, which I later found out had students registered as TA’s but working in different capacities such as administrative or research assistants. After cleaning up the data, the research participant size stood tentatively at about 230 AI’s and TA’s.

The pie chart below illustrates the percentages of the initial participant sample size.

![Pie Chart](image)

**Figure 3.2: Research Sample Size**

**Procedures for the recruitment of the participants**

In their study, Anderson et al., (2006) proposed three ways to distribute online surveys: personal contacts, listserv members, and conference participants. In order to reach out to the research participants, I made use of personal contacts and had various departmental directors send
out the survey link through their respective listservs. I sent out emails to the department directors requesting that they forward the link to my survey to AI’s and TA’s in their respective departments. Some did very promptly and copied me in their emails as well, while others did neither. With the help of my advisor, another set of emails were circulated which also yielded a good number of responses.

However, to facilitate more prompt responses, in the summer of 2018, I visited all the departments personally requesting from the department directors that my survey be distributed via email. This was also helpful in getting more participants, although it didn’t guarantee participant responses. The last step I took was to personally contact students in these departments through emails and face-face settings. In different departmental workshops, lunch-breaks and random visits, I was able to talk with some students about my research and have them fill out the surveys. Through them, I got in contact with others and equally requested for their participation. It’s not a given that everyone I talked to or contacted eventually took the survey. However, a total of 129 participants eventually took the survey. This number accounted for 56% of the estimated number of graduate instructors. The pie chart below shows percentages of the actual participant population for this research.
As seen in Figure 3.3 above, participants were from the Colleges of Business, Engineering, Liberal Arts and Sciences. Out of these colleges, participants came from different departments. The college of Business had students from Business Administration, while students in the College of Engineering were from Biomedical, Civil, Mechanical, Material Science, Electrical and Computer Engineering. From Liberal Arts, participants belonged to the department of Rhetoric and Composition, History and Psychology. And for the College of Science, participant departments were Biological Sciences, Chemistry, Computational Science and Geological Sciences. As seen in the figure above, most participants in the survey were from the college of Science, followed by Liberal Arts, Engineering and Business respectively.

**Data Collection**

*Surveys*

Surveys are useful in understanding complex phenomenon in large population groups. As Creswell (2003) opines, survey designs provide “quantitative or numeric description of trends,
attitudes, or opinions of a population by studying a sample of that population” (p. 153). The surveys conducted in this research provide statistical highlights of graduate students’ current experiences. Also, considering that the survey was administered online and remained open throughout the summer while some participants were away on vacation, it was possible for them to participate despite their different locations and time zones. Participants could take survey at their comfortable place and time. The survey was composed of both open and close-ended questions. While the close-ended questions required very specific details such as years of teaching experience, academic program and student status, the open-ended questions offered a chance for participants to talk briefly about their experiences teaching with different kinds of technology and ways through which they have been able to navigate through them. Unlike paper surveys, online surveys arguably yield longer responses (Dillman, Symth & Christian, 2009). It was therefore helpful in highlighting similar patterns across participants’ responses. The surveys also offered a measure of the attitudes, trends and challenges which graduate instructors have towards digital literacies. The design of the survey questions was constantly questioned to ensure quality results in data collection.

To collect data, the first page of the survey had a consent form which participants had to read and sign before moving unto to the survey questions. In this section, participants were informed briefly about the research purpose, what the survey involves, the duration, risks, any known benefits and decision to opt out of the study. Their decision to participate in the study was completely voluntary. The survey had a total of 19 questions which explored participants’ demographics, teaching experiences with technology, challenges in doing so, and potential ways of overcoming them. Those who wished to participate in follow-up interviews were told to indicate so and leave their emails at the end of the survey.
**Focus Group Interviews**

Interviews offer a means for researchers to explore themes and patterns on certain topics, while also allowing subjects to freely provide necessary information and expose many realities of a specific topic (Gruberman, 2005). A total of 32 survey participants indicated an interest to be contacted for follow-up interviews. Following several emails and invitations via doodle.com to set up group interview dates, it was challenging to get up to 5 participants at the same time, given their very busy schedules. Three participants indicated not being able to participate for confidential reasons. Four others indicated not being able to participate but remained hopeful of doing so, once they were available. Of the 25 participants left, focus group interviews were conducted at the University Writing Center on the university campus. The University Writing Center was chosen because of its open and convenient hall available upon scheduling. The serenity of and space in this environment allowed for easy conversations and recording of data, with the assurance of little or no background noise. Each session lasted for 45 minutes and had a total number of participants ranging from 3-5. This was based on participant availability because in some cases, they signed up but failed to be present at the interview sessions.

Prior to the interview sessions, participants were given consent forms, which they read, and indicated that they agreed to be audio recorded during the interview process. The interview was recorded with a digital recorder. Participants responded to both prepared and spontaneous follow-up questions and were also given a chance to elaborate on some of their experiences, which according to grounded theory, is crucial to informing the data. Interview data was compared to survey data to allow for different perspectives to emerge. Not only did the focus group interview offer a more detailed information of participants’ expectations of how to teach with technologies, it enabled them to provide detailed perspectives of how their cultural backgrounds affect their use of specific technologies.


3.3 Grounded Theory Methods

Grounded theory methods are a “logically consistent set of data collection and analytic procedures aimed to develop theory… which often start with individual cases, incidents or experiences and develop progressively more abstract conceptual categories to synthesize, to explain and to understand your data and to identify patterned relationships within it (Charmaz, 1996, p. 28). Quite important is its emphasis on the process of analysis and the development of categories and theories, rather than just focusing on the results of the inquiry. Grounded theory blends in with qualitative research in the way that it meshes interpretive analysis with traditional positivist assumptions and because it relies on a set of procedures which can be employed in different types of analysis. Grounded theory methods take credit for its systematic procedures used to handle rich data in both qualitative and quantitative research.

3.3.1 DATA ANALYSIS

Data analysis in grounded theory is a central process used to generate theory out of research data. The four grounded theory strategies of coding, memo writing, theoretical sampling, and theoretical saturation are the defining features of data analysis using a grounded theory method (Charmaz, 2008). This process involves noting emerging themes, engaging in a constant comparison process and doing a reflective analysis (Charmaz, 2008). Data collection and data analysis are however, “integrated phases rather than sequential stages” in grounded theory (Charmaz, 2008, p. 402) and so they remain flexible and are usually done simultaneously (Creswell, 2003).

Throughout the data collection phase, a thorough examination of huge chunks of data gradually become narrowed down into categories, which are then examined thoroughly in the research data analysis process. The researcher obtains analytic categories from data and not
preconceived concepts or hypotheses. Grounded theory methods of analysis demand that the
researcher pay close attention to the empirical world in which he/she is studying. Considering the
importance of research questions in driving data and analysis, researchers become fully aware
about why, how, and when to determine if they are gathering rich data. Drawing from a
constructionist perspective, Charmaz (2006) argues that researchers ought to study intentions,
meanings, and actions of participants, regardless of how the data was collected.

3.3.2 CODING
Coding is the first step of data analysis in grounded theory because it “generates the bones for
analysis” (Charmaz, 2014, p. 113). At this step, data retrieved from the study is broken down to
bits by use of short codes that summarize the data. These codes are further developed into broader
categories, which in another sense are themes with interpretive dimensions. The process of coding
shows how data is selected, separated and sorted. In qualitative research, coding is one way
splitting up data in little portions, which can then be easily scrutinized with other bits, for further
categorization and labeling of data (Padgett, 1998; Patton, 2002; Tutty, Rothery, & Grinnel, 1996).
According to Corbin and Strauss (1990), coding is “fundamental analytic process used by the
researcher” (p. 12), and not simply a part of data analysis. “Coding is an iterative, inductive, yet
reductive process that organizes data, from which the researcher can then construct themes,
essences, descriptions, and theories” (Walker & Myrick, 2006, p. 549). Unlike other quantitative
coding that applies preconceived codes to data, with qualitative grounded theory coding, the
researcher creates codes as they emerge out of the data. This process enables the researcher to
interact with data as he continuously questions and re-examines it closely. The coding process
comprises of two main phases: initial and focused coding. The initial phase involves naming each
line or segment of data, while focused coding marks the most significant and frequent codes, which are later synthesized and integrated into the larger portions of the data (Charmaz, 2014).

**Initial Coding**
Initial coding is a process of line-by-line coding of transcribed data by the researcher, where she pays attention to repeated actions or events that are recurrent in the data. It “involves naming each word, line or segment of data…the goal is to remain open to all possible theoretical directions indicated by the readings” (Charmaz, 2006, p. 40). Line-by-line coding prompts the researcher to identify undetected patterns from the data, and to pull apart significant events to better understand what constitutes them, and how they occur (Charmaz, 2014). This process opens for new ideas as well and keeps the researcher from adding or taking away data based on personal instincts, and rather strive to represent the data exactly as it is. Doing so prompts the researcher to think about data in a multitude of ways. Charmaz (1990) asks questions like “what is going on? What are people doing? What is the person saying? What do these actions and statements take for granted? How do structure and context serve to support, maintain, impede or change these actions and statements?” (p. 1165). When researchers pay attention to these kinds of questions as they create initial codes, rather than focusing on their perspective as truth, they refrain from making quick assumptions that participants accept, reject or try to suppress a fact about their situation.

Also, when responding to these questions, action codes (words) are used to replace the data. As Charmaz (2014) argued, coding “data as action reduces tendencies to code for types of people. Coding people as types leads you to focus on individuals rather than what is happening in the data” (p. 117). Initial coding is done with use of gerunds (noun form of verbs) such as *feeling, resisting, revealing...etc.* Below is an example of how initial codes were built for this study.
Participant Response

Blackboard of course, just because the university requires it. And then, um, I incorporate a lot of YouTube videos. Um, and um, I recently, like the last year I started using "remind" which is a phone system that allows me to send them reminders on their smartphones, of assignments and stuff, but it also has the option to do it through emails because not all of my students will have smartphones. And it also allows me to let them know if there's any changes to the schedule as they go along.

Initial/Line by line Coding

Using blackboard because it’s a university requirement.
Using YouTube in classes
Narrating recent experience of teaching with “Remind” phone system
Explaining use of phone system to “set reminders on smartphones and assignments
Indicating use of phone system via emails
Suggesting-not all students have smartphones
Listing benefits of phone system (make changes to schedule)

Figure 3.4: Initial Coding Sample

This initial step of coding and constant comparison with data is what leads the researcher to decisions which define core conceptual categories. Initial codes are provisional because they stay open to many analytic possibilities which best “crystallize” participant’s experiences and highlight interesting insights on how participants’ thoughts meet and clash (Charmaz, 2014). These codes have the potential to shed light of “taken-for-granted” assumptions on the research topic.

Also, I considered a positive deviancy approach while coding the data in order to find the best practices of instructors who excel in their use of technology via local means, without access to any special resources. Positive deviance as used in this research draws from Singhal, Sternin and Dura’s (2009) study “Combating Malnutrition in the Land of a Thousand Rice Fields” which examined how some poor families in Thanh Hóa were able to avoid malnutrition without having access to special resources. These people were considered “positive” because they did the right things, and “deviants” because they engaged in practices that others did not. The term “positive deviants,” then, generally refers to people who excel in circumstances where others fail. The positive deviance approach emphasizes the need to “flip a problem and focus on the solution” (p.
3). It is strongly built upon the “belief that people learn by doing” (p. 8). In a similar way more specific to this study, I built initial codes which represented how graduate instructors “hack” through or work around circumstances where others have challenges. Doing so was crucial to noting local solutions to technology integration that can be amplified to improve all instructors’ technological literacy.

**Focused Coding**

“Focused coding synthesizes and explains larger segments of data…it is a selective phase that uses the most significant or frequent initial codes to sort, synthesize, integrate and organize large amounts of data… to pinpoint and develop the most salient categories in large batches of data” (Charmaz 2006, p. 40). Focused codes account for how initial codes represent the data. The following questions by Charmaz (2014) were helpful in determining which codes best served as focused codes: “What do you find when you compare your initial codes with data? In which ways might your initial codes reveal patterns? Which of these codes best account for the data? Have you raised these codes to focused codes? What do your comparisons between codes indicate? Do your focused codes reveal gaps in the data?” (Charmaz, 2014, p. 141). Examples of how focused codes were built for this research is seen in figure 4 below.
As seen from the examples above, focused coding is a "significant step in organizing how to treat data and manage emerging analysis. By attending to initial codes and making decisions about focused codes, the researcher trims away the excess" (Charmaz, 2014, p. 141) to focus on crucial ideas which spring forth from the data.

**In-vivo codes**
These are codes built out of participants’ direct terms or words. They provide a useful point of inquiry, while also preserving participants’ exact meaning. To find “in-vivo” codes, these four characteristics by Charmaz (2014), were useful (1) Terms everyone knows that flag condensed but significant meanings (2) A participant’s innovative term that captures meanings or experience (4) Insider shorthand terms reflecting a group’s perspective (3) Statements that crystallize participants’ actions or concerns” (p. 134). Some in-vivo codes found in the data include learning

<table>
<thead>
<tr>
<th>Initial Codes</th>
<th>Focused Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Finding blackboard difficult to use</td>
<td>- Having challenges using instructional technologies</td>
</tr>
<tr>
<td>- Trying to “figure out” how blackboard works</td>
<td></td>
</tr>
<tr>
<td>- Struggling to use technology</td>
<td></td>
</tr>
<tr>
<td>- Indicating how “challenging” it is to use blackboard discussion boards</td>
<td></td>
</tr>
<tr>
<td>- Having a “major failure” using blackboard in the classroom</td>
<td></td>
</tr>
<tr>
<td>- Feeling awkward by problems which “pop-up” in the classroom</td>
<td></td>
</tr>
<tr>
<td>- Having issues helping students create visual projects</td>
<td></td>
</tr>
<tr>
<td>- Learning to use technology from “tech savvy” friends</td>
<td>- Learning to use technology by working with others</td>
</tr>
<tr>
<td>- Having little or no experience with blackboard prior to teaching</td>
<td></td>
</tr>
<tr>
<td>- Learning to use technology from colleagues</td>
<td></td>
</tr>
<tr>
<td>- Learning how to use technology at graduate student meetings</td>
<td></td>
</tr>
<tr>
<td>- Learning how to use technology by self-research</td>
<td>- Learning by personal effort</td>
</tr>
<tr>
<td>- Learning without official training</td>
<td></td>
</tr>
<tr>
<td>- Learning to use technology on the job</td>
<td></td>
</tr>
<tr>
<td>- Exploring how to use technology</td>
<td></td>
</tr>
<tr>
<td>- Requiring a little “hunting” to find new things</td>
<td></td>
</tr>
<tr>
<td>- Finding self-learning exciting as opposed to being told what to do</td>
<td></td>
</tr>
</tbody>
</table>
by “pushing buttons”, feeling “thrown into the deep end of the pool”. The contexts within which these codes were retrieved are seen in figure 5 below.

3.3.3 CATEGORIZING
“Categories explicate ideas, events, or processes in the data” (Charmaz 2006, p. 91). To arrive at categories, researchers look closely at focused codes and then begin to frame analytic questions about them. In what Charmaz (2008) described as ‘raising terms to concepts’ researchers define terms clearly and analyze them using clearer wordings with the intention of building conceptual categories. So, the codes move from being simply descriptive labels or topics to reflect larger parts of the researcher’s theoretical framework, from which explanations and further predictions are made. To build categories out of focused codes, researchers constantly make comparisons between “data, incidents, contexts and concepts by comparing (1) people’s beliefs, experiences, actions, situations; (2) data from the same individuals at different points in time; and (3) comparing categories in the data with other categories (Charmaz, 2008, p. 42). “Categories can carry so-called properties and dimensions. A property is a general or specific characteristic of a category, whereas a dimension denotes the location of a property along a continuum or range” (Strauss and Corbin, 1998, p.101).

So, when determining a term as a category, the researcher notes its properties, conditions under which it came about, and how it evolved. He eventually shows its relationship to other categories by making constant comparisons (Charmaz, 1990). The constant comparative method developed by Strauss (1987) was a means to facilitate the grouping of emergent themes into categories and identifying how categories and sub-categories are connected. New categories eventually build out this process (Lacey & luff, 2001). Creswell (2003) defines constant comparison “as an inductive data analysis procedure in grounded theory research of generating
and connecting categories by comparing incidents in the data to other incidents, incidents to categories, and categories to other categories” (p. 406). Major sources used for building categories in this study were “inferences from the data, the research questions, theoretical issues, imagination…intuition, and previous knowledge” (Dye et al., 2000, p. 2). The categories and sub-categories were named following those observed in the literature review. This was so as to facilitate data interpretation, and to validate the research (Ratcliffe, 2005). This process of comparing and interpreting data continues until no new significant categories or concepts emerge. Some categories built out of the data are presented in figure 5 below.

<table>
<thead>
<tr>
<th>Initial Codes</th>
<th>Focused Codes</th>
<th>Categories</th>
<th>In-Vivo Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Finding blackboard difficult to use</td>
<td>-Having challenges using instructional technologies</td>
<td>-Challenges</td>
<td>-Feeling “thrown into the deep end of the pool”</td>
</tr>
<tr>
<td>-Trying to “figure out” how blackboard works</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Struggling to use technology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Indicating how “challenging” it is to use blackboard discussion boards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Having a “major failure” using blackboard in the classroom.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Feeling awkward by problems which “pop-up” in the classroom</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Having issues helping students create visual projects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Learning to use technology from &quot;tech savvy&quot; friends</td>
<td>-Learning to use technology by working with others</td>
<td>Collaboration</td>
<td></td>
</tr>
<tr>
<td>-Having little or no experience with blackboard prior to teaching</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Learning to use technology from colleagues</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Learning how to use technology at graduate student meetings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Learning how to use technology by self-research</td>
<td>-Learning by personal effort</td>
<td>-Self-help Strategies</td>
<td>-Learning by “pushing buttons”</td>
</tr>
<tr>
<td>-Learning without official training</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Learning to use technology on the job</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Exploring how to use technology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Requiring a little “hunting” to find new things</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Finding self-learning exciting as opposed to being told what to do</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 3.6: Category Sample**

### 3.3.4 MEMO-WRITING

Memo-writing is the stage where the researcher elaborates on the categories, by writing extensively about questions and ideas implicit and explicit in the data. This stage is typically referred to as the “intermediate stage between data collection and writing a draft of a paper or
chapter” (Charmaz, 2008, p. 166). The researcher observes data for multiple perspectives and seeks most accurate ways to organize and represent the information. Memo-writing provides the researcher a lens to uncover assumptions in the data, which could otherwise go unnoticed. It offers a chance for the researcher to learn more about the data and write more analytically, rather than making summaries. Much of memo-writing emphasizes constant comparison with data to ensure that analysis emerges out of the data, and not the researchers’ perceptions. Charmaz (2008), guidelines for building grounded theory memos, which were considered for this study includes the following:

(1) title the memos for easy sorting and storage; (2) write memos throughout the entire research process; (3) define the code or category by its properties found in the data; (4) delineate the conditions under which the code or category emerges, is maintained, and changes; (5) compare the code or category with other codes and categories; (6) include the data from which the code or category is derived right in the memo; (7) outline the consequences of the code or category; (8) note gaps in the data and conjectures about it. (p.166)

Some strategies used for writing memos in this research included keeping a journal for major thoughts, concerns and decisions. This process was helpful in elaborating upon assumptions embedded in the categories. It was as Charmaz described “a discovery phase” which allowed my thoughts to wonder and explore as much as possible. However as grounded theory intimates, a constant comparison with the data even at this phase is very crucial.

Other methods for memo-writing which I found useful was building clusters. The ability to write down ideas in little circles and carefully map how the ideas relate or differ was helpful. By sifting and sorting through the categories, clustering provided a picture of what the research
findings would look like. After this, I engaged in more memo-writing. Below is an example of how memo-writing was done in this study

“Majority of participants indicates that they use Blackboard as a course management system because it is a university requirement. It also seems that instructors (mostly AI’s) incorporate other technologies in their classes because they find them easier to teach with, and to facilitate their class lessons. Interestingly, they learn how to use these technologies on their own. Wondering why they do not devote equal time to learning how to use Blackboard. Also questioning how prepared instructors are to integrate technology in their functions as AI’s and TA’s.”

3.3.5 THEORETICAL SAMPLING
“Theoretical sampling means seeking pertinent data to develop emerging theory. The main purpose of theoretical sampling is to elaborate and refine the categories constituting your theory” (Charmaz, 2014, p. 193). Theoretical sampling is done when categories are examined for properties, until no new properties emerge. That is, from relevant and useful categories, the researcher focuses on specific issues, experiences or events and not necessarily on individuals (Charmaz, 2008), to highlight key issues in the research study.

Theoretical sampling is crucial for the following reasons: it is “strategic, specific and systematic” because it refines categories; it helps the researcher clarify connections and variations between categories, and to define gaps between the categories (Charmaz, 2014). After this stage, the researcher engages in further memo-writing which at this point, is more “precise, analytic and incisive” (p. 46), because theoretical sampling not only advances data analysis, but also keeps the researcher from working with very broad data or derailed analysis. Following this, the literature on this subject is explored further and carefully compared for how it aligns or differs from the research findings. This process ends when ‘theoretical saturation’ is reached.
3.3.6 **THEORETICAL SATURATION**
Data is said to have saturated when analysis does not yield any more categories or new insights to the research findings (Charmaz, 2008, 2014). In other words, when the comparison of emergent theory with the literature doesn’t produce further similarities or difference, the final phase of data analysis has been reached. At this point, the researcher produces research findings which closely reflect the study. With regards to this study, after engaging in a constant comparison between data, emergent codes and categories built out of the data, the results were considered saturated when data did not replicate further new insights.

3.3.7 **ETHICAL CONSIDERATIONS**
Like all research, ethics plays an integral role in my research studies especially because it deals with research participants. Considering ethics, I was mindful of the area in which the research will be conducted, how participants were selected, how data was collected, analyzed and represented. Moreover, considering that digital literacy and pedagogy are intertwined with issues of race, privilege, power, class, gender and age (C. Selfe (1999), R. Selfe (2005), etc.), I was mindful of my own biases as a researcher and careful of how the data retrieved, served both my interests as a researcher, and that of my participants. This is usually sometimes tricky given that “whether we are aware of it or not, we always bring certain beliefs and philosophical assumptions to our research” (Creswell, 2003, p. 1). Also, the notion of openness about my inquiry was also ethical decision to keep participants fully aware of what the research was about.

Reflexivity according to Koro-Ljungberg (2015) is all “the personal, interpersonal, institutional, pragmatic, emotional, theoretical, epistemological and ontological influences on our research and data analysis process” (p. 34). Considering my research, where I adopted a mixed-methods approach, all these stances enabled me as a researcher to critically reflect on my values, biases as well as on the research process. Also, as an English Composition instructor, working to
interview some composition instructors for the same things that I teach, I was also able to reflect on my teaching practices, and better explored/questioned the technological practices of other instructors. Working with students from other disciplines, I was careful to respect and appreciate our academic differences and the values we place on some technologies over others. Their perspective was not treated as “different” but rather as a contribution to the richness of the carried technologies used by graduate students. Moreover, the process of interviewing and validating interview data, which were equally considered as reflexive practices, were core processes in my research study. Reflexivity, in this sense, meant that I constantly self-critiqued my approach to the research.

Closely linked to reflexivity was how I chose to position myself in the research process. Sapienza (2007) highlighted the necessity of negotiating additional roles and positionalities alongside being the researcher to both understand the group studied and also become part of it. It was important for me to take on a “research positionality that acknowledged and utilized a rhetorical ethos that both informed my research agenda and ... participation in the group” (p. 91). Negotiating additional roles and positionalities with respect to my research entailed taking a position that is fair to my participants and myself as a researcher. Ultimately, this way of positioning myself allowed me to better represent my participants in constructive and respectful ways. Sapienza’s (2007) work resonates with this study because of how I observed my ethos and that of the research participants, and the “multilayered roles that intersect and inform one another: participant, observer, helper, and so forth” (Sapienza, 2007, p. 91).

3.3.8 RESEARCH LIMITATIONS
Conducting a study aimed at providing empirical results of Ph.D. graduate instructors 21st century technological pedagogical content knowledge (TPACK) and multimodal literacy practices across
disciplines in a four-year college setting was challenging because of the varied ways in which different technologies were used. Having limited knowledge on how some of these technologies work posed as a challenge to fully grasp the extent to which these students faced difficulties. On the other hand, it was relatively easier to understand some of the challenges faced by graduate instructors in the Rhetoric and Writing studies program based on my similar previous experiences.

It was impossible to ensure that all research participants invited via email, face-face or otherwise eventually took the surveys or participated in the interview sessions. The attempt to contact and encourage a huge participant response rate was not exactly successful as some directly declined participation while others didn’t respond. Thus, given that over half of the target population participated in the surveys, with a total of 16 who participated in the interview sessions as opposed to 32, it is apt to say that the results of this study do not fully represent the exact situation of this campus. However, the findings do offer important details about instructors’ perceptions and experience teaching with technology.
Chapter 4. Interpreting Data: Discussions on Graduate Instructors’ Technological Literacy

This chapter presents the findings to survey and focus group interviews conducted for this study. The first part of this chapter presents statistics and detailed graphical representations of responses to the survey questions, participant size and salient findings. The second part of this chapter will provide results built out of interview data categories. Both parts offer crucial findings that open spaces for recommendations in graduate student technological literacy.

4.1 Survey Analysis

The survey was designed to collect relevant data for the research questions driving this study. To fully present results of the survey, the first part of this chapter provides an overview of participants’ colleges, years of experience and specific functions. It also responds to the first three research questions and the last part of the third research question which probes into positive deviant strategies used by students to overcome ‘hacks’ in their use technology for their specific functions as AI’s or TA’s. The fourth research question, which makes a comparison between the technological literacy of international graduate instructors and resident graduate instructors, will also be elaborated upon in the second part of this chapter. In question 1 of the survey, participants indicated their different colleges/departments.

Table 4.1: Participants Colleges/Departments

<table>
<thead>
<tr>
<th>College</th>
<th>PhD Degrees</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>Business Administration</td>
<td>9</td>
</tr>
<tr>
<td>Total participants in Business</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Engineering</td>
<td>Biomedical Engineering</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Civil Engineering</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Electrical &amp; Computer Engineering</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Environmental Science &amp; Engineering</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Materials Science &amp; Engineering</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Mechanical Engineering</td>
<td>1</td>
</tr>
<tr>
<td>Total participants in Engineering</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td>----</td>
<td></td>
</tr>
<tr>
<td>Liberal Arts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Psychology</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Rhetoric &amp; Composition</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Liberal Arts Total participants</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>in Liberal Arts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sciences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Chemistry</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Computational Science</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Geological Sciences</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Total participants in Science</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Sum total</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>Participants with unspecified</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>program details</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total number of recorded responses</td>
<td>129</td>
<td></td>
</tr>
</tbody>
</table>

As shown in Table 4.1 above, there was a total of 64 participants with unidentified program/department details (they didn’t respond to this question), and a total of 129 participants in the research survey. Out of this population, 68% comprised teaching assistants (master’s level students), while 32% were assistant instructors (doctoral students). Teaching assistants grade papers, conduct labs, tutorial sessions, teach occasionally for their assigned professors and carry out other specific functions which they are assigned to. Assistant instructors on the other hand are mostly fulltime teachers, meaning they are instructors of record who do not necessarily assist professors.
Considering that the participants enrolled in this study are fulltime PhD students, 38.46% of instructors had 1-2 years of working experience, while a majority (41.76%) of them indicated having more than 3-5 years of working experience in higher education. A relatively smaller percentage of instructors, 19.78%, had over 5 years of experience. Noting that the majority of the graduate students involved in this study have over 4 years of experience as either a teaching assistant or an assistant instructor, it is understandable that as full-time PhD students, some of them have previous working experiences while at the master’s level, or they could be advanced PhD students in their third to fifth years. Their specific functions as TA’s and AI’s were recorded as follows.
Figure 4.2: AI/TA Specific Functions

This data suggests that most of the graduate instructors (34%) enrolled in this research grade student assignments, while a second majority of them (31%) assist professors to teach labs or classes. Another 12% of instructors hold tutorial sessions for students, while 11% were part-time instructors. The least population of instructors (8%) were registered as full-time teachers of record. Instructors were asked to check all answers which apply to them, and the “other” functions accounted for 5% of this data and included proctoring during exams, “resolving complaints and discrepancies” for students, doing “prep work” and conducting research for professors.

As mentioned in chapter 1, the purpose of this research is to observe the technological literacy and pedagogical experiences of graduate instructors to better understand the challenges which they have using technology in their specific job functions. To shed more light, this section addresses the first three research questions, by looking closely at the related survey questions.
Research Question 1: What digital literacies do institutions expect graduate instructors to bring to the classroom? Are these expectations the same across disciplines?

This question was asked with the intention of assessing students’ knowledge of the technologies required by their departments prior to their enrollment as TA’s or AI’s. This information is useful to the overarching goal of this research because it helps to trace instructors’ preparedness to use technology. Moreover, it also highlights some nuanced issues at the institutional level that possibly limits instructors’ technological literacies. Survey questions 8 and 9 were useful in providing responses to this research question. Question 8 asked “Were you aware of the technologies required by your institution for your job assignment prior to your enrollment as a TA?” Participants’ responses were as follows:

Table 4.2: Instructor Awareness of Technologies to be used prior to enrollment as TA’s/AI’s

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Other Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>41</td>
<td>Technologies were not required by department</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Familiar with technologies, but not sure which were required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Was aware of some, but not all</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Can’t recall</td>
</tr>
</tbody>
</table>

While 38 instructors were aware of the technologies to be used in their roles as AI’s or TA’s, 41 instructors indicated not being aware of the required technologies. The knowledge of which technology to use for TA/AI functions helps instructors acquaint themselves with the technology and even more so plan how to integrate these into their classes. The absence of this knowledge as indicated by 41 instructors also goes a long way to hinder how these instructors prepare to use instructional technologies. Other participant comments also indicate that some instructors did not have full knowledge of instructional technologies or that the technologies were not necessarily a basic requirement. In either case, little or no instructional technology awareness directly or indirectly affects how instructors use these technologies. For interview question 9, participants
were asked “How did you find out about the technologies you are required to use for your specific job assignment? (Please check all that apply)”. As seen in the question 9 responses to the survey questions below, instructors without prior knowledge learned on the job or figured out how to use these technologies as they moved along.

![Bar Chart](chart.png)

**Figure 4.3: Sources of Information About Use of Technology Prior To Enrollment as Graduate Instructors.**

This data is indicative of the fact that the majority of instructors (40%) learned how to use instructional technologies from their colleagues, while a second majority of them (21%) learned from friends. Campus workshops and listserv emails that are representative of how institutions support students’ technological literacy accounted for 20% and 4% of participant population respectively. A critical reading of this data acknowledges the presence of institutional support for graduate students considering their technological literacy, and questions why students do not make full use of this sources of knowledge, or rather, why it is not a major source of assistance to graduate instructors. Besides the options listed above, 5 instructors who specified other options in the 14% category above, suggested that they learned how to use instructional technology from
their advisors. “Other” recorded sources of knowledge include “trial and error,” Google, workshop trainings from publisher, training session from department chair, TA meetings, education classes, self-research and previous knowledge from other institutions.

**Research Question 2: What digital literacies do graduate instructors bring to the classroom?**

**And how useful/not useful are these literacies in facilitating pedagogy?**

The second research question which probes into the digital literacies that graduate instructors bring to the classroom also examines how useful these literacies are in facilitating their AI/TA functions. Survey questions 6 and 7 respond to this inquiry by probing into the kinds of technology which graduate students incorporate in teaching, grading and other specific functions. Question 6 asked “Which of the following kinds of technologies do you incorporate in your functions as TA/AI? (Please check all that apply)”. Instructors listed the following technologies in the chart below.

![Figure 4.4: Technologies Used by Graduate Instructors](image)

From this data, 27% of instructors use Blackboard for teaching and grading. Worth noting is the fact that Blackboard is the main instructional technology to be used by instructors at this university. What this implies is that less than half of the participant population for this survey use
or incorporate Blackboard in their functions. The second most used technology by instructors is YouTube (23%). Another 17% of graduate instructors use discussion boards, 10% of them use google docs, while 8% use blogs. Technologies most used by instructors in the 14% category (other) include I-clicker, Dropbox, Tophat, McGraw-Hill Connect, Cengage, YouTube, MATLAB, Blackboard reef, Twitter, GoogleEarth, Microsoft Excel, Adobe Illustrator, Canva, Prezi. Most instructors in this category indicated that they use emails and Moodle.

Instructors further specified how they use these technologies in their specific functions. This information was helpful in determining how useful/not useful their technological literacies are in facilitating pedagogical and other practices. For example, in survey question 7, graduate instructors were asked to explain how they use two of the above technologies in their functions. Table 4.3 captures their responses on how they use the technologies which they chose to talk about.

### Table 4.3: Specific Uses of Technologies by Graduate Instructors

<table>
<thead>
<tr>
<th>Technologies</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackboard</td>
<td>Grading</td>
</tr>
<tr>
<td></td>
<td>Discussion forum</td>
</tr>
<tr>
<td></td>
<td>Track student progress</td>
</tr>
<tr>
<td></td>
<td>Upload class notes, syllabus, calendar</td>
</tr>
<tr>
<td>Youtube</td>
<td>Illustrates safety rules for assignments</td>
</tr>
<tr>
<td></td>
<td>Show animation videos</td>
</tr>
<tr>
<td></td>
<td>Teach Excel</td>
</tr>
<tr>
<td></td>
<td>Videos on writing</td>
</tr>
<tr>
<td>Moodle</td>
<td>Grading</td>
</tr>
<tr>
<td></td>
<td>Create reports</td>
</tr>
<tr>
<td>Google Docs</td>
<td>To give feedback</td>
</tr>
<tr>
<td>McGraw-Hill Connect</td>
<td>Assign homework</td>
</tr>
<tr>
<td>iClicker</td>
<td>Quizzes</td>
</tr>
<tr>
<td></td>
<td>Assessment</td>
</tr>
<tr>
<td>Powerpoint</td>
<td>Class notes</td>
</tr>
<tr>
<td>Dropbox</td>
<td>Upload assignments</td>
</tr>
<tr>
<td>Cengage</td>
<td>Assignments</td>
</tr>
<tr>
<td>MATLAB</td>
<td>Programming</td>
</tr>
<tr>
<td></td>
<td>Simulation</td>
</tr>
<tr>
<td>Weebly or Wix</td>
<td>E-portfolio</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Tumblr</td>
<td>Discussion</td>
</tr>
<tr>
<td>Google Earth</td>
<td>Study landscapes</td>
</tr>
<tr>
<td>Canva</td>
<td>Create Posters</td>
</tr>
<tr>
<td>Prezi</td>
<td>Presentation</td>
</tr>
<tr>
<td>GitHub</td>
<td>For coded assignments</td>
</tr>
</tbody>
</table>

Table 4.3 shows the kinds of technologies used by graduate instructors and offers details of how they use these technologies in their classes. The different technologies above are used by instructors in varied ways because of their different functions. Instructors in Liberal Arts mostly used Blackboard, Google Earth, YouTube, PowerPoint, Weebly/Wix, Tumblr, Canva and Prezi. Others like Moodle, McGraw-Hill Connect, iClicker, Dropbox, Cengage, and MATLAB were commonly used by graduate instructors in the college of Engineering and Sciences.

**Research Question 3: Are there any graduate instructors who enter with low or deficient technological literacies but who manage to become proficient without access to special resources?**

Survey questions 7, 12, 14 and 15 which examined how graduate instructors rate their use of technology, also questioned their level of technology training at the start of their job assignments as TA/AI’s and their level of preparedness to integrate technology into their classes and what challenges they have doing so.
Figure 4.5: Graduate Instructor’s Level of Technological Literacy

The data findings on how instructors rate their ability to use instructional technology presents majority of participants (62%) as intermediary users of technology, while the second majority of the population (24%) considered themselves as advanced users. It is important to note that only 13% of instructors classified themselves as beginners. Given that the categories “advanced,” “intermediary,” and “beginner” were broadly used to define as “expert,” “efficient” and “little” knowledge of how to use technology, it seems apt to say that both the intermediary and advanced participant population of 87% have a good working knowledge of how to use technologies in their functions. This explanation is also justified by the fact that majority of instructors feel prepared to integrate technologies in their functions as seen in Figure 4.6 below.
In figure 12 above, instructors were asked to rate their level of preparedness to effectively integrate technology in their functions. On a scale of 1-10, 28 instructors indicated having a preparedness level of 8, while 20 instructors indicated 7, and 12 others identified with 9. This finding suggests that most instructors have a good knowledge of the technologies they use. Also, instructors who indicated preparedness levels of 5-6, can be considered intermediary users, giving their fair or efficient knowledge of technology. Instructors who indicated 5 and below can equally be classified as beginners or having little knowledge of technology as explained in figure 7.

The gap between these findings is the fact that while 56 instructors (62.22%) specified being intermediary users of instructional technology, 73 of these instructors (counting from scale 7-10 in figure 9 above) equally indicate feeling very prepared to use these technologies in their functions. What this suggests is the possibility that majority of instructors in this study feel confident about their knowledge and use of technology. It is also worth exploring why 13.33% of instructors have little knowledge of how to use technologies or identify as ‘beginners’ with their

Figure 4.6: Graduate Instructors Level of Preparedness to Integrate Technology into Their Functions.
use of technology, and why 10 people in this population feel underprepared to teach with technology. Survey question 12 explores this to an extent because it questions the institutional training which instructors had prior to their roles as AI/TA’s.

![Figure 4.7: Do you feel you had adequate training when you started using these technologies?](image)

Most graduate instructors, 37.50%, indicated that they had adequate training prior to their roles as AI’s or TA’s. While 31.82% denied having adequate training, another 30.68% of this population is not exactly certain of how much required training they had for their roles, and so they selected “maybe.” Here lies another explanation for some instructors under preparedness to use and integrate technology in their work. Considering that majority of instructors learned how to use instructional technologies from their colleagues, as seen in figure 9, it seems evident to note that most of them learned to use these technologies on the job.

Also considering that most instructors (62.22%) in figure 11 identified themselves as “intermediary” (efficient) users of technology, as opposed to 24.44% of “advanced” users and 13.33% of “beginners,”, survey question 15 responses add to this detail by highlighting that
instructors have more challenges teaching students to use these technologies, as opposed to using it themselves. In other words, instructors feel more confident about their knowledge of these technologies than they are with using these technologies for teaching, grading, and other roles as seen in Figure 4.8 below.

Figure 4.8: Areas Where Instructors Feel Challenged with Technology

There exists a significant gap between instructors who feel challenged teaching students to use technology, 72.13%, and those who feel challenged using these technologies themselves 27.87%..

What these responses suggest is that instructors feel more comfortable using these technologies personally than teaching or working with them for other functions. It is also a possibility that they know how to use these technologies differently for personal purposes than for broader academic functions. For example, it might be a different experience knowing how to look up grades and class material on Blackboard, than it is to create discussion boards and conference sessions with students on Blackboard.

**Question 3b: What are some of the “hacks” that students use to navigate obstacles?**
In line with research question 3a (Are there any graduate instructors who enter with low or deficient technological literacies but who manage to become proficient without access to special resources?), is research question 3b highlighted above, which took on a positive deviant approach to investigate the unique ways that instructors overcome some of the issues they encounter when using technology. Understanding how instructors with low or deficient technological literacies worked differently from others to become proficient and advanced users of technology was crucial to harnessing other instructor’s technological literacy.

From survey question 9, 13, and 16, instructors’ responses shed light on how they improve upon their low and intermediate technological literacy as per the data without access to special resources. In other words, it examines why some instructors are more knowledgeable than others, and how they overcome the ‘hacks’ in their technological literacy.

![Figure 4.9: How Instructors Get Technical Assistance to Use Technology](image)

**Figure 4.9: How Instructors Get Technical Assistance to Use Technology**

Some ways in which instructors get assistance for the “hacks” in their use of technology as seen from the responses above, is by conducting research on Google. A total of 19.74% of instructors do self-research on Google to learn how to properly integrate technology into their
functions. In other words, self-help proves to be a major way of learning how to use technology. A second majority of instructors, 19.42%, learn to use technology from colleagues, while 14.89% of learn via IT support on campus. Below is a statistical representation of instructors’ responses.

Table 4.4: How Instructors Overcome “Hacks” When Using Technology

<table>
<thead>
<tr>
<th>Answer</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google search</td>
<td>19.74%</td>
</tr>
<tr>
<td>Colleagues</td>
<td>19.42%</td>
</tr>
<tr>
<td>IT Support on Campus</td>
<td>14.89%</td>
</tr>
<tr>
<td>YouTube tutorials</td>
<td>13.59%</td>
</tr>
<tr>
<td>Friend</td>
<td>10.36%</td>
</tr>
<tr>
<td>Campus technology workshops</td>
<td>7.77%</td>
</tr>
<tr>
<td>Students</td>
<td>6.47%</td>
</tr>
<tr>
<td>Technology workshops organized by department</td>
<td>5.50%</td>
</tr>
<tr>
<td>Other (Please specify)</td>
<td>2.27%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

As seen in the figure above, 13.59% of instructors overcome the challenges of using technology by researching on YouTube. This percentage could also be added up to the population of instructors who do self-research, that is 19.74% of instructors who learn through Google search, and 13.59% of instructors who learn through YouTube, making a total of 33.33% of instructors who learn through self-help. Other means of learning from friends (10.36%), campus workshops (7.77%), and students (6.4%) had relatively lesser percentages. The least population of instructors (2.27%) recorded that they got technology support through “other” means such as learning from instructors/professors, learning by trial and error and using previous knowledge from other universities. Considering that only 22.66% of instructors indicated having benefited from institutional assistance (IT support on campus and campus technology workshop), what instructors suggest could be done differently by the institution to better meet their needs was presented in their
responses to survey question 16: “how do you think your challenges using technology can be met? What do you suggest being done differently?”

**Table 4.5: Instructors Suggestions for Improvement in their Technological Literacy**

<table>
<thead>
<tr>
<th>Suggestions to challenges with technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>More campus workshops and follow-up sessions</td>
</tr>
<tr>
<td>Communicating with students during class time</td>
</tr>
<tr>
<td>Blackboard training</td>
</tr>
<tr>
<td>Standardize technologies uses across departments for easier training for TA's and AI's</td>
</tr>
<tr>
<td>Mandatory blackboard training for freshmen</td>
</tr>
<tr>
<td>Classrooms should have touch screen monitors</td>
</tr>
<tr>
<td>More trouble-shooting instructions for students</td>
</tr>
<tr>
<td>Get help from others</td>
</tr>
<tr>
<td>Training with Moodle</td>
</tr>
<tr>
<td>Technology tutorial handbook should be given to students prior to their assignments</td>
</tr>
<tr>
<td>Prepare step by step instructions for students</td>
</tr>
<tr>
<td>Update software license</td>
</tr>
<tr>
<td>Campus IT training</td>
</tr>
<tr>
<td>Regular tutorial sessions for both teachers and students</td>
</tr>
<tr>
<td>Blackboard Course for TA's</td>
</tr>
<tr>
<td>Tutorial videos on how to use class technologies</td>
</tr>
<tr>
<td>Make using technology a part of the course work</td>
</tr>
<tr>
<td>Self-motivated to find solutions</td>
</tr>
</tbody>
</table>
Workshops for new students during orientation

4.2 Interview Analysis

At the end of the survey, participants were asked if they were willing to be contacted for a focus group interview to further discuss their experiences using technology in their AI/TA functions. Out of 129 participants in this study, 20 participants (23%) agreed to be contacted for an interview. Twenty-five participants (28%) selected “maybe” which means they were unsure of their availability for a follow-up interview, while 43 participants (49%) declined being contacted for an interview. Out of 25 participants who agreed to participate in an interview session, 16 instructors made themselves available for the sessions.

Interview sessions comprised both resident and non-resident instructors from different college and departments. The sessions lasted for 45 minutes. At the start of each session, participants were handed documents to fill out, which asked for their names, departments, years of teaching experience, how they classify themselves as users of technology ("beginner," "intermediary," "advanced"), offering brief justifications for their use of these technologies, and their residency status (resident/non-resident), where non-resident refers to international students. These details and responses to the interview questions provided useful information for research question four, which observes whether non-resident graduate instructors are likely to teach with technology across majors in similar ways to resident instructors. It also provides in-depth suggestions to challenges which instructors face using technology in their functions. Instructors present at the interview sessions came from the college of Engineering, Liberal Arts and Science, as illustrated by the various departments in Figure 4.10 below.
Looking at the data above, one quickly notes that, of the 16 instructors who participated in the interview, most of them (10) were from the College of Liberal Arts, specifically from Rhetoric and Composition (9) and History (1). Three other instructors from the College of Engineering were from Civil (2) and Electrical Engineering (1) departments, while from the College of science, 3 instructors came from Geological Sciences. Instructors’ participation in the interview was based on their willingness and availability. With more students from Liberal Arts, especially from the department of Rhetoric and Composition, it might seem that the challenges and suggestions given in this section are more applicable to these group of instructions. However, considering the driving goal of this research, which is to explore graduate instructors’ experiences, it is important to note that the problems and solutions mentioned in this section are also reflective of most of the student population in this research, as shall be explained in chapter 5.

Also, from the interview participant data, it was noted that graduate instructors involved in this research have been AI’s or TA’s for at least 1 year in higher education, with the maximum years of experience being 8. As seen in Figure 4.10 below, up to 4 instructors have 2 years of

Figure 4.10: Graduate Instructors’ departments
teaching experience, 3 instructors had 3 years of experience, 3 sets of 2 instructors had 4, 5 and 7 years respectively, with one instructor having up to 8 years of experience.

Figure 4.11: Duration of Graduate Instructor’s AI/TA Experience

Considering instructors’ level of experience, it may be expected that they would have a relative wealth of knowledge in their use of technology. However, when asked to rank their knowledge and use of technology, 5 of 16 instructors identified themselves as “advanced users” of technology, while 11 said they were “intermediary” users of technology. No instructor indicated being a “beginner.”

Figure 4.12: Instructors’ Knowledge/Use of Technology
Lastly, in this introductory part of the interview, 7 of 16 participants were non-resident instructors, while 9 of them identified as resident instructors. Suffice it to say that there were slightly more non-resident instructors present at the interview.

![Bar chart showing the number of instructors by status](image)

**Figure 4.13: Graduate Instructors’ Status**

More importantly, in consideration of research question three which examines whether non-resident graduate instructors are likely to use technology in similar ways to graduate instructors, only 1 of 7 resident instructors specified having “advanced” knowledge and use of technology, while 4 out of 9 non-resident instructors indicated having “advanced” knowledge. So out of 5 instructors with “advanced” knowledge and use of technology, only 1 was a resident instructor. All other 10 instructors (non-resident and resident) said they were “intermediary” users of technology.

Acknowledging that this sample size is neither a significant representation of the initial population size of this study, nor is it a reflection of all graduate students’ experiences, the results however annul the assumptions held at the initial stages of this research, that non-resident instructors are less likely to teach and use technology as resident instructors. It also subtly suggests that resident instructors are less likely to teach and use technology as non-resident instructors. It
remains worthy to note however, that participants’ interpretations of what these words mean could be different. For example, a non-resident instructor who indicated having an advanced knowledge and use of technology justified this by his ability to explore and learn different technologies. Similarly, a resident instructor who presented herself as an “intermediary” user of technology, equally justified this by her ability to learn by doing research and seeking assistance from others. However, as shall be examined from the in-depth interview responses below, it seems apt to say that both groups of instructors have similar experiences with technology.

The interview questions were mostly like survey questions for the sole purpose of giving participants a chance to share their experiences in more detail. For example, instructors were able to elaborate more on how and why they use certain technologies over others, how they were prepared to use these technologies, the challenges which they experience using these, and how it was overcome. In this section, instructors’ experiences validated or annulled some salient information in the literature review, which expounds on graduate students’ experiences with technology. Using a grounded theory approach to sieve through this data, the results of the interviews revealed the following themes:

1) Uses and critiques of Blackboard course management system
2) Factors influencing instructor’s decision to use instructional technologies
3) How instructors learn to use technology
4) Recommendations for improvement in technological literacy

The last section of this chapter provides an analysis of interview findings through an explanation of these four over-arching themes. The confidentiality of interview participants has been protected by use of pseudonyms.
1. Uses and critiques of Blackboard course management system

It is no coincidence that most instructors talked about their use of Blackboard and the challenges they have using this technology. Blackboard, being the major course management system at this institution was a topic of discussion in all focus group interviews. Instructors used Blackboard for storing grades, accessing online books, tracking student activity, facilitating teaching online, creating and managing discussion boards and managing course content. Miguel, an instructor in the college of Science said:

Using the Blackboard is really good. One part of it is that you don’t have to worry about losing any grades because they're going to be there, even if the class closes and at that time they can still access them, so it's the safest way of having the grades kept where students can see them whenever... So, it's the safest way to keep grades without worrying. Another point is, it actually helps like that tracking aspect, you can be able to know how many students are responding in terms of assessments... and the last aspect I could recommend, is like if you're using this kind of books, for example, online ones and you're linked to the blackboard, then it's easy for them to get to that one instead of going direct to that book outside, they can be linked to the blackboard.

Miguel, like the other instructors, values Blackboard for its potential to store grades, course books and tracking students’ participation in the class. Mathew from the Department of Geology was also appreciative of Blackboard’s multiple functions.

But I mean it's, it's fun to use it for instance, setting up the whole course on Blackboard...for instance, if it's a lab work, you put all their labs on there so then when they are coming to class it's easier. That way you don't have to print all the stuff for them to use, so they can print it out and bring it to class. So that makes it easier. You can send announcements to them before they come to class, so they know exactly what they're supposed to bring... I think it's fun...creating stuff that they use it for... like exam. You can do a like a very strict kind of exam where…If is on an online program, you can basically get the person, showing a face... you know, it shows the ID so you compare if he or she is the one writing the exam and then you know, you can save, you can lock the interface...the desktops so that they can't actually flip through pages. So immediately they open the exam page they just use the exams until they are done.
Mathew’s description of how he uses Blackboard highlights the multiple functions of the course management system. While he finds it “fun” to use and seems pleased at its ability to perform different functions, other instructors feel overwhelmed using this system. For instance, having worked with other learning management systems, Mary from the Rhetoric and Composition program holds the opinion that “Blackboard is kind of unwieldy difficult in a lot of ways, because it is so immense in its capacity.” Like Sarah who thinks Blackboard “is not really great,” John also finds Blackboard a “boring platform.” Explaining further, Mary indicates

Um, well for me, when I first came here and started using blackboard, I had had experience with other learning management systems, but I hadn't specifically had experience with Blackboard. And Blackboard is, it's amazing because it can do everything, but that's kind of the wonderful thing and the terrible thing about it is there's so much to it. And um, so I kind of felt like I was thrown into the deep end of the pool and just allowed to figure things out.

Mary has mixed feelings about the functions of Blackboard. Unlike Mathew who felt excited about the multi-purpose functions of Blackboard, Mary seemed overwhelmed by it. Alex also expressed his “biggest” frustration using blackboard because of the constant updates of the interface.

Yeah, the biggest challenge that I have is kind of Blackboard...like whenever they update the modules they would send that email, but we don't take you know...much more seriousness about it. But now when the semester starts, you realize that the Blackboard that you had at the end of the semester is different probably you'd have to do some other approach. You, you try to get the class, kind of its hidden you know, you have to, you know, mess around and maybe you just have a few minutes. So those updating features, adding in new features and the approach every time is like a challenge which like you have to keep checking it like ahead of time before the semester starts.

Mary and Alex’s experiences reflect thoughts and concerns of the other instructors. A closer look at this reveals that instructors feel overwhelmed by the many functions of Blackboard, mostly because they do not have a good mastery of it. In their narratives, instructors’ experiences move along lines of “trying to figure out” how Blackboard works, “learning by trial or by fire… as it
burned,” “struggling to use the technology,” “feeling awkward by problems which pop-up in the classroom” and finding it “challenging to use Blackboard discussion forums.” Also, as Alex indicates, sometimes negligence on the part of the instructors is one reason why they are unable to keep up with the technologies they are required to use. For example, Emily feels “lazy to learn or practice” teaching with different technologies. Moreover, considering that majority of instructors “feel compelled” to use Blackboard because it’s a university requirement” or “simply because the university says so,” highlights how they feel about this course management system and hence, the reason why they incorporate other learning systems into their functions.

Besides using Blackboard to teach, grade conduct labs and other tasks, instructors also mentioned having challenges integrating other technologies in their classes. For example, Brenda tried incorporating Kahoot (game-based platform for learning) into her class lessons, but “couldn’t figure it out.” She said, “I'm really embarrassed to say I couldn't... I tried to like research through the university and research on my own and I just, I hit a wall I could not figure out Kahoot for my life”. Similarly, John tried using “Quizzizz” (game-based software for creating quizzes) in his class. As he explained,

It's a different system and it's one, it's one that they can do at home, so they can log in overnight and review whatever and then, you know, you get the scores and everything like that. So, the issue I had is, is I just assigned them their first quizzes last night and I didn't realize that there was an option to make it to where you couldn't do more than one submission. So, everybody did really good because they just did it over and over and over again (laughs) until they got a hundred percent.

For Amit who worked as a TA for his advisor, his major challenge was being told to use Java script and platforms without any knowledge, assistance, or prior discussion of the technology he would need. So, he had to research and “figure it out.” These challenges were common to instructors from the Science and Engineering departments. Peter’s experience below greatly summarizes
Right when I first started teaching here…, I have to admit, it was very difficult for me to teach with technology because I was not even literate in terms of the ways we had to teach rhetoric and writing in first year composition class. In the beginning I even didn’t know how to use Blackboard and there was not enough training for me from the university. So how I learned to teach is through my friends. So, I would ask like almost all of you, I learned from all of you here actually how to use blackboard and how to use different technologies. But now I feel that I’m much more confident in terms of the ways we use technology in the classroom because now I’m exposed to different kinds of technologies. And uh, as to the question is, like, you have to have the knowledge of using technology, I have that knowledge, where to find the knowledge I know, but I don’t know how to use them, all of them in the classroom yet, right. I know where the knowledge lies, and I can show my students where to go to find out that knowledge.

Peter raised three important concerns for instructors in his field. First, he had no knowledge of the instructional technologies he was required to use as a teacher, second, he learned how to use technology by asking around from friends and colleagues, and third, although he feels more confident about his knowledge of technology, he still feels limited having to teach with technology of how to use it. These points cut across other instructor’s experiences and spark important suggestions on how to improve instructor’s technological literacy in this study.

2. Factors Influencing Instructor’s Decision to Use Instructional Technologies

Factors such as course outline/syllabus, level of tech-savviness, personal preference, teaching philosophy and the desire to use technologies familiar to students, influence instructors’ decisions to use different kinds of technology. For example, Jose found the need to use Google technology for his class because he felt “frustrated” using Blackboard.

So, I think my decision to use Google Docs was more one of uh…exploratory… I like to what I would consider update and upgrade myself in terms of technology. So, if Blackboard is frustrating. What is an alternative? So, I think I talked to myself that maybe google classroom might be a way for me to engage these students and see how it is going to work,
but I know for sure that I have to make arguments why I'm not using Blackboard per se and I don't have that power and authority at this moment. Not to use Blackboard because that's where they will monitor my teaching right, but I, I use that just as a side, like for some couple of assignments or projects. It was easier for students to follow instructions to know where to pause, where to make comments or how to see all the comments. Uh, so I think the decision was all mine and it was a pretty risky decision because I could get into trouble with that, but sometimes you just have to take the risk to learn new things.

Jose’s decision to use Google classroom resonates with other instructors like Martin, who sometimes uses YouTube as back-up for when Blackboard is down, given that it is always available for an impromptu discussion on a class topic. Jose and Martin’s viewpoint is reflective of Rhetoric and Composition instructors’ experiences because Blackboard is a required instructional technology to be used by all AIs. Maria further elaborates

I use Blackboard of course, just because the university requires it. And then, um, I incorporate a lot of YouTube videos. Um, and um, I recently, like the last year I started using "remind" which is a phone system that allows me to send them reminders on their smartphones, of assignments and stuff, but it also has the option to do it through emails because not all of my students will have smartphones. And it also allows me to let them know if there's any changes to the schedule as they go along. So that's a new one that I started using. Um, and I encouraged them to use google for their own sakes just because it provides them a way to save their assignments without losing them or without requiring to use their own laptop. Like if something happens to their laptop or their computer at home, they have that option to still bring up their assignments wherever they are. So those are just a few of the things I've done.

These instructors’ experiences indicate that they understand the usefulness of integrating technology into their classroom instruction. However, feeling limited by the functions of Blackboard, they resort to incorporating other technologies which facilitates collaboration between students and allows for prompt feedback and assignment updates. They suggest that these technologies are relatively easier to use or more functional than Blackboard. Understanding that Blackboard does have tools for collaboration like blogs, discussion boards and a relatively well-built grading system, one would question why it feels constraining to use Blackboard. A possible reason for this would be to consider what Julio says about it.
I think Adobe Spark was the first one I used to teach multimodal projects, because I mean we have other choices. I would make them do infographics or brochures, and for them like I would use maybe canvas …well, I, I think to be honest, maybe initially I was not very sure of myself, you know, like being able to guide them through video making and all. So that definitely played a big role.

Julio’s comment doesn’t quite explain why he chose to use Adobe Spark, but it does expose his initial discomfort teaching visual projects because he wasn’t sure of how to do so. His response also confirms the research finding that majority of instructors in this study are unaware of the technologies necessary for their specific functions. In all, while a good number of instructors applaud Blackboard for its functions and potential facilitate course instruction, majority of research participants find this resource limiting mostly because of the challenges they face navigating through its’ functions.

Instructors’ personal preferences also influence the kinds of technology they use. For example, Carina from Civil Engineering chose to use McGraw Hill Connect because she felt it would save her “a lot of time and heart ache.” In Carina’s opinion, McGraw Hill Connect is a good system because students get instant feedback to problems in Engineering, which is “worth the time and effort used in setting it up.” For Carina, “time cost analysis” and “benefit to students” is what determines the kinds of technologies she uses. Alejandra finds it important to use technologies that keep her students engaged, while Kendra prefers technologies that have more presentation templates. For example, Martha, like Kendra prefers that her students use Canva to create posters and not PowerPoint, which she thinks is “outdated and oversized.” Also, when asking students to create multimodal projects like the website, Frida gives her students a list of software which she believes are good and encourages them to use whichever one they are comfortable with. Mary equally prefers contemporary ways of teaching like using Tumblr and Twitter which helps her connect better with her students, as opposed to technologies like Facebook which she doesn’t use anymore, because in recent times it is “mostly used by old people.”
Other factors that influence instructors’ decision to use technology include their teaching philosophy and preference for using the technologies that they are familiar with. Some instructors believe “teachers only teach with technologies they are comfortable with,” and “perform better doing what they want, as opposed to what they are compelled to do.” Martha finds it “ridiculous” to state what teachers must/must not do with technology. She feels that teachers should be free to explore different kinds of software that are useful to their work, as opposed to being confined to use specific assigned technologies for class instructions. On this note, Frida added:

I feel like just over the last couple of years they've been doing a little better about giving us course shells and things to give us a little more structure going in. But that too has its advantages and limitations because if, if that course shell doesn't match what the ways that you're used to teaching, then you have to adapt your teaching style to the existing system. By implication, instructors use technologies differently based on their teaching styles and as initially seen, their preferences and desire to suit their students learning outcomes are all important considerations which they make.

“Technological divide” is a term used in this study to explain instructor’s decisions to use some technologies over others, based on how they categorize the benefits of using “new technology” vs “old technology.” At several points in the interview, instructors referred to students as “modern “because they are growing up in the age of new technology. In this case, it seems that their reference to this divide between technology is a way of marking changes in technology over time, from traditional print and alphabetic text to multimodal composing, which is in this case is a mix of audio, visual, textual, spatial and aural modes. Peter, who is an AI, wishes to improve his use of technology by making it better for the young students in his classroom. He believes that teaching “modern students” requires using modern technologies they can relate to. John who works as a TA for a professor in Electrical Engineering, said:
I've had professors that are like 80 years old that only use the chalk and the blackboard, which is fine, which is good... And then there are other professors which are young professors...that just use the projector. I think that there are advantages and disadvantages, disadvantages to each other. And then I, uh, based on those experiences, I ended up doing my own interpretation on what technology should be in the classroom. So, I pretty much use a mix of both, both technology and old school for certain classes... For example, I teach circuit, so we use circuit to analyze or something. And then in the whiteboard I do the old school stuff. So, I try to be balanced in that aspect, but I still use technology every day in the classroom.

John finds it important to have a balance between the new technology and the “old technology” which in this case is the whiteboard. The white board helps him to explain concepts in circuit, while the software helps students do more hands-on work. John’s example marks instructors’ thoughts about the uses of both new and old technologies, given that they incorporate both kinds of technology in their specific functions. Frida found it useful to make herself available to her students by using “youthful and contemporary technologies” which puts her closer to their level.” She added “so I think that kind of disrupts the hierarchy of the classroom and therefore they are encouraged to call me.” Instructors were also of the opinion that students follow guidelines of how to use software more easily because they have some prior knowledge of how to use the web and are already acquainted to some of these technologies.

3. How Instructors learn to use technology

Noting that majority of instructors have several years of experience at this institution, with the least being 1 year and the most being 8 years, their challenges using Blackboard, which is the main course management system at this college, as well as the other technologies which they incorporate in their classes is worth paying attention to. In this light, it makes sense to note that fewer instructors identified themselves as advanced users of technology, while majority of them selected the category “intermediary.” Also, as discussed in part 1 of this chapter, 38 instructors said they were aware of the technologies required in their functions as AIs or TAs prior to enrollment, while
40 of them said they were not aware of these technologies. So how then did instructors learn to use the required/necessary technologies? Interview findings reveal that instructors learn how to use technology in four ways: self-help, collaboration, previous knowledge and institutional support.

**Self-Help**

The majority of instructors in this study indicated that they learn to use and integrate technology into their functions while on the job by “hunting” to find new things, “exploring,” “figuring things out” “messing around with it,” “trial by fire” and by “self-research.” What most of their responses and relative explanations indicate is that learned to use technology on their own. Some instructors like Martin, who had no previous knowledge of what technology he would need as a TA, said that he was accepted into the program based on his Engineering credentials.

> So before working it was just like you applied, they didn't even ask if you knew Blackboard or if you knew any of it where you just applied and got hired. In my case, just based off of my engineering credentials. And then it was kind of trial by fire for the technologies in blackboard, you learned as it burned.

John learned on his own, giving reasons that “there was no like official training, like it was literally just getting thrown in the deep end, you know, whenever I started TA, it's just a matter of like, okay go enter these grades.” Peter confirmed this by recounting his own experience “It was just they give you your syllabus, they give you the labs and then you read it, you go and look for the things that you need for the lab, you out them there and then that's it.” John’s experience also reveals that he worked with professors who couldn’t assist him with how to use the required technologies.

> I learned on the job basically. So, uh, as far as technology goes, most of that was, was done with where I'd be working with professors and they didn't know, maybe how to do this or
that with Blackboard and they'd asked me and so I would just tinker around in blackboard and figure things out.

These narratives reflect common challenges experienced by instructors in the Colleges of Engineering and Science. They train themselves to assist their professors in grading, conducting labs, tutoring and other specific roles assigned to them. Some instructors like Joseph, indicated that he became an instructor “by accident” because his professor was retiring, and so “abandoned” the class to him. He took up the task of learning things by himself.

Instructors in the College of Liberal Arts who are fulltime AI’s also had similar experiences. For example, Carina who’s an AI started teaching based on her qualifications as a professional writer, she had “no training and no preparation” to teach with technology. Carina said, “They gave me the book prior, one week prior for classes to start and I started teaching… and so it was more, you know, research on my own.” Most of the AI’s also specified learning how to use majority of technologies on their own. As Mary said “I taught myself and so I don't struggle now, but I certainly did in the beginning. It was just kind of hit or miss, like those poor students my first semester and they were like my little Guinea pigs (laughs).” Most instructors in these departments learned by using Google and watching YouTube videos to have a basic sense of how to teach visual argument projects in their classrooms. Some instructors also added how they got to know some of the required technologies, not exactly how to use them.

I guess as a master’s student we were asked to tutor at the writing center and then we were asked to shadow, um, or maybe not shadow but absorb, observe another teaching, of a more experienced instructor and then after that we were just kind of on our own and so we had some support but we learned kind of as we went along. So, we watched, and we tutored and then we watched and then we went out there and did it on our own.
Students in Rhetoric and Composition agreed that having this form of orientation gave them an insight of how AI’s teach in the classroom. This is a helpful approach to get instructors acquainted with necessary pedagogical practices, but not technological practices. For as Mary further indicated:

The unfortunate part though is that we're expected to know what will need in the classroom and so we're supposed to not only master it ourselves but then make sure that our students can. Blackboard is not a friendly user face and more than that, like we're supposed to ensure that we teach them how to use it as we want them, but we don't ourselves know what it is that we exactly want from the technology

These instructors’ experiences indicate a lack of technological skill set necessary to facilitate their functions. Ben’s perspective shed more light on non-resident student’s expectations of the program and what challenges they experience having to teach with technology.

It was more of an adventure and teaching yourself because uh, I come from a country where in my undergrad, we don't really use technology per se, like how to use it. You don't have to go to class with your laptop. The teachers use the traditional means of teaching, dictated notes and all those, except when you're doing your final research that you have to, you have to use computer to type...so It was, it was pretty strange for me that I just came into the technology and uh, I did not get the kind of training I expected. I expected that probably they would evaluate my knowledge of technology and maybe help me, like drill me on how to use these, not just for myself but for my teaching, but that, that was pretty absent, and it was just like a requirement. So, I had to learn it myself and do whatever I had to do but, I will consider myself now as a pretty advanced with the use of teaching using technologies. And I will say 95 percent of that is self uh ...self-learning, then the other five percent is maybe one or two orientations.

Besides having no prior knowledge of technologies from which to draw upon for his teaching, Ben’s expectations of being “trained” or directed in this regard was not met. Another salient point from his response is his expectation to know how to use these technologies not just for himself but for his teaching. This speaks volumes about the importance of having instructors well versed with
their pedagogical practices, as their failures do not only rest upon them as individuals but are far
binding on the students they teach and work with.

**Collaboration**

Another recorded means through which instructors learn to use technology is through
collaboration. When in doubt or unsure of what to do, they ask their “tech savvy friends,”
colleagues and professors. Learning from professors was an option mostly given by TA’s in the
Colleges of Engineering and Science. Although they were told of the technologies needed for their
tasks, they were not shown how to use them. Sandra happened to be the only instructor who
“learned step by step how to use Blackboard for uploading and grading assignments” by her
advisor. Other AI’s like John, in the Rhetoric and Composition program learned from his friend
how to use tools for student’s multimodal assignments

Adobe Spark tool was something I learned from Freddy actually. He was presenting on it
at a university. And I found that to be very helpful, especially when I had to make my
students do this psa project where they had to make videos and all that. And I think that
that was something that really helped me overcome the instructional gaps or ...I mean…the
kind of problems I would have uh… you know playing around with technology in terms of
making my students do these uh multimodal projects. I think adobe spark was pretty
helpful.

Besides learning from colleagues personally or at conferences like John did, Janet learns by
attending several campus workshops that she believes offer training she’s in need of. If for any
reason she can’t make it to the training, she asks to meet the instructor personally, so she can get
assistance on a one-to-one basis. She added, “I think you need to go search if you want it, just like
we ask our students.” Unlike other instructors, she emphasizes the need to create time and actively
seek assistance from skilled personnel. Brenda shared a piece of advice from her “tech-savvy”
friends, which she has long held-onto.
I have a lot of friends that are a lot more tech savvy than me. And um, one of my friends who's a tech support guy told me one of the best ways to learn any software program is to just start pushing buttons and see what happens and you know, and I've taken that advice to heart through the years and it's helped me, you know, because I feel like as intelligent people, we do have that ability to try something and see if it works or no and I also learned a certain such skills with, from, from some of my friends in the cohorts.

As Brenda indicates, most of the instructors in this study learn by “pushing buttons,” regardless of how they first got acquainted with the kinds of technologies they ought to use. Others like Bill in the History department were able to sign up for a Blackboard Institute workshop in the summer because his wife who is in another department told him about it. He seemed pleased with the assistance he got from this workshop because it met his need of learning to teach online. Vanessa, who attended the same workshop, felt she was in the wrong place. She wanted some specific information about Blackboard, which she didn’t get from the institute. Their experiences suggest some issues in the way the information about the workshop was circulated. Who was invited to attend the workshop? What was the workshop about? These questions examine why Bill did not get the invitation, or why Vanessa wasn’t sure about the details of the workshop before attending.

Having personally attended this workshop, which I found very useful because I was preparing to teach online, I also asked the same questions. I was encouraged to attend by a colleague who had previously attended the workshop. I wondered why a workshop of such good use (at least for AI’s in the Rhetoric and Composition program) was restricted on only 20 participants. I wondered why not many people knew about it. I felt this would have been helpful to me in my first semester as an AI. What’s more, I thought it was very practical given that it lasted for three days, and we learned to do different things each day.

**Previous Knowledge**

Considering that all instructors who participated in this study are PhD students, as afore-mentioned, it is understandable that some of them transfer knowledge of how to use technology
from their previous institutions and perhaps previous work as MA graduate instructors. A good number of participants learned to use technology from their previous college, although the technologies required varied. For example, in Benson’s previous college, they used Canvas as a course management system. Although he felt this system was more user-friendly than Blackboard, some previous knowledge of how to operate it was helpful in navigating Blackboard. One instructor recounted her experience learning from her current institution, when she was enrolled in a different program at the time.

It was in the other programs. So, uh, as I say they would do, they would maybe do like two or three things and they will invite the person from blackboard to just practice those three items. So I think that was effective because it was not overwhelming and it was not like the blackboard academy that requires a lot of hours so that, that would be very specific and according to the needs of the program, you know, like if the program values, for example, the record book, so that person would come and just focus on how to keep the record book in the Blackboard or how to create groups or how to do some other things depending on the level. So, I think that was effective just in a couple of items and like maybe only 30 minutes during that day of meetings and trainings and things like that. But it might be different for the program like this one, which is so big.

The kinds of experiences which instructors had from their previous institutions/programs varied but was in all helpful towards their current use of technology in their specific functions. Some learned from workshops while others learned from departmental programs.

**Institutional Support**

Institutional support was also one of the ways through which instructors learn to use technologies. This means however, didn’t stand out as a major source of learning for majority of them. Instructors learned through workshops organized by Academic Technologies, such as the Blackboard Institute, and in-class technology assistance from campus IT services. They also had departmental support as was the case with Sandra and Martha. For example, Sandra’s department (Geological Sciences) organizes “informal group sessions” where instructors meet to discuss the
technologies that they would have to use in their classes in the upcoming weeks. For Martha, in her department, they have “comp camp” orientations where new graduate instructors are introduced to the program and all their specific requirements.

Yeah, a little, we only did a little in comp camp and we got a little through Academic Technologies and a little through required workshops. So, a little, little bits and pieces here but not like a system or a course or anything, but we did get bits and pieces.

In all, based on data collected in this study, instructors learn to use technology more by self-research and collaboration than they do using previous experience and learning from campus workshops and other institutional assistance. This finding questions effective institutional support to instructors as far as teaching with instructional technologies are concerned.

4.3 Recommendations for improvement in technological literacy

Finding recommendations to challenges which instructors experience was one major objective of this research. Based on their individual experiences and the collective challenges recorded in his study, this section documents a few of the many comments/recommendations which were given by graduate TA’s and AI’s in different departments regarding the technology support which they receive from the institution. According to Peter,

The workshops are not based on the needs of the participants, like me for example. So, like as a participant, I still remember how I felt while the workshop was going on uh, I wouldn't call it a workshop in the way we understand workshop, in workshop, participants are supposed to get engaged in the work. It was a presentation and it was one-way traffic, just showing things without paying any heed to the participants. So, I didn't find it effective at all.

Peter didn’t think the workshop was effective because he didn’t have a chance to carry out hands-practice of what he was being taught. Quoting from language theorists and educationists, he explained that in every class, there is a need for a presentation, practice and production. To him, campus workshops “begin with presentation and end with presentation, there is no practice or evaluation of what the students learn.” To this effect, he made the following recommendation:
First of all, as I told you earlier, before any kind of workshop is organized. We have to have the need analysis. For example, from our department (Rhetoric and Composition), I'd be interested in any kind of technology and if so, what are they? and what kind of class would you want there? Do you want just to listen to the presenter or do you want the presenter to walk you through the process at the speed of the learners? Not at the whim of the presenters. That's why most of the workshops are not effective for people who really want to learn. I'm really concerned, and this has been a very, you know, I would say that there's not a good environment for that part...for really needy people.

Peter’s recommendation echoes other instructor’s expectations for what campus workshops should look like. Workshops should be tailored towards specific instructional needs like taking into consideration those who have “no knowledge of Blackboard, some knowledge of Blackboard or a lot of knowledge of Blackboard “because sometimes they assume that instructors have a basic knowledge of it, which on the contrary makes them “zone out” during the session. Martha adds,

I think it's necessary and it's clunky and that's technology grows and gets better, but I do think that they need to... Somebody somewhere needs to understand that, you know, earlier in the semester we need to kind of have some training that is suited for those of us that indicate "yes I can set up folders and items for example.. but I want to know how to make sure that these quizzes release on this day at this time and that they, you know, the answers are jumbled and you know, they can't cheat or would" You know...Those are more advanced questions and so they do need to offer something better for us as we get better as opposed to the same tired workshop's over and over that are required. Which is also a time suck for us when we could be learning something else.

Martha suggests that identifying instructors’ need earlier on in the semester, together with creating workshops based on a need analysis would be more helpful. The frequency of these workshops and follow-up sessions for assessment, should also be taken into consideration to evaluate instructors’ use of the technology and possibly examine where they are lacking knowledge. Also, workshops could also be organized by departments considering that they all use different technologies and have different instructional expectations from their AI’s and TA’s.
For example, with regards to the comp camp, organized by the First-Year Composition program, Ben recommended that the department could partner with Academic Technologies to have someone show instructors how to use Blackboard, as opposed to “informing” them that they will have to use Blackboard. In other words, instructors could practice using Blackboard, in the same ways that they are tested on their ability to create documentaries during their first–semester departmental orientation. Testing composition instructor’s knowledge of how to create documentaries is such that they can explore how to do use these technologies and be able to teach students to use them. However, Ben argued that assignments such as the documentary would be more effective if instructors are showed how to do it practically as opposed to doing them as take-home assignments, where they could seek extra help. Mary, who thought this was a great suggestion also suggested that it would be good to have a one week “crash course” on Blackboard as well as on other technologies to be used by instructors.

Without putting all the responsibility of honing graduate students’ instructional needs on campus workshops, instructors also identified that they equally have a role to play in learning and improving upon their technological literacy.

I learned it on my own. Well, I had help... and I think we need to take the burden off of the, uh, the workshop leaders, presenters. I mean, I think we need to take some kind of responsibility if we want something and need something, we need to go out there and you know, learn it and just like I needed to learn how to design a webpage, I mean, and if the workshop was not addressing my needs, then I, I went ahead and did it, made an appointment with Fernando and he was, he worked with me and showed me how to navigate it and then I was able to show my students now.

Surely it may be challenging to have workshops that meet instructors’ individual needs, but working by departments or some collective need, it can set the foundation needed to improve upon via self-research. To close the gaps caused by the tension/uncertainties of how to use certain
technologies, and to help students find solutions to problems that arise in the classroom, Brenda structures her class in a unique way from the other instructors.

She created a “quick tips” page on Blackboard which gives students guidelines on how to use technology. Then she puts students in groups and lets them ask each other questions. For “complicated” projects like the documentary, she asks her “advanced” students to assist, and to respond to students’ questions on the discussion board if they don’t find answers within the group, they make use of Academic Technologies and librarians and if they have no solution then they can email her. Setting up her class this way helps students with their use of technology and facilitates collaboration between them. It also prompts them to value seeking assistance from external sources, and to do self-research. Also, the importance of dedicating time at the start of each semester to carefully think through which technologies would better assist students in different projects was emphasized. When asked what instructors wished they would improve their use of technology to teach or grade, Frida said:

For my students, um I wish that when I first started teaching with technology that I would have dedicated time, and this is hard to do as we were also students ourselves, right? But I wish I would have dedicated the time myself to have a better idea of what I wanted to do with some of the technology, twitter and Tumbler in particular. And I wish that I would have, um, taken the time to learn it and maybe create those very thorough examples where I could say, well, this is what a website should look like, or these are what your tumbler post should look like, well because the first time around when I taught with those technologies, we were empty. We were just kind of like… well let's see how it goes

In line with this, Mary stressed on the need for instructors to find meaningful and engaging ways to teach students. This could be by talking to them face-face, using technologies that facilitate instant communication and having a structured layout on blackboard that really explains things well.
4.4 Role of Assumptions in Pedagogy

The place of “assumptions” in pedagogy cannot be overlooked in this study. Instructors’ responses indicated a crucial role which “assumptions” have in using or teaching with instructional technology. Instructors make assumptions about what technologies students know how to use in the classroom, while faculty and campus support systems make assumptions about instructor’s level of preparedness to teach or work with certain technologies. It is important to consider these assumptions because they alter students effective learning processes, and instructors’ ability to function fully in their roles. Kelly’s comment below reflects how instructors make assumptions about students.

I used to assume that most of my students knew Microsoft, at least Word, but I have sometimes been surprised at what they don't know. Um, and also, you know, with the international students, sometimes their experience of the interface will be different. They come from different locations and so I feel like particularly in teaching freshmen, there's a lot more of an obligation for me to make sure that they do understand the technologies and, and fortunately there's been enough similarity with Google documents and Microsoft word now that if they know one, they can adapt to the other. Um, and I assume that they can navigate their way around the social media. Sometimes that helps their understanding, um, but um, with other technologies, especially when I teach second semester composition. When we start doing like iMovie, that's been one of the biggest challenges for students to learn how to do movie making. That's the whole, you know, even for me that's been a tech challenge.

Other technologies which instructors assume students know how to use include PowerPoint, excel, Google Earth, I clicker and McGraw Connect. They have sometimes been “surprised” to find that some students do not know how to use Google Docs. Instructors do not assume that students know how to program codes or do multimodal assignments because of their more “advanced requirements.” This finding highlights a possibility that instructors assume that students know how to use the technologies that they are comfortable teaching with, and that students have trouble using technologies which instructors are not very versed with. That is, when instructors feel challenged to use certain technologies, they assume students would have similar challenges and
vice versa. By implication, instructors use their technological literacy level as a scale from which to measure their students’ knowledge.

Such assumptions whether true or false, limit instructors from fully examining students’ technological needs to assist them in the best ways possible, and to know which technologies would be most effectively integrated and used by students in their classes. For example, teaching with the assumption that students know how to use a certain technology, when indeed they do not, hinders effective pedagogy and vice versa. Similarly, when university personnel from the Academic Technologies office assume that instructors know how to use certain technologies, it also paralyses their learning processes. Like a few others, Martha’s comment reflects this below:

And then we took that class to be able to teach online and that was given all online. But that’s also giving the assumption that you know how to operate within the Blackboard shell effectively to be successful in the online class. You know, and by that time I was, but if I would’ve taken that, you know, my first year as a master's student, I think it would have been very overwhelming, because I didn't come from RWS you know, and so it was, all concepts were new, the technology was new, the people were new, the department was new. So, I do think that, yeah, give us a little bit more time. It would have been helpful.

Close to Martha’s experience is faculty’s assumption that graduate instructors are prepared to teach with technology or can learn things on their own, and so they provide little or no technological assistance to them at the start of their duties. Overcoming assumptions means taking a step back to carefully assess and evaluate students and instructors to better understand their needs. On the part of instructions, it is making a conscious effort to teach students the way they expect the institution to assist them—conducting a need analysis, teaching step-by-step procedures for technologies that they require students to use. It is giving students some basic knowledge and allowing for practice and evaluation of how they use these technologies. Instructors wish that they can improve in the following ways:
Um I think for myself, I would, I would begin the class trying to get a better handle on their level of ...their level of knowledge about the technologies that we intended to use and try to, um, take then tailor the use of those technologies through the semester to kind of where they all stand. So that I wasn’t just making an assumption about, um, about their skill set, um, you know, positive or negative and you know, maybe some type of kind of, uh, you know, introductory, uh, example in introductory type little project in adobe illustrator and see if they can do the most basic functions in that program and then if they can, great and we can build off of that. But if they can’t, then I know I need to start from the very beginning. Um, and not assume, you know, through halfway through this, assume until halfway through the semester when they come to me and tell me they can’t, um, you know, that they’re having trouble with it.

As explained in the excerpt above, examining students and instructor’s base knowledge of technology rather than assuming what they know or do not know, is a good starting point for ensuring that they learn to use their required technologies efficiently. To effect good pedagogical practices, instructors, faculty and other support systems need to feel more obligated to understand how technology is used and make more effort to meet their needs.

Thus, as seen in this chapter, in response to the research questions, findings to survey and focus group interviews conducted in this study had very similar results. The interview data provided more detailed explanations to participants’ responses in the survey. The survey which comprised of a greater number of participants in this study, showed that although most instructors learned to use instructional technology from their colleagues and self-research, they categorized themselves as “intermediary” users of technology who felt adequately prepared to teach with technology. However, their unpreparedness to use this technology knowledge for purposes other than their instructional functions was worthy of note. More on this gap between instructors’ knowledge of technology and use of technology shall be discussed in the following chapter.

The focus group interviews explained instructors uses and critiques of the Blackboard course management system, examined how instructors learn to use technology, together with factors that influence instructor’s decision to use instructional technologies and lastly offered
recommendations for improving instructor’s technological literacy. Unique to this interview data, was the finding that non-resident instructors identified themselves as “advanced” users of technology. Discussions on this are also presented in the next chapter. Chapter five of this study pulls together salient findings from this data and provides a discussion of analysis in line with the theories on which this study is grounded. It also provides recommendations to the challenges faced by instructors and opens spaces for further research.
Chapter 5. Fine – Tuning Graduate Instructors’ Technological Literacy

5.1 Overview

This last chapter offers a summary of the purpose for this research and shows how multi (modal) literacy theories and the TPACK framework (technological, pedagogical and content, knowledge) which were used as theoretical underpinnings for this study and discussed in chapter 2, foster a better understanding of instructors’ technological literacy. It also summarizes the research methods and offers concluding notes on findings to the research questions guiding this study. In doing so, it pays close attention to the following key notes from the research findings: (I) graduate instructors’ technological literacy, (II) barriers to technology integration by instructors and (III) recommendations for a more effective technology integration by graduate instructors. This information reveals how research results both validate and differ from the extant literature on technology integration in pedagogy. This chapter closes with comments on the research limitations and a presentation of salient and unique contributions from this study that open spaces for further research.

5.2 Research Summary

This research critically examined graduate instructors’ technological literacy as teaching assistants and assistant instructors across disciplines in a four-year university. Teaching assistants’ responsibilities at this school entailed grading student papers, conducting labs, proctoring and occasionally assisting to teach classes in their respective disciplines, while assistant instructors were charged with the responsibility of working as full-time teachers for undergraduate courses. Mindful of the usefulness of technology in education and other spheres today, and its constant advancement, these instructors were faced with the task of knowing how to effectively integrate technology into their functions. Technological literacy in this study referred to instructors’ ability
to use technology for effective instructional purposes (Selfe, 1999). The notion that technological literacy is influenced by ideological, social, historical and cultural factors (Selfe & Selfe, 2002) such as instructors’ perceptions and beliefs on how to use technology for their classes and instruction was also examined. This research also considered arguments that non-resident graduate instructors are more likely to be ineffective at integrating technology into their work as resident graduate instructors.

Drawing from the extant literature on this topic, it was noted that instructors found it challenging to integrate technology into their functions for reasons such as lack of skills, training, ineffective campus workshops, not enough institutional support, unfamiliarity with a technology-supported pedagogy, the divide between digital natives (people who grow up surrounded by digital technology) and digital immigrants (people who “migrate” into technology later in life) otherwise referred to as the gap between the “technological haves” and “haves-not.” Other social factors like individual values and preference for one technology over another also hindered instructors’ effective use of technology. These varying challenges faced by instructors exemplify what Rittel and Weber (1973) term as “wicked problems” of technology use. That is, problems which have no fixed solution because of the inconsistent, complex and evolving nature of technology. Given all these contentions, the purpose of this research was to better understand how graduate instructors integrate technology into their functions.

This project’s inquiry was deeply rooted in my personal experience as a non-resident instructor who started teaching a college-level writing class with very little instructional technology expertise. Observing that the other instructors (both resident and non-resident) experienced similar challenges like myself, I felt the need to explore this issue further. One consideration for doing so was to examine if resident instructors are more likely to effectively use
technology for their functions than non-resident instructors are. However, to arrive at the root cause of these challenges experienced by instructors, this research also examined some potential causes for graduate instructor’s inefficient use of technology. In this light, the research questions for this study broadly explored the technological literacies that institutions expect graduate instructors to bring to the classroom, if these expectations are the same across disciplines, and the usefulness of technological literacies which graduate instructors bring to their functions. It also employed a positive deviant approach to examine how graduate instructors with low or deficient technological literacies manage to become proficient without access to special resources, and paid close attention to the “hacks” which they use to navigate obstacles.

5.3 Research Findings

This section summarizes salient findings of this research study, specifically in response to the research questions.

- What technological literacies do institutions expect graduate instructors to have prior to their enrollment in the university? Are these expectations the same across disciplines?

The findings for this study suggest that across disciplines, most graduate students were unsure of institutional expectations for their technological literacy. However, they had some knowledge of the technologies required for their instructional functions. Most instructors acquired knowledge of how to use these technologies from their colleagues and friends. Other sources of information included institutional training workshops, self-training, advisor training, TA meetings, previous knowledge, education classes and listserv emails.

Also, over half of the population of graduate students had no prior awareness of the technologies they needed to work with prior to their enrollment as AI’s or TA’s. The difference between this population of graduate students and those who had knowledge of instructional
technologies prior to their enrolment was less by three people. So, it can be said that the difference between instructors who had prior knowledge of technologies the institution expected them to use, and those who didn’t, was close to even.

- What technological literacies do graduate instructors bring to the classroom? And how useful/not useful are these literacies in facilitating pedagogy?

Research findings revealed that most graduate instructors had proficient knowledge of Google search tools, Microsoft Word, Google Docs, Google Earth and YouTube. Some instructors had prior knowledge of how to use course management systems like Blackboard, which is the main instructional technology at the institution where this research was conducted. While this knowledge was useful in facilitating pedagogy and other TA functions, most instructors reported having difficulties using Blackboard and other course specific technologies like Kahoot, I-c linker, Weebly, Wix and iMovie.

Despite the challenges that instructors had using Blackboard, most of them (26.90%) integrated this platform in their functions. Those who used YouTube for assistance made up the second majority of the population (23.35%). Other technologies which instructors found useful and sometimes used as easier alternatives to Blackboard were I-c linker, Dropbox, Tophat, McGraw-Hill Connect, Cengage, MATLAB, Blackboard Reef, Twitter, Google Earth, Microsoft Excel, Adobe Illustrator, Canva, Prezi, Tumblr, GitHub and Moodle.

- Are there any graduate instructors who enter with low or deficient technological literacies but who manage to become proficient without access to special resources? What are some of the “hacks” that students use to navigate obstacles? And how can these be adopted by other students in similar situations?
According to research findings, most instructors (62.22%) had “intermediary” (efficient or good enough) knowledge of how to use technologies for their functions, while a second majority of them (24.44%) identified as “advanced” (expert) users of technology, with the least population (13.33%) having little knowledge of how to use technology. Moreover, more than a third of the graduate instructors (37.50%) had adequate training prior to using technology in their roles as AI’s and TA’s, while (31.82%) of them had no adequate training, and 30.68% of them said “maybe” which means they were unsure about their knowledge of the required technologies.

Although most instructors indicated having intermediary knowledge of how to use required technologies, 72.13% of them felt challenged teaching with these technologies, as opposed to 27.87% of them who felt challenged using these technologies for personal purposes. This data revealed the presence of few instructors with low or deficient technological literacy and showed that majority of instructors had challenges integrating technology into their functions.

Findings also indicated that most instructors “hack” through obstacles they experience mainly by doing research on Google, collaborating and learning from their colleagues. Other means of learning included YouTube, campus IT services, campus workshops and departmental technology workshops respectively.

- Are non-resident graduate instructors likely to use technology across majors in similar ways to resident GTA’s/AI’s?

Contrary to other scholarly findings in the literature on non-resident graduate student teaching and use of technology, results of this study showed that non-resident and resident graduate instructors use technology in similar ways. In the focus group interviews, all 10 instructors (resident and non-resident) identified as “intermediary” users of technology. Only 1 of 7 resident instructors specified having “advanced” knowledge of technology, while 4 out of 9 non-resident instructors
had “advanced” knowledge. So out of 5 instructors with “advanced” knowledge and use of technology, only 1 was a resident instructor. The results showed that although most graduate instructors in this study are intermediary users of technology, there were more non-resident graduate instructors with advanced knowledge of technology. Worth noting is the fact that all instructors (both resident and non-resident), regardless of their technological literacy, faced challenges integrating technology into their instructional functions. The gap in knowledge of technology and use of technology shall be discussed further in the implications section below.

5.4 Theoretical Framework

5.4.1 Multi (modal) Literacy Theories
This section shows how multi (modal) literacy theories and the TPACK framework (technological, pedagogical and content, knowledge), which were used as theoretical lenses for this study, allow for a critical look at instructors’ technological literacy. The theory of multimodality, which acknowledges the use and interaction of multiple modes such as video, layout, gesture, speech, images and alphabetic texts in pedagogy accurately described instructors’ pedagogical decisions. A major claim about multimodality in this research was that multimodal theories should not be limited to the field of rhetoric and composition but should also be applicable to other disciplines because teaching and grading in this modern era is first and foremost a multimodal activity. This claim is backed by the fact that all graduate instructors in this study used more than one of the modes mentioned above for their instructional functions. However, these modes were used differently across disciplines because of the different course contents and technological and pedagogical expectations of these courses. For example, while students in Rhetoric and Composition used software like iMovie and Weebly for student’s visual assignment projects, others in Engineering used software like Kahoot to facilitate course instruction. Regardless of the
differences in the software, they all employed multiple modes such as visual, textual and gestural. Arguably, the practice of teaching is multimodal, given how it combines speech and gestures along with other techniques used by the teacher. This argument aligns with Kress and Van Leeuwen’s (2002) position that modes can be “can be operated by one multi-skilled person, using one interface, one mode of physical manipulation” (p. 2).

The theory of multimodality was not only helpful in pointing out semiotic resources employed by instructors in their functions, but it also showed how (in)effective they were in using multiple modes for their functions. For example, an assessment of instructor’s knowledge of technology showed their inability to combine certain textual and audio-visual modes for class instruction and grading. Such lack of knowledge exposed the need for instructors to recognize how their instructional practices fail to incorporate web 2.0 tools. Moreover, it confirmed the concern put forth by Doering et al. (2007) that instructors need to think “multimodally and semiotically” in ways that allow for critical planning and preparation of how to use different media for their functions. As the research findings suggest, multimodality has a major function in college-level curriculum especially considering that it is practiced by all instructors. Instructors have a major role of directing how multimodal practices are introduced and used in their functions. Selber’s book *Multiliteracies for a Digital Age* details some ways through which instructors can better harness their multi(modal) literacies.

Selber (2004) reframed the idea of what it means to be technologically literate by emphasizing the effective integration of technology into curriculum by teachers and students. His categorization of multiliteracies into functional, critical and rhetorical literacy are useful in interpreting some data in this research in very specific ways. For example, findings of this study showed that instructors use technology in very functional ways – in ways not deeply integrated in
a careful reflection of course content and related pedagogical practices. Instructors preferred to integrate some technologies over others in their course work because of their comfort levels, and not necessarily because they carefully considered how it impacted their teaching style. In doing so, they also placed students as consumers of technology as opposed to helping them critically think through their interactions with technology. Such issues, which commonly fall under the umbrella of “constraints,” are deeply ingrained in instructors’ decision making-processes (Selber, 2014). As Selfe and Selfe (2002) argue, “if students cannot design, author, analyze, and interpret material on the web and in other digital environments- they may be incapable of functioning effectively as literate citizens in a growing number of social spheres” (p. 642). What these scholars emphasize is that to be a “literate citizen” goes beyond pressing keys, to understanding and questioning how to manage obstacles when using software and hardware applications (Selber, 2014). Instructors and students should both be equipped to negotiate their technological practices in strategic ways. However, until instructors are equipped to do so, students would remain limited in how they use and interact with technology.

In this light, multi (modal) literacy theories were also crucial in highlighting how important it is for institutions to test, assess and support graduate student’s technological literacy in the best possible ways. This is exemplified by Selber’s (2004) model on “systemic requirements for change” in integrating technology into curriculum. Selber’s model supports change in technical, pedagogical, curricular, departmental and institutional contexts. At the technical level, he argued that considerations be made for student’s local standards which they encounter in their curricular experiences. Courses which help students gain-hands on experience working with software that creates audio and visual projects are essential to their technological literacy (Palmeri, 2012). With
regards to this study, understanding instructors’ technological literacy levels proved to be one way through which institutions could better offer support in areas where they have trouble.

On a pedagogical level, Selber (2004) called on instructors to be “courageous enough to experiment with technology in the classroom, even if that experimentation makes them rather uncomfortable” (p. 199). For students to learn how to “reason rhetorically, creatively, and analytically; collaborate productively; locate and assess information; and communicate information clearly and persuasively to different audiences” (p. 200), there is the need for instructors to become co-learners in instructional activities” (p. 201).

As examined in this study, instructors served as co-learners of instructional activities by constantly trying to improve their technological literacy. When challenged, they resorted to finding help online, asking their colleagues and attending campus IT workshops. However, to be co-learners of instructional technology, Selber (2014) insists that instructors need to be responsible for shaping the literate practices of their students. “It is not enough for them to learn how to analyze the persuasive effects of images and sounds; instructors must also gain extensive experience with composing persuasive multimodal texts for diverse audiences and purposes” (Palmeri, 2012, p. 157). Instructors’ active involvement in technology education and integration ought to expose students to the “chameleon-like nature of computers” (Selber, 2014, p. 211). They ought to help students manage the constant and evolving nature of technology and show some flexibility in replacing technologies in their courses with more modern and efficient ones.

Regarding departmental and institutional support, Selber (2004) argues that “teachers, program administrators, department heads, and upper administrators should all sincerely believe that the dominant approaches to technology education on campus are impoverished, if not harmful, and that humanist perspectives can help a university construct better alternatives” (p. 226). So like
Palmeri (2012) adds, “if faculty are to prepare graduate students to study and teach alphabetic writing as a multimodal process, then it is imperative that they offer them numerous curricular opportunities to employ visual and auditory strategies of knowing in order to invent and revise their scholarly work” (p. 152). This call for institutional support echoes instructors’ request in this study, for more focused and hands-on departmental technology training. Selber’s (2004) five-fold model on “systemic requirements for change” and arguments put forth by other scholars like Selfe and Selfe (2002), and Palmeri (2012) are important factors which when considered, would boost instructors’ technological literacy in remarkable ways. Technical, pedagogical, curricular, departmental and institutional support are all valid factors put forth by Selber (2014), which have potential to advance instructors’ technological literacy in this study. Suffice it to say that, the theory of multimodality and multiliteracy theories were important foundations upon which instructor’s technological literacy was examined.

5.4.2 Technological Pedagogical Content Knowledge (TPACK)

The TPACK framework by Mishra and Koehler (2006) was also important in the analysis of this research data. As explained in chapter 2, the TPACK framework was designed to better evaluate instructors’ technological, pedagogical and content knowledge, and to critically observe how these areas interact with each other in the design of curriculum. The diagram below is a representation of the TPACK framework.
Given that this study focused on the technological literacy of graduate students, key areas used from this framework emphasized instructors’ use of technology and how they adapted and combined this knowledge with their course content and pedagogy. Thus, using the TPACK framework, emphasis was placed on instructor’s technological knowledge (TK), technological content knowledge (TCK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPACK). Other components of this framework such as pedagogical knowledge (PK) and content knowledge (CK), were addressed rather passively as the focus of this study was not to examine these areas.

The TPACK framework enhanced an understanding of how instructors use and integrate technology in teaching and grading. As exemplified by these research findings, some complexities existed in the connection between instructors’ knowledge of technology and their ability to
integrate technology into pedagogy. Instructors noted that they could use technology for personal purposes but felt challenged integrating these technologies into their teaching. This experience revealed a complex interplay of instructors’ technological, pedagogical, and content knowledge (TPCK), as illustrated in the diagram below.

![Diagram showing the disconnect between Instructor’s TPACK Knowledge Components](image)

**Figure 5.2:** (Dis) connection between Instructor’s TPACK Knowledge Components
(Modified to represent findings for this study)

In the diagram above, the disconnect shown by the detached rather than overlapping TK circle shows that instructors in this study do not mesh content, pedagogy and technology in instruction, but rather add technology into already existing content and pedagogical structures. That is, they do not equally consider technology knowledge in the planning, preparing and actual delivery of course content. Unequal knowledge in all these content areas, especially noted by instructors’ lack of technology knowledge has implications for how they design their course content and their teaching style given that expertise in one content area with little or no mastery of
the other content areas leads to ineffective instructional practices. As seen in this case, the
disconnection between technological, pedagogical and content knowledge affects connections in
other content areas such as technological pedagogical knowledge (TPK) and technological content
knowledge (TCK). For example, classes where instructors have a good mastery of the course
content, with limited knowledge of pedagogy makes the instructional approach a content
dominated one. Alternatively, courses where instructors have more knowledge of pedagogy than
content makes the instructional approach a pedagogical dominated one. For instructors to
effectively integrate technology in coursework, they need to have a good mastery of the three core
sources of knowledge (technology, pedagogy and content) and fully understand how and why these
knowledge sources need to interact (Koehler & Mishra, 2008; Mishra & Koehler, 2006).
Understanding the interactions between these bodies of knowledge would enable instructors to
integrate technology in more useful and authentic ways. Also, although instructors’ content and
pedagogy knowledge were not individually assessed, findings on how they integrate technology
into pedagogy revealed that they had good knowledge of their course content and understood how
to teach it to students – implying that they understood the relationship between pedagogy and
content knowledge (PCK).

The TPACK framework was also beneficial in uncovering instructors’ professional
development experiences, as well as the necessary training and assistance that they required to
boost their potential. For example, that instructors’ request more departmental specific and
practical technology assistance showed that workshops ought to serve as areas where technology,
pedagogy and content should interact. Thinking of workshops this way also helps departments and
IT personnel to conduct these sessions based on instructors’ specific technological needs that are
situated within their specific course content and pedagogical strategies. These workshops ought to
be flexible enough to accommodate different teaching styles and philosophies. On this note, it would be even more beneficial to have IT representatives in different departments, so that they teach technology use with a better understanding of the given course content. Alternatives to this strategy would be as Selfe (1988) argues, that instead of giving the responsibility of making decisions about technology to the departmental “computer specialist” or chair, it would be important to “make computers an issue for departmental discussions and decision making” and “let computer decisions grow out of departmental goals and objectives” (p. 65). Doing so allows the department to use their goals and objectives to inform how they want technology to be used by graduate students, they can together also discuss about funding, costs, and other instructional needs which all this would entail. In all, rethinking technology support this way, is a good step for effectively developing instructor’s technological literacy.

More still, TPACK showed potential in strengthening old methods of teaching given that it emphasized the importance of meshing course content with pedagogical techniques well represented by technology (Mishra & Koehler, 2008). As seen in this study, instructors did not consider pedagogy, content and technology in their work. They relied heavily on content and pedagogy (PCK) as the main components of instruction. However, for curriculum to be balanced with sound technological knowledge, Harris and Hofer (2011) argued that instructional planning “must occur at the nexus of curriculum requirements, students’ learning needs, available technologies’ affordances and constraints, and the realities of school and classroom contexts” (p. 211). Instructors understanding of TPACK would improve with intense introductory courses which address technology, pedagogy and content knowledge, and their intersections. Introductory technology courses, have however, proven to be useful platforms for introducing technology to instructors (Shin et al., 2009; Schmidt 2009). It goes to say that traditional methods of teaching
would be strengthened with proper technology orientation for instructors because of its potential to make them critically think through the importance of meshing technological, pedagogical and content knowledge and carefully make decisions about how to integrate technology into their classes.

5.5 Implications of Research Findings

5.5.1 Technological Knowledge of Graduate Instructors

According to the research findings, prior to their enrollment, most graduate instructors (AI’s and TA’s) were not aware of the technologies required for their instructional functions. The absence of this knowledge has several implications on their level of preparedness to integrate technology into their work. First, it is telling that technology is considered as an “add-on” device, rather than a tool necessary to enhance effective instruction (Koehler & Mishra, 2014). Secondly, instructors do not possess technological, pedagogical and content knowledge because they learn to use technology in ways quite unconnected to the subject matter they are teaching (Niess, 2005). Having technological, pedagogical, and content knowledge means that instructors understand how technology, content and pedagogy relate and interact with each other. Considering this reciprocal relationship should entail properly preparing to use these technologies prior to their functions and carefully identifying what technologies would best benefit their course content.

This notion is confirmed by the finding that instructors have less knowledge of how to use technology for teaching and instruction, than for other personal purposes, even though majority of them identified as intermediary and advanced users of technology respectively, with over 3 years of working experience. Knowing how to operate technological systems and integrate technology into teaching and learning is a major reflection of teacher’s technological pedagogical content knowledge. Also, as Selber (2004) argued, technology and instruction should not be divided. For
teachers to be functionally literate, they should be able to use technology, understand the social conventions shaping their use of technology and be able to solve technological problems in very strategic ways.

Instructors in this study learned from their colleagues and friends how to use the instructional technologies. Although relatively fewer instructors reported that they learned to use technology from the institution, institutional support towards graduate instructor’s integration of technology into curriculum remained questionable, given institutional support is not one of the major means through which instructors learned to use technology. Drawing from the American Association of Colleges for Teacher Education’s (AACTE) handbook of technological pedagogical content knowledge (TPCK) for educators (2008), technology integration strongly depends on institutional influence over what teachers do and what students learn. In other words, the institution should have a major role to play in following up on how instructors integrate technology into their functions.

Moreover, when the technological literacy of resident and non-resident graduate instructors was compared, the results showed that both groups of instructors faced similar challenges using technology. They also learned to use these technologies in similar ways including but not limited to colleagues, self-research, institutional and departmental support, and from friends. As opposed to the literature which presents non-resident students as digital immigrants or “technological haves not” with resident-students as digital natives or “technological haves,” this research findings showed that non-resident students were more than likely to qualify as advanced users of technology. Social contexts like values, ideological factors like class and experiences, amongst others generally affected resident instructor’s decision to use technology. For example, some instructors preferred to use specific technologies like Tumblr, as opposed to Facebook for teaching
composition courses, while others preferred to use more modern technologies, they felt students would better relate to. Others opted to use technologies that they have previous knowledge about and felt more comfortable integrating into their classes. So, although nationality and cultural orientations (different background of knowledge and ways of learning) varied between these groups of instructors, it was less likely to affect how non-resident instructors use technology.

**Barriers to Technology Integration by Instructors**

Most of the challenges faced by instructors came from a lack of technology integration knowledge and skills, as well as their unfamiliarity with the pedagogy of using technology, or a ‘technology-supported-pedagogy. This finding is in line with DeVoss, Cushman and Grabill’s (2005) research on technology structures, which show that lack of information and technology preparation are major reasons for instructors’ difficulties using technology. Instructors lacked knowledge needed to effectively use Blackboard and other related technologies for their functions. They “struggled” to learn other technologies which they used in place of Blackboard by self-research on Google and YouTube, and through assistance from other colleagues and friends. Some instructors who attended campus workshops to get help from campus IT services argued that these services did not fully meet their needs because they were not very detailed or specific to their needs. Workshops rather had the feel of a “presentation” without the necessary hands on work or follow-up evaluation sessions. This finding aligns with Mehan’s (1989) argument that, desirable outcomes are not met when institutions merely introduce technology into classrooms, but rather when people are able to use the technology to make a difference. Instructors’ complaints of the constant and confusing updates of Blackboard and other instructional technologies confirmed the fact that technology is constantly changing and so should their knowledge of technology.
Another major barrier to technology integration was teacher attitudes and beliefs towards the required technologies. Taking “attitude” to be “specific feelings that indicate whether a person likes or dislikes something” (Hew & Brush, p. 229), while “beliefs” is how useful or not a person finds a specific technology, instructors showed a negative attitude towards some technologies and preferred to use technologies which they have previous knowledge about or found relatively easier to use. For example, Blackboard, which was the main required institutional technology for AI’s and TA’s, was only commonly used by 26.90% of instructors. It was also the technology most criticized by instructors. While it is questionable why only 26.90% of instructors used this technology, it was clear to note that their attitudes and beliefs about this technology affected their decision to integrate it into their classes. This information corroborates Bezemer’s (2012) argument that certain modes only become generally accepted as unified ways of teaching when they have a “shared cultural sense within a community.” This was seen with instructors in this study who used Blackboard mainly because it is accepted and promoted by the university as a major instructional technology. However, because of their different views, disciplines, social contexts and philosophies of teaching, the modes employed in their functions were very diverse.

Using the positive deviance approach, it was noted that Instructors used several strategies to “hack” through the barriers they faced when integrating technology into their functions. Some of these “hacks” included scheduling follow-up meetings or one-one meetings with campus IT personnel to get assistance for their course specific needs. Others structured their classes in groups where students needing specific technology assistance could ask questions from members within their circles, or post on the class “help-page” and receive feedback from their peers. Also, some instructors sought assistance from “tech-savvy students” in class, while others sent students to get assistance from campus IT services or invited IT services to facilitate certain topics in their
classrooms. Besides these unique strategies, most instructors learned by asking other colleagues, Googling and watching YouTube tutorial videos.

5.5.2 DISCUSSIONS ON RECOMMENDATIONS FOR TECHNOLOGY INTEGRATION BY GRADUATE INSTRUCTORS

The recommendations given by graduate instructors who participated in this research study indicate that a major weakness for technology integration at this institution is the lack of theories and conceptual frameworks to inform how instructors should integrate technology into their work. For example, instructors demanded that campus IT workshops should be built around a specific need analysis. They found it important for IT personnel to understand the needs of students and for them to tailor their instructional material towards these needs as opposed to offering “same general workshops” occasionally. Also, the suggestion to narrow down campus IT workshops to department specific workshops was such that instructors get to understand their instructional technologies better, given it would apply to their specific course content. This idea resonates with Hew and Brush’s (2007) work on technology integration, which showed that successfully training teachers to integrate technology involved the following characteristics:

(1) *Training should* be focused on technology skills and experiences within an educational context (2) *should* provide opportunities for ‘hands on’ work with the particular technology resource, and (3) the training *should be* consistent with specific and authentic needs and problems *which teachers face* in their professional contexts (Ottenbreit-Leftwich et al., 2012).

These suggestions accurately represent the recommendations given by instructors in this study. Findings debunk the “one size-fits-all approach” to campus workshops and ask for closer and careful attention to instructors needs. It also validates Shrum’s (1999) argument that “brief exposure, does not provide sufficient training or practice to incorporate technology into the classroom” (p. 85). Some instructors said they needed more hands-on training as opposed to presentation sessions, which could be categorized as a “brief exposure”. Other recommendations
for instructors’ technological literacy development was to make technology workshops mandatory for all instructors and ensure that details about these workshops were properly communicated and widely disseminated to the appropriate audience. Moreover, the mandatory attendance at some departmental orientations, where some graduate instructors were briefed on the required technologies for their functions was not as effective, given that teachers had different levels of preparedness.

Instructors who requested IT assistance at their orientation meetings or at crash courses which they wished to have earlier in the semester also emphasized that these sessions should address their needs, give them a chance to engage in active learning, and should also clearly mesh technology, pedagogy and content of the courses which they are required to oversee. Departmental trainings should employ diversified instructional strategies – they should have committee or well-trained personnel in charge of mapping out instructors’ technology need analysis, after which instructors should be required to participate in the workshops. These workshops should be content specific enough to cover details such as how to create discussion boards on Blackboard, how to build websites, how to grade students work, use iMovie and Google maps. Training instructors in this manner would enable them to move beyond treating technology as an “add-on” to focus more on the connections between technology, content and pedagogy. Instructors would learn to pay more attention to how technology, pedagogy and content interact. Without this knowledge, instructors would continue spending at least the first semester figuring out how to use these technologies and in turn hinder their students’ effective learning.

Instructors would have good technological pedagogical content knowledge if they take intense educational courses on how to integrate technology in pedagogy (Schidmt, 2009; Shin et al., 2009). “Literacy educators and students must see themselves as active participants in social
change, as learners and students who can be active designers—makers—of social futures” (The New London Group, 1996, p. 65). Considering this research, instructors should be equipped with effective technology knowledge needed to teach, grade, facilitate labs and other functions, so that they can make better decisions about the technologies best suited for different class projects, as opposed to being limited to using specific technologies that they have grown to be comfortable with.

5.5.3 Research Limitations
The limitations of this study as mentioned in some parts of chapter 3 and 4 of this research are summarized in this section. It was challenging to fully assess the technological literacies of graduate students across disciplines in a four-year college setting because of the varied kinds of technologies that they use and the different purposes for which these technologies are equally used. For example, it would have been quite inaccurate to conclude that instructors in Geological Sciences taught more effectively with Google Earth than instructors in Rhetoric and Writing Studies who used iMovie or websites for students’ visual projects, given the complexities, levels of knowledge and varying purposes of these technologies.

Moreover, as a researcher from the Rhetoric and Composition program, having limited knowledge about some of the technologies used by instructors in other departments somewhat blurred my understanding of the challenges they experienced and the chance of fully exploring these further. For example, when AI’s in the College of Engineering mentioned having difficulties using software that create student assignments with the use of codes, the next best question was to let them explain what these challenges were and explain how the software operates. My understanding of this information was shallow compared to how I was able to connect and better understand the challenges posed by instructors from Rhetoric and Composition.
It was also challenging to reach out to all participants, and to ensure that they were all recruited and willing to participate in the survey and focus group interviews. Thus, the sample size of this research does not reflect all graduate students’ experiences. It however, offers a good sample of instructor’s technological literacy across disciplines, with a focus on how their challenges working with technology can be met.

Regardless of the limitations mentioned above, this study was successful in measuring graduate instructor’s technological, pedagogical and content knowledge (TPACK). Findings of this study would benefit the various departments involved in this research and would improve instructor’s technology experiences and other instructional support campus wide. The section below outlines the implications of this research and show how it impacts the future of effective technology integration across disciplines.

5.5.4 RESEARCH CONTRIBUTIONS
As noted in the findings to the research inquiry, instructors’ experiences at this institution offer valid and important contributions to the literature on graduate instructor’s technological literacy. These contributions include the following:

1. Instructors’ preference of learning to use technology from their colleagues and friends presents collaboration as a valued means of boosting technological literacy.

2. Improving lesser-used services like campus workshops, IT services and departmental technology workshops with a focus on building instructors TPACK knowledge, is also important means of honing instructors’ technological literacy.

3. Non-resident graduate instructors have advanced knowledge of technology as opposed to the literature, which argues that international students lack the necessary skill and expertise to facilitate instruction. Cultural backgrounds, race, class, values and beliefs do not
negatively affect how non-resident instructors integrate technology into their work. Quite
contrarily, the results of this study revealed that non-resident students have potential to
research and learn how to effectively integrate technology into their functions.

4. Graduate instructors were not fully-equipped to integrate technology into their functions
based on the following:

- Most instructors had no prior knowledge of the technologies needed for their
teaching and instructional functions.
- A good number of graduate instructors (31.82%) did not have adequate training to
use technology, while 30.68% of instructors were not sure if they had good enough
knowledge to integrate technology into their work.
- Most instructors (72.13%) felt challenged teaching with technology, as opposed to
27.87% of them who felt challenged using these technologies for personal purposes.

These findings indicate a gap in teacher-preparation at the institutional level, which needs to be
addressed to improve graduate instructors’ technological literacy. It also shows that instructors
lack a theoretical and practical knowledge of the relationship between content, technology and
pedagogy knowledge. In all, what this research ultimately highlights are that examining and
understanding the technological needs of graduate instructors is crucial to ensuring good and
educative spaces for instructors, and the students whom they teach or assist in different ways.
Improving graduate student’s technological literacy would not only make them effective at
teaching and other functions but has far reaching implications on the future of instructional
technology.
5.5.5 OPEN SPACES FOR FURTHER RESEARCH
Further research on this topic could be to examine the technological literacy of graduate students specifically at the master’s level, to understand how similar or different their experiences are in comparison to PhD students. It is a possibility that their experiences as recent graduates and incoming graduate students from countries abroad would be different from those considered in this study. Their perspective would also be a great way to expose the technological needs of entering graduate students in different programs. In wrapping up all these contemplations, this study closes on the note that without solid theoretical underpinnings of technology, pedagogy and content knowledge, teaching and learning ceases to meet the needs of an evolving world of modern technologies and ways of operating.


Finder, A. (2005). When the teacher has mastered all but english. *International Herald Tribune*.


Kolko, B. E. (1998). We are not just (electronic) words: Learning the literacies of culture, body, and politics. *Literacy Theory in the Age of the Internet, 61*-78.


Nyquist, J. D. (1991). *Preparing the professoriate of tomorrow to teach. selected readings in TA training*. ERIC.


Padgett, D. K. (2016). *Qualitative methods in social work research* Sage Publications.


Schacter, J. (1999). The impact of education technology on student achievement: What the most current research has to say.


Appendix 1: Consent Form

University of Texas at El Paso (UTEP) Institutional Review Board

Informed Consent Form for Research Involving Human Subjects

Protocol Title: Technological Literacy Across Disciplines: Examining Graduate Instructors' Experiences
Principal Investigator: Sidouane Patcha-Lum
UTEP: English

1. Introduction
You are being asked to take part voluntarily in the research project described below. Please take your time to make a decision, and feel free to discuss it with your friends and family. Before agreeing to take part in this research study, it is important that you read the consent form that describes the study. Please ask the study researcher or the study staff to explain any words or information that you do not clearly understand.

2. Why is this study being done?
You have been asked to take part in a research study which looks critically at how Graduate Instructors incorporate technologies such as Blackboard, Google Docs, Movie maker, iMovie, WordPress in their classroom instruction. Approximately, all full-time graduate students who teach undergraduate classes at UTEP will be enrolled in this study. You are being asked to participate in the study because you are enrolled as a fulltime graduate teaching instructor. If you decide to enroll in this study, your involvement will include participating in a voluntary online survey via utepqualtrics.com, and with your approval you will also engage in a follow-up focus group interview. These focus group interview sessions will comprise of 5 participants, with International graduate students, and Resident graduate students in different group sets. Interview sessions will last for 45mins. I plan to interview a total of 10 - 20 people for the entire study. Instructors could be either male or female and age and ethnic background is not taken into consideration. Participants are not likely to be vulnerable to coercion or undue influence. Criteria for inclusion is being a fulltime Graduate instructor, who teaches in a classroom on the UTEP campus. Human subject involvement in the project will begin by April 2018 and end in September 2018.

3. What is involved in the study?
If you agree to take part in this study, you will participate in a voluntary online survey via utepqualtrics.com, at your own place of choice and with your consent, you will also engage in a follow-up interview at the UTEP library for a duration of 45mins within the months of April – September 2018. Focus groups will comprise of no more than five graduate students. With your consent, interview data will be recorded, and pseudonyms will be used to replace your name. Only the primary research investigator will have access to real names and data concerning this research.

4. What are the risks and discomforts of the study?
There are no known risks associated with this research
5. What will happen if I am injured in this study?
The University of Texas at El Paso and its affiliates do not offer to pay for or cover the cost of medical treatment for research-related illness or injury. No funds have been set aside to pay or reimburse you in the event of such injury or illness. You will not give up any of your legal rights by signing this consent form. You should report any such injury to Sidouane Patcha-Lum at 915-383-7646, and to the UTEP Institutional Review Board (IRB) at (915-747-7693) or irb.orsp@utep.edu.

6. Are there benefits to taking part in this study?
There will be no direct benefits to you for taking part in this study. This research may help us to understand and find ways to curb some of the challenges faced by Graduate Instructors as they incorporate classroom technologies in their classes.

7. What other options are there?
You have the option not to take part in this study. There will be no penalties involved if you choose not to take part in this study.

8. Who is paying for this study?
No payments are paid towards this study.

9. What are my costs?
There are no direct costs. You will be responsible for travel to and from the research site and any other incidental expenses.

10. Will I be paid to participate in this study? N/A
You will not be compensated for taking part in this research study.

11. What if I want to withdraw, or am asked to withdraw from this study?
Taking part in this study is voluntary. You have the right to choose not to take part in this study. If you do not take part in the study, there will be no penalty or loss of benefit. If you choose to take part, you have the right to skip any questions or stop at any time. However, we encourage you to talk to a member of the research group so that they know why you are leaving the study. If there are any new findings during the study that may affect whether you want to continue to take part, you will be told about them. The researcher may decide to stop your participation without your permission, if he or she thinks that being in the study may cause you harm.

12. Who do I call if I have questions or problems?
You may ask any questions you have now. If you have questions later, you may call Sidouane Patcha-Lum at 915 383 7646. If you have questions or concerns about your participation as a research subject, please contact the UTEP Institutional Review Board (IRB) at (915-747-7693) or irb.orsp@utep.edu.

13. What about confidentiality?
Your part in this study is confidential. None of the information will identify you by name. Pseudonyms will be used in place of your real name. All records will be securely locked in a
computer for a period of 2yrs while the research is on-going. After this period, all primary data for this research will be deleted.

14. Mandatory reporting

N/A

15. Authorization Statement

I have read each page of this paper about the study (or it was read to me). I know that being in this study is voluntary and I choose to be in this study. I know I can stop being in this study without penalty. I will get a copy of this consent form now and can get information on results of the study later if I wish.

Participant Name: ________________________________  Date: ____________

Participant Signature:______________________________  Time: ____________

Consent form explained/witnessed by: ________________________________

Signature

Printed name: ______________________________________

Date: __________  Time: __________
Appendix 2: Recruitment Email

INVITATION FOR INSTRUCTOR’S PARTICIPATION IN SURVEY

Subject line: Survey about graduate instructors’ experiences teaching with technologies

Dear Sir/Madam,

I am PhD student at the University of Texas, El Paso, currently carrying out my dissertation research titled “Technological Literacy across disciplines: Examining Graduate Instructor’s Experiences,” which primarily examines the digital literacy and pedagogical experiences of graduate instructors. This research aims at finding solutions to challenges which instructors face teaching with classroom technologies such as Blackboard, Microsoft Office and web-based technologies like Google docs, iMovie, Moviemaker, Wordpress, Wix and Weebly and others.

In support of my research, I am seeking full-time graduate instructors from your discipline/program to participate in an online survey via Qualtrics. I would be very grateful if you can forward my request to them.

Should any instructor agree to participate in this study, all individual, identifiable data/records will be kept strictly confidential.

Voluntary participation will consist of the following:
1. Completing a survey that will take approximately 15-20 minutes
2. Engaging in a follow-up focused group interview, only upon their acceptance to participate.

To participate in this study, graduate instructors can click on this survey link (link). For further questions, contact me at spatchalum@miners.utep.edu.

Sincerely,
Sidouane Patcha-Lum.
Doctoral Candidate in Rhetoric and Composition
Appendix 3: Survey Questions

1. To begin, please select indicate the department you belong to

2. Please select which option applies to you
   - Full time student
   - Part-time student
   - Other (please specify)

3. What is your primary job assignment?
   - Teaching Assistant
   - Assistant Instructor

4. What are your specific functions as a TA or AI? (Please check all that apply)
   - Full-time teaching
   - Part-time teaching
   - Assist Professor to teach labs or classes
   - Holding tutorial sessions for students
   - Grading
   - Other (please specify)

5. What kinds of technologies do you incorporate in your functions as TA/AI?
   - Blackboard
   - Forums/Discussion boards
   - Blogs
   - YouTube
   - Google Docs
   - None
   - Other (please specify)

6. Please briefly explain how you use two of the above technologies to facilitate your work as a TA or AI

7. How will you rate your use of technology to facilitate your specific job assignment?
   - Beginner (Little knowledge of how to use required technologies)
   - Intermediary (Efficient knowledge of how to use required technologies)
   - Advanced (Expert in using required technologies)

8. How long have you been a TA or AI?
   - 1-2yrs
   - 3-5yrs
   - Over 5 yrs

9. How do you get technical assistance to use these technologies? (please check all that apply)
   - Google search
   - Colleagues
10. Were you aware of the technologies required by your institution for your job assignment, prior to your enrollment as a Teaching Assistant or Assistant Instructor?
   - Yes
   - No

11. How did you find out about the technologies you are required to use for your job assignment? (please check all that apply)
   - Training workshop at my institution
   - Listserv emails
   - Colleagues or friends
   - Other (please specify)

12. Do you feel you had adequate training when you started using these technologies?
   - Yes
   - No

13. How did you prepare yourself to use these technologies?

14. On a scale of 1-10, how will you rate your level of preparedness to effectively incorporate these technologies into your job assignment?

15. What (if any) are some challenges you have doing the following:
   a. Using these technologies
   b. Teaching students to use these technologies
   a. How do you think your challenges can be met? What do you suggest being done differently?
   b. Please check which applies to you
      a. Resident Graduate Instructor
      b. Non- Resident Graduate Instructor
   c. Will you be willing to participate in a focus group interview to discuss your experiences using technology in your AI/TA functions?
      - Yes
      - No
d. If you answered yes, please provide the following information
   Name:
   Email address:

Please kindly distribute this survey link (include link here) among your colleagues (PhD) who teach or assist in teaching activities using new media technologies. Your help and participation in this research is greatly appreciated.

Thank you!
Appendix 4: Interview Questions

1. When/how did you learn how to function in your role as TA/AI?

2. Tell me about your experiences (lack of experiences) using technology in your role as TA/AI?

3. Did you receive any preparation or training at UTEP to prepare you to work with these technologies? If so, what was that?

4. What would you add/take-away from these trainings to make it more effective?

5. Describe a recent situation in which you learned a new program or digital tool. Who/what/when/where/why taught you?

6. How do you make decisions (if any) about technologies used in your roles as TA/AI’s? (Which ones? how? when? why?)

7. What are your challenges using these technologies to teach, grade?

8. What kinds of technologies do you assume students know how to use? (And why?)

9. What kinds of technologies do you use that you think are unfamiliar to students? (And why?)

10. How do you support students to work with these technologies?

11. In your opinion, do you think students find it important to use these technologies? (Why/not?)

12. If you could change anything about the ways you or students use technologies in your classes or specific functions, what would you change?
Vita

Sidouane Patcha Lum earned her Bachelor of Science degree in Journalism and Mass Communication from the University of Buea-Cameroon in 2013. In 2015, she received her Master of Science degree in Rhetoric and Technical Communication from Michigan Technological University. She joined UTEP’s Rhetoric and Composition doctoral program in 2015.

Dr. Patcha was a recipient of UTEP’s 2017 and 2018 Career Preparation Summer Scholarships, and the 2016 Summer Research Grant. She also received the 2018 Graduate School Dodson Grant, and Baker Hernandez Grants from the English Department.

Dr. Patcha has presented her research at several academic conferences such as the 2018 Conference on College Composition and Communication (CCCC), and the 2018 Association of Teachers of Technical Writing (ATTW) conference in Kansas City, where she received a Research Methods Workshop scholarship. She also presented relevant academic research at the 2017 Annual Africa Conference at the University of Texas, Austin, the 2018/2016 Cultural Rhetorics Conference in East Lansing Michigan, and the 2016/2017 Annual Graduate Student Research Expo at UTEP.

While pursuing her degree, Dr. Patcha worked as an Assistant Instructor for in-class and online Composition/Professional writing courses, and Assistant Director for the Rhetoric and Composition graduate program. She also served as the Program Officer for UTEP’s Rhetoric Society of America (Frontera Rhetorica), where she shared her academic work at student organized colloquiums. Dr. Patcha’s dissertation, “Technological Literacies Across Disciplines: Examining Graduate Students’ Experiences” was supervised by Dr. Beth Brunk-Chavez.

Contact Information: <patchasidouane@gmail.com>