THE USE OF DIGITAL TECHNOLOGIES TO CREATE MULTIMODAL ENSEMBLES IN TEACHER PREPARATION PROGRAMS: A MIXED METHODS RESEARCH STUDY

A Dissertation

Presented to

The Faculty of the School of Teaching and Learning

Sam Houston State University

In Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

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by

Jacquelyn Rene Rust

December, 2021

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DEDICATION

This degree, dedicated to my parents, has taken me many years to complete. I moved away from my hometown to continue my studies while my dad was fighting cancer. No one knows how long they have left with a loved one, and this is especially true after a cancer diagnosis. I prayed my dad would be around to see me walk across the stage at commencement. Unfortunately, he passed away at the beginning of my second semester in the doctoral program.

Years before the thought of earning an advanced degree, my stepmom encouraged me to follow my heart and enter the field of education. Without her support, I am not sure which way my life would have gone. In addition, my dad instilled a strong work ethic in my brother and me; he raised us to finish what we started. My dad worked hard for his family and followed through on his commitments. I know, because of his strength, I was able to continue and finish this degree.

When I enrolled in the program, I also experienced many milestones of life's journey. After completing my coursework, I married, birthed two boys, changed jobs, and took a break from the program. Through all these changes, Dr. Price and Dr. Votteler allowed me the time, offered encouragement, and provided the tools to help me see this program to completion. Without their encouragement, this would have been a much more difficult journey.

I sacrificed time away from my children, Killian and Everett, and husband Clint, while reading, researching, typing, editing, and revising my dissertation. Clint has supported me since the beginning of this degree. He filled all the roles required to keep our family together and moving forward while offering his endless support of my goals.

ABSTRACT

Rust, Jacquelyn Rene, *The use of digital technologies to create multimodal ensembles in teacher preparation programs: A mixed methods study.* Doctor of Education (Literacy), December, 2021, Sam Houston State University, Huntsville, Texas.

The purpose of this study was to determine how preservice teachers are being taught to use digital technologies to create multimodal ensembles in teacher preparation programs. A hermeneutic content analysis with a partially mixed sequential equal status designed study was used during this research. The three data sources explored and examined for this study for 10 consecutive years (2010-2020) included scholarly journals, blogs, and websites.

The data that emerged from this analysis showed that there is, in fact, little research on this topic. The connection between digital technologies, preservice teachers, and multimodal ensembles is vital in the articles that discussed the topic but were lacking in the research overall. The implications for this research study will lead to further research in teacher preparation programs and the movement to equip preservice teachers with the knowledge and pedagogies to prepare their future students to be a successful and integral part of a digital and multimodal society.

KEY WORDS: Digital technologies; Preservice teachers; Multimodal ensembles; Teacher preparation programs; Hermeneutic Content Analysis

ACKNOWLEDGEMENTS

I want to express gratitude to my supportive and patient dissertation chair, Dr. Votteler, who has encouraged me throughout this research project. I am incredibly grateful for her many text messages, emails, feedback, and endless support throughout this process. I would also like to thank my entire dissertation committee for allowing me to ask questions and expressing their thoughts on strengthening my study.

Additionally, I would like to thank those who designed the doctoral curriculum to include digital literacies, technologies, and multimodal assignments. Dr. Gerber taught the digital technology courses and opened my eyes to how educators must add digital technologies into coursework. I completed my first multi-genre writing assignment in Dr. Votteler's course. I acquired much information about mixed methods research from Dr. Onwuegbuzie. Through these experiences, I decided on further explore how digital technologies are used to create multimodal assignments in teacher preparation programs.

I would like to thank my cohort member Jason Fuqua for keeping in contact and demanding that I finish this dissertation. We had many classes together throughout the program. We helped one another with questions about our coursework and cheered one another on to do our best.

Clint, I am not sure I can ever thank you enough or repay you for the support you showed me and sacrifices you made for our family to make this possible for me. You have always been there for me, and I would not want to do life with anyone else.

Killian and Everett, you can do hard things. Keep moving forward in your life, the result can be beautiful and rewarding.

PREFACE

The basis for this research initially stemmed for my passion for preparing pre-K-12 students with the skills and knowledge about digital technologies and multimodal ensembles. Our world is ever-changing, and for student success in our digital and multimodal society, they should possess this knowledge and these skills. For our students to be successful, teachers need to have this knowledge and these skills, and for teachers to have this knowledge and these skills, they need to be supported, exposed to, and taught these skills in teacher preparation programs. The question is, what specific knowledge, skills, and experiences should teacher educators be equipping preservice teachers with to ensure their future students are thriving in a digital and multimodal society? My passion is to search for this information and provide further research to help teacher educators adequately prepare preservice teachers to be knowledgeable and skilled teachers on this topic.

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CHAPTER I

Introduction

"If the charge of teacher educators is to prepare teacher candidates, we must ask, what kinds of knowledge, skills, and experiences will they need to prepare their students for an increasingly complex multimodal, textual world?"

Melanie Hundley &Teri Holbrook (2013, p. 502)

Personal Experience

I began my doctoral journey in August of 2013. During this time, I took many courses that discussed digital literacies, multimodal literacies, digital media, and digital technologies. I was fascinated by the implementation of these tools to create and enhance projects in public schools and colleges. In public schools, teachers are being strongly encouraged or required by their state to implement digital literacies, digital media, multimodal literacies, and digital technologies. It piqued my interest about the extent these literacies, media, and technologies were being taught in teacher preparation programs.

When talking with my teacher friends, they confirmed that they were not extensively taught about these technologies and literacies in their teacher education programs in Florida and Texas. According to the teachers I spoke with, they had very little training if any with these technologies and literacies. I myself did not have training and was not encouraged to use the aforementioned technologies and literacies in my alternative education program training. Therefore, I began researching and reading journal articles about studies that were taking place on this topic. At this time, there was an insignificant number of studies or articles about this topic. As a researcher, I want to

see how many journals are publishing articles about this topic and what the findings are in these articles. Is there currently sufficient research covering this topic? Are preservice teachers being taught and implementing these strategies in their teacher preparation programs? I think the preservice teachers need an extensive understanding of these literacies and technologies to efficiently and effectively teach their students in the classrooms (Erstad, 2013; Friedman & Kajder, 2006; Hundley & Holbrook, 2013; Kadjer, 2005). Therefore, I began extensively researching this topic.

Background of the Study

Today, the definition and practice of literacy is changing due to social forces and new technologies that are being developed and produced; as the social forces and new technologies change so will discourse (Leu et al., 2013). According to Gee (2013), "Rather, meaning in language is tied to people's experiences of situated action in the material and social world" (p. 136). In other words, students learn through hands-on and authentic experiences with content in the classroom and form social languages within those groups. As educators, it is imperative that teachers create a classroom environment that mirrors what students will encounter when they enter the workforce and learn in society (Oberländer et al., 2020). Making meaning of texts through visual images, font style, varying font sizes, color, and sounds are modes that societies have always utilized to make meaning. Furthermore, making meaning also requires different skills than it did many years ago such as (a) browsing screens and hyperlinks, (b) communicating in social networks, and (c) producing text (Roswell et al., 2013).

Statement of the Problem

It is essential to recognize, to evaluate, and to support preservice teachers' pedagogical understanding when designing and delivering lessons incorporating digital technologies and multimodal means in their course work (Al-Hazza & Lucking, 2012; Howard et al., 2021). Preservice teachers need these digital and multimodal skills when they enter into their future classrooms (Elstad & Christophersen, 2017; Valtonen et al., 2015). Unfortunately, more often than not preservice teachers are unprepared to use digital technologies and problem-solve in technology-rich environments compared to other tertiary graduates (Howard et al., 2021). In order to be competitive in the global economy that awaits them after graduation, students need to be taught how to communicate and to collaborate effectively using multimodal literacies (Leu et al., 2004; The New London Group, 1996). Therefore, it is essential for those who develop and implement teacher preparation programs to adapt and to modify the course work required for preservice teachers to meet the demands of educating youth in a digital and multimodal society (Farjon et al., 2019; Hundley & Holbrook, 2013; Oberländer et al., 2020; Serafini, 2014; Voithofer et al., 2019). It is not enough to only provide preservice teachers with access to digital technologies, time to experiment with the technology, and technology training and expect the preservice teachers to fully immerse and integrate digital technologies into assignments and their pedagogy. Further, it is important that teacher education programs equip preservice teachers with the skills to meaningfully integrate digital technologies in their course work (Howard et al., 2021). Moreover, researchers suggest that the digital literacy components need to be simultaneously taught

in education programs to create multimodal projects. (Friedman & Kadjer, 2006; Hundley & Holbrook, 2013; Kadjer, 2005;).

Purpose of the Study

This partially mixed sequential equal status designed study (Leech and Onwuegbuzie, 2009; Nastasi et al., 2010) brought to light the relationship, or lack of, between digital technologies, multimodal ensembles, and preservice teacher education programs. Preservice teachers are seldom, if ever, exposed to digital technologies and multimodalities while enrolled in teacher preparation programs (Hundley & Holbrook, 2013; Kadjer, 2005). Previous research has been conducted on student learning via multimodal texts, but few to no researchers have conducted research studies on digital literacies being used to create multimodal ensembles in education programs (Hundley & Holbrook, 2013; Kadjer, 2005). The researcher described the findings in journals and articles that present digital technologies and multimodal aspects that are utilized, developed, and implemented in teacher preparation programs. Then, the findings were coded and counted to see what percentage of journals and journal articles are publishing information about digital technologies and multimodal ensembles that are taught in preservice teacher education programs.

Collins et al. (2006) provide a typology of reasons for using a mixed methods research design that are categorized under four rationales: (a) participant enrichment, (b) instrument fidelity, (c) treatment integrity, and (d) significance enhancement. Of the four rationales, significance enhancement was utilized for the purpose of this mixed methods research study. Significance enhancement enriches a researcher's interpretation of the data via mixing qualitative and quantitative data procedures (Collins et al., 2006).

Greene et al. (1989) identified (a) triangulation, (b) complementarity, (c) development, (d) initiation, and (e) expansion as the five purposes for mixing qualitative and quantitative research designs. Out of the five purposes identified in Greene et al.'s (1989) framework, initiation and expansion were found to be most appropriate for this study. Initiation was used to discover emerging connections between multimodal ensembles, digital technologies, and preservice teachers as well as other connections that might arise from the research. In addition, development was used to increase validity of concepts and examine results using the strengths of qualitative and quantitative methods (Greene et al., 1989).

Goals of the Study

The goal of this study was to partially mix the qualitative and quantitative components, thereby yielding a partially mixed sequential equal status designed research study (Leech & Onwuegbuzie, 2009; Nastasi et al., 2010). Newman et al. (2003) identified nine goals: (a) to predict; (b) to add to the knowledge base; (c) to have a personal, social, institutional, and/or organizational impact; (d) to understand complex phenomena; (e) to measure change; (f) to test new ideas; (g) to generate new ideas; (h) to inform constituencies; and (i) to examine the past. The following goals that pertain to this study are (a) to add to the knowledge base, (b) to generate new ideas, and (c) to inform constituencies. To my knowledge, there are few studies that link the relationship between digital technologies, multimodal ensembles, and preservice teachers or education programs. This study aimed to add to the knowledge base by conducting a hermeneutic content analysis (HCA) to add to the current research that has been conducted. As the HCA was conducted, new ideas or concepts emerged organically by setting aside

preconceived ideas and biases during the research process. This study was used to inform the constituencies by providing them with information about the relationship between digital technologies, multimodal ensembles, and preservice teachers. Those responsible for designing and implementing teacher preparation programs can then implement, change, or conduct further research in using digital technologies and to create multimodal ensembles into teacher preparation programs.

Objectives of the Study

The research objectives presented by Johnson and Christensen (2014) are (a) exploration, (b) description, (c) explanation, (d) prediction, and (e) influence. I was interested in the qualitative process, the meaning of the data, and the inferences made from the data acquired through words. Therefore, the objective for the qualitative phase in this study was description (Creswell & Creswell, 2018; Johnson & Christensen, 2014). Contrastingly, the objective for the quantitative phase of this study was exploration. The aim was to describe the findings and explore the information in-depth for new ideas and future research using the statistical information from the cluster analysis of the variables (Bazeley, 2010; Johnson & Christensen, 2014).

Conceptual Framework

Halliday (1978) suggests three metafunctions: (a) the ideational metafunction, (b) the interpersonal metafunction, and (c) the textual metafunction, which provide "a conceptual framework for representing the social context as the semiotic environment in which people exchange meanings" (p. 110). The ideal metafunction examines how thoughts and concepts are signified through the use of selected language. Interpersonal metafunction indicates how a relationship between the producer and receiver is

established via language use. Finally, textual metafunction is demonstrated when the organization of language is completed in specific ways. When educators use these three metafunctions, they are able to recognize how multimodal ensembles come together to make meaning. This framework will be used to interpret journal articles that use these components to make meaning of the multimodal ensembles (Serafini, 2014). Halliday's framework provides an understanding of what multimodal texts do; therefore, the three metafunctions will help the researcher explain the relationships found in the study (Serafini, 2014).

According to the Texas Essential Knowledge and Skills (TEKS) standards, students are required to "collect and organize information from a variety of formats, including text, audio, video, and graphics" (Texas Education Agency, 2011, para. 126.7, 3B). Furthermore, the student is expected to "collaborate and communicate both locally and globally using digital tools and resources to reinforce and promote learning" (Texas Education Agency, 2011, para. 126.7, b2). The requirements for technology in grades 3-5 are as follows: "(a) draft, edit, and publish products in different media individually and collaboratively; (b) use font attributes, color, white space, and graphics to ensure that products are appropriate for multiple communication media, including monitor display, web, and print; (c) collaborate effectively through personal learning communities and social environments; (d) select and use appropriate collaboration tools" (Texas Education Agency, 2011, para. 126.7, 2 a-d). The TEKS will help guide the researcher's keywords that are used to search for journal articles that discuss using digital technologies to create multimodal ensembles. Multimodal ensembles are "a cohesive entity that uses a variety

of semiotic resources, including written language, visual images, and design elements to represent and communicate ideas and meanings" (Serafini, 2014, p. 172).

Methodological Framework

A hermeneutic content analysis was conducted to determine the more frequent used words and phrases to explore the connection between multimodal ensembles, digital technologies, and preservice teachers. The study focused on 10 consecutive years (2010-2020) of numerous educational journals, websites, and blogs (Berelson, 1952; Krippendorff, 2004). Data were researched and collected from multiple sources to strengthen the study and its results.

Mixed Methods Question

1. In what ways are preservice teachers taught to create multimodal ensembles using digital technologies in preservice teacher preparation programs?

According to Plano and Badiee (2010), the mixed methods question was predetermined because the question was "stated at the beginning of the study based on the researcher's understanding of the literature and practice" (p. 297). A qualitative question and a quantitative question were combined to create one mixed methods question. The question was answered by using qualitative and quantitative research methods when conducting the content analysis.

Significance of the Study

This study offered an opportunity to explore journal articles, websites, and blogs to determine the presence or absence of digital technologies and multimodal aspects in teacher preparation programs. In addition, this study provided teacher educators and

preservice teachers with insights about the multimodal and technological aspects that are or are not being taught in teacher preparation programs.

Determining the meaning of multimodal texts through images, font style, varying font sizes, color, and sounds are modes that humans have always utilized to make meaning (Hundley & Holbrook, 2013), but present-day society also requires that students have knowledge of browsing screens and hyperlinks, communicating through social networks, and producing text, among other tasks. Thus, making meaning requires different skills than it did many years ago (Roswell et al., 2013). This study provided direction to teacher educators who design and implement preservice education programs and offered direction into which aspects of digital technologies and multimodal projects should to be added or incorporated into the programs to better prepare preservice teachers and their future students to meet the demands of the world.

Definition of Key Terms

Mode - A mode is a structure of visual and verbal units created within or across countless cultures to signify and to express meaning (Serafini, 2014). For example, photographs, sculptures, written languages, paintings, types of music, and poetry are modes used to express meaning around the globe (Serafini, 2014). In addition, Curwood and Hassett (2009) recognized social and cultural modes such as talk and drama.

Multimodality - Multimodality is an interdisciplinary approach that indicates a message beyond written language and includes multiple modes (Serafini, 2014). Additionally, multimodality references the theory that meanings are embodied and conversed across cultures by diverse semiotic resources (Serafini, 2014). For example, a project that integrates music, hyperlinks, pictures, and text is multimodal.

Multiliteracies - Multiliteracies are "the reconceptualization of literacy as a multidimensional set of competencies and social practices in response to the increasing complexity and multimodal nature of texts" (Serafini, 2014, p. 171). Multiliteracies do not consist of a single cognitive skill but, instead, involve several social practices that extend beyond reading and writing text (Serafini, 2014).

Digital Literacies - Digital literacy means "having the skills you need to live, learn, and work in a society where communication and access to information is increasingly through digital technologies, such as internet platforms, social media, and mobile devices" (Western Sydney University, 2020, "What is digital literacy" section).

Digital Technologies - Digital technologies are types of electronic equipment, devices, or applications used to create projects in the classroom, such as smart phones, tablets, computers, websites, smart boards, digital television, etc. (Victoria State Government, n.d.).

Multimodal Ensembles - Multimodal ensembles are "a cohesive entity that uses a variety of semiotic resources, including written language, visual images, and design elements to represent and communicate ideas and meanings" (Serafini, 2014, p. 172).

Visual Literacy - Visual literacy is "the process of generating meaning in transaction with multimodal ensembles, including written text, visual images, and design elements, from a variety of perspectives to meet the requirements of particular social contexts" (Serafini, 2014, p. 172).

Delimitations

This study utilized articles of journals, websites, and blogs containing keywords or phrases pertaining to multimodal, modalities, multimodal ensembles, digital literacies,

digital technologies, preservice teachers, teacher educators, and teacher preparation/education programs. The qualitative phase contained a specific quantity of journals and journal articles.

Limitations

Tables included in this study display (a) the threats to internal validity and external validity for the quantitative phase of the study, (b) the threats to internal credibility and external credibility for the qualitative phase of the study, and (c) the legitimation for the mixed methods phase of the study.

Four tables can be found at the end of this proposal. Table 1 lists the limitations for the internal credibility in the qualitative phase accompanied by the explanation and occurrences. Table 2 lists the limitations for the external credibility in the qualitative phase accompanied by the explanation and occurrences. Table 3 lists the limitations for internal validity in the quantitative phase accompanied by explanations and occurrences. Finally, Table 4 lists the limitations for external validity in the quantitative phase accompanied by explanations and occurrences.

For this mixed methods research study, there are nine legitimation types identified by Onwuegbuzie and Johnson (2006): (a) sample integration legitimation, (b) insider-outsider legitimation, (c) weakness minimization legitimation, (d) sequential legitimation, (e) conversion legitimation, (f) paradigmatic mixing legitimation, (g) commensurability legitimation, (h) multiple validities legitimation, and (i) political legitimation. Political legitimation was particularly pertinent in this study because consumers of the literature might have a tendency to value the qualitative over the quantitative research or vice

versa. Multiple validities were important to ensure that all research validities were used and discussed in the qualitative and quantitative (Onwuegbuzie & Johnson, 2006).

Organization of Remaining Chapters

The subsequent chapters provide a review of the literature and the method of the study. Chapter II provides an extensive review of the existing literature on multimodal learning in preservice teacher preparation programs. Chapter III explicitly illustrate the method, sampling design, data collection, software, and an analysis of the data.

CHAPTER II

Review of Literature

Introduction

The purpose of this literature review was to shed light on the importance of digital technologies and multimodal literacy practices. The argument was made that literacies are changing around the world. We now live in a digital world; therefore, preservice teacher education programs should prepare preservice teachers to teach with digital technologies so they can help students create multimodal ensembles in their pre-K-12 classrooms.

During this research process, databases were searched using keywords and phrases that included preservice teachers, multimodal literacies, technology, new literacies, theories, history, multiliteracies, pedagogy, new literacy practices, in-service teachers, and attitudes and perceptions of technology. Articles were grouped into themes that included: preservice teachers' views as teachers and students in education programs, technology in the classroom, personal use and pedagogical understandings, preservice teachers' evolving perceptions via reflection, preservice teachers, digital technologies, multimodal literacies, multimodal ensembles, perspectives of preservice teachers, and teacher education programs. Additionally, the Texas Essential Knowledge and Skills (TEKS) database was searched to determine if they included the teachings of digital literacies or digital technologies to create multimodal ensembles in pre-K-12 classrooms. Literacy around the world is changing due to technological advances, and the need for teacher educators to teach preservice teachers how to use digital technologies to create

multimodal ensembles is imperative. The preservice teachers are the ones going into the pre-K-12 classrooms to prepare students for the digital world they will work in.

Reading and writing have always have been composed and comprehended using multiple modalities. As literacy changes and evolves, there are many choices afforded to composers of multimodal works through technology, which require making meaning of digital literacies (Vasudevan et al., 2013). Throughout the world and in our surrounding environments, meaning is made from graphics, font, color, sound, images, and icons (Leu et al., 2013); people are surrounded by these different modes of meaning in their personal, community, and work lives. The world and workforce inhabited by the human race is changing at a rapid pace (Leu et al., 2013). Therefore, the demand for employers and employees to work in a horizontal environment (i.e., a system wherein an employee works with other employees on the same level), living in a postindustrial economy, exhibits why teaching future pupils in a vertical education system (i.e., a system wherein an employee leverages their skills to climb the corporate ladder) is no longer essential and beneficial. Global economic competition requires the use of every employee's intellectual capital to solve problems and to increase productivity and competitiveness in the global market (Leu et al., 2013).

Through education preparation programs, preservice teachers' views and beliefs about multimodal meaning making can be fostered and carried into their teaching careers (Leu et al., 2013). In turn, preservice teachers will be preparing students for the horizontal workforce where they will enter upon graduating from high school, college, or preparatory programs. In order to work in a horizontal workforce, where critical thinking and meaning making are essential, students need to be well prepared during their

educational careers. If not, the United States economy will fail to be productive and competitive (Leu et al., 2013).

The concept of literacy is quickly changing because of the rapidly developing technology that is being produced in our society. Implementing new literacies is not hindered by the newly developed technology, but by how well an educator or student is able to utilize the multimodal literacies that technology affords in schools, work, and society (Leu et al., 2004). Knowing how to make meaning out of images, lines, types of fonts, sounds, graphics, and gestures will prepare students and educators to make meaning from their surroundings (Curwood & Hassett, 2009). Students need to be taught how to communicate and to collaborate effectively using multimodal or new literacies in order to be competitive in the global economy that awaits them after graduation (Leu et al., 2004; The New London Group, 1996).

In order for preservice teachers to gain a pedagogical understanding of multimodal and digital technologies, and to prepare students for their futures, researchers have addressed how essential it is for preservice teachers to be prepared for real-world applications in their pre-K-12 classrooms via teacher preparation programs. Thus, teacher educators who create and implement teacher preparation programs are recognizing the need to incorporate digital technologies to create multimodal ensembles and are incorporating introductory courses or revising education programs that are integrating technology (Friedman & Kadjer, 2006; Hundley & Holbrook, 2013; Kadjer, 2005).

Preservice Teachers' Views as Teachers and Students in Education Programs

In their qualitative research study of 65 preservice teachers attending a private university in the Southern United States, Hundley and Holbrook (2013) examined

participants' ability to learn how to (a) create multimodal writing projects, (b) teach their students how to create multimodal writing projects, (c) design writing tasks, and (d) progress to understanding theoretically sound methodology. A thematic analysis was conducted on the data collected, which included metanarratives, exit slips, and specific class discussion transcripts. Four themes emerged in the study as preservice teachers encountered (a) challenges as writers, (b) difficulty thinking with image, (c) struggles with wanting to possess authoritative control over the readers' responses to their writings, and (d) challenges when incorporating technology into their course assignments.

Condy et al. (2012) conducted an interpretive study in which they utilized Interpretative Phenomenological Analysis (IPA) to conduct and to analyze the data collected. Of the 59 senior-level students enrolled in an education program in South Africa, 29 chose to use digital storytelling to bring awareness to multicultural awareness over a paper-based portfolio. There were 10 students of diverse ethnicity who were chosen to participate in the study. The researcher's goal was to determine how different races "perceive and experience digital storytelling in multicultural classrooms" (Condy et al., 2012, p. 281). The researchers claimed that the education students understood the benefits of digital storytelling and wished the approach had been implemented in the first year of the educational program. The findings suggested that preservice teachers recognized how digital storytelling facilitated their understanding of one another, their diverse backgrounds, and how it would support their understanding of future students from different cultures (Condy et al., 2012).

In Friedman and Kajder's 2006 study, students enrolled in an undergraduate education course were examined to gain insight about the perceptions that preservice

teachers possess about using and integrating technology in their course work and in their future classrooms. The 42 humanities students were instructed to write six anonymous posts and 12 weblog entries, and their 30 elementary education students were required to post anonymous feedback to teacher prompts once a week. In all, 1,206 responses were acquired and analyzed weekly using open coding. The researchers looked for common themes throughout the 2003 fall semester. Friedman and Kadjer (2006) found that preservice teachers (a) were unsure of how to use the technology in the class but were willing, (b) wanted the course to be relevant to the subject areas that they would be teaching in the future, (c) did not participate in technology instruction before the course and wanted faculty members to model how to integrate technology, (d) thought technology in education courses should be current and mirror what is available in pre-K-12 schools, and (e) recognized the value of integrating technology.

Dymoke and Hughes (2009) observed and analyzed the ways in which multimodal environments enhanced 56 preservice teachers from the United Kingdom and Canada in their poetry-writing experiences and how digital technology is shaping education. The researchers sought to discover preservice teachers utilizing their experiences in the classroom when they became teachers. Some of the preservice teachers began to play with the multimodal literacies by posting images, hyperlinks, videos, and webcams to class wikis, but the attempts were found to be unsuccessful. By the end of the study, 63 poems had been posted, with some students posting approximately three poems and some deciding not to contribute to the wiki. Providing feedback, learning about poetry, and sharing their work were the components that benefited the preservice teachers rather than recognizing the benefits of the multimodal features. Similar to Friedman and

Kadjer's (2006) study, Dymoke and Hughes (2009) reported that, at times, the technology was unavailable for students, which hindered their multimodal experience.

A Likert-format scale was designed, administered, and interpreted by Al-Hazza and Lucking (2012) in their quantitative research study. The survey was administered to 192 graduate and undergraduate preservice teachers. Seven of the nine themes were determined to have a high level of reliability, whereas two of the themes presented low reliability levels that were excluded from the study. Results indicated that the women possessed a more positive outlook on emerging new technologies and new literacies, and the possible impact that technology may have on improving the education of students. The researchers also concluded that the women used technology more than the men in order to remain socially connected.

Sheridan-Thomas (2007) designed an action research study which entailed collecting 64 preservice teachers' written work over the course of three semesters. Themes were identified through the researcher's work of reading and rereading the education students' writing assignments, as follows: (a) literacy is complex, (b) students might have different literacy interests than what are taught in schools, and (c) students' out-of-school literacies can provide links to in-school literacies through interest and engagement of reading multiple texts.

Technology in the Classroom

Kajder (2005) conducted a semester-long qualitative research study to investigate the lasting effects of an introductory technology course on nine preservice teachers' beliefs, planning, and practices when preparing for their fieldwork. The researcher used triangulation by collecting data utilizing three different methods: (a) participant

observations, (b) participant interviews, and (c) lesson plans. One of the five recurring themes identified by the researcher was that preservice teachers expected their students to be highly knowledgeable about technology. Preservice teachers shied away from implementing technology into their classrooms because the students would possess too much or too little knowledge about technology. Results indicated that they were concerned about losing control of the classroom environment and did not want to be viewed as inferior to the students when integrating technology in their lessons (Hundley & Holbrook, 2013; Kadjer, 2005).

Burnett (2011) analyzed data in a qualitative study and found three contingencies (a) handling identities in diverse networks, (b) creating and supporting self-narratives, and (c) restructuring identities. Three stages of individual interviews were conducted with seven participants during a seven-month time period, which focused on preservice teachers' digital literacy practices in and out of school. Although Burnett (2011) found that participants in her study sometimes constructed lessons to reflect a more structured teacher-centered environment to ensure control of the class, six out of the nine preservice teachers in the study conducted by Kadjer (2005) claimed that they actually wanted to use technology in their future classrooms because of students' interests in technology and their lack of access to technology at home. However, Kadjer (2005) reported a small number of preservice teachers who implemented technology in their lessons and teaching during field experience after having one course of technology training directly before their fieldwork, which the researcher attributed to pedagogical thinking and teaching placements.

Additionally, Friedman and Kadjer (2006) noted that preservice teachers were enthusiastic at the thought of using technology in their future classrooms, but noted that when preservice teachers' classroom instruction began, they would more than likely fail to recall the course content and be less likely to implement technology into their classrooms if they had only enrolled in one course about technology integration in their education programs. Comparatively, Rosaen and Terpstra (2012) conducted a qualitative research study and analyzed 51 preservice teachers' written course work during their third and fourth semesters. The researchers coded the work using a 4-point scale independently and then collaboratively compared and reevaluated their findings.

The researchers interpreted the findings between the two cohorts who were taught information about digital literacies and afforded opportunities to create hands-on work. Like Friedman and Kadjer (2006), the researchers found that preservice teachers acquired a broader concept of literacy and could broadly discuss the importance of implementing technology into the classroom but were unable fully to incorporate digital technologies into their planning. Perhaps the lack of digital technology inclusion by preservice teachers is linked to a low perceived self-efficacy. Tracey and Morrow (2012) stated, "According to Bandura, people with highly perceived self-efficacy try more, accomplish more, and persist longer at a task than do people with low perceived self-efficacy" (p. 132).

Personal Use and Pedagogical Understandings

Interestingly, Hundley and Holbrook (2013) found teacher candidates were avid users of technology in their everyday lives, but resisted when asked to implement digital literacies into their writing assignments. Participants expressed that creating writing

projects using anything but conventional writing was not real writing, and were convinced that the correct way of writing was the way they had learned in elementary, middle, and high school. Hundley and Holbrook (2013) reported that preservice teachers wrestled with the complexity of images coexisting with the text, and often would add text along with the images to be sure the readers fully understood what was being conveyed. When participants attempted to create multimodal writing projects, they mentioned how difficult it was to imagine the final product.

Preservice Teachers' Evolving Perceptions via Reflection

Hundley and Holbrook (2013) questioned preservice teachers who learned to create multimodal writing projects and asked them to analyze the composition process they had created in the hopes that they would gain a deeper pedagogical understanding of the writing process when integrating conventional writing with digital literacies. Results indicated a minor shift in their resistance. According to Hundley and Holbrook (2013), the majority of the preservice teachers viewed digital literacies as support for literacies used in school but did not view digital technologies as tools for composing new types of multimodal ensembles. In addition, Parkes and Kadjer (2010) conducted a case study consisting of English and music majors that required students to reflect often upon their learning by using E-Portfolio, Vlogs, and blogs as a means for students to post their reflections about their experiences and practices throughout the fall and spring semesters. The authors created congruent prompts and a rubric to assess students' reflections during the fall semester. Professors responded to the undergraduates each week and continued to converse on the topics well after their comments were made. The students were thought to have a deeper understanding through reflection.

Condy et al.'s (2012) study yielded similar results to Parkes and Kadjer's (2010) study and indicated that preservice teachers gained a deeper understanding of the pedagogical principles when they reflected on creating their digital storytelling. Parkes and Kadjer (2010) found that teachers who had the least experience with the technology expressed the most negative feedback, but revealed that their learning was augmented through self-examination. Notably, when the students were asked for their thoughts about the process, they stated that more specific prompts were necessary to know what to reflect on, and examples of reflections were needed to understand what constituted a good reflection.

Summary

This chapter included information on how the definition of literacy is changing at a rapid pace and how coordinators of teacher preparation programs need to be ready to prepare preservice teachers for the challenges of teaching digital technologies in coexistence with conventional print in the classroom (Hundley & Holbrook, 2013). In education programs, professors should be careful in making assumptions about the technological ability of preservice teachers to create multimodal projects based on their success with technology in their personal lives (Al-Hazza & Lucking, 2012). As shown in Hundley and Holbrook's (2013) study, the researchers acknowledged their own naivety that was based on the students' avid use of technology in their personal lives. Hundley and Holbrook presumed that preservice teachers would be able to compose multimodal writing projects, however, their previous experiences with writing in school strictly consisted of writing conventional compositions. Preservice teachers should be able to develop "a critical lens through which they will be able to question, challenge, and select

appropriate technologies for the classroom" (Friedman & Kadjer, 2006, p. 150). And they must reflect upon their personal identities to recognize the patterns that affect what type of teacher and what type of digital literacies that they will incorporate into their classrooms (Burnett, 2011; Friedman & Kadjer, 2006). Therefore, Hundley, Holbrook, and Sheridan-Thomas recommend that teachers receive time to take risks when designing, teaching/delivering, and reflecting upon the multimodal lessons that they are incorporating in their field work or classrooms (Hundley & Holbrook, 2013; Sheridan-Thomas, 2007).

Furthermore, when preservice teachers become in-service teachers, they are required to possess knowledge about the course content they will be teaching, and be able to reach diverse students through multiple modes of learning such as auditory, visual, written, and oral communications. It is critical for professors and selected teacher mentors to possess content knowledge and to model how to reach diverse learners through multimodal ensembles (Condy et al., 2012; Dymoke & Hughes, 2009; Sheridan-Thomas, 2007). Moreover, research has suggested that professors and in-service teacher mentors—during course work and field work—must (a) model, (b) be supportive, (c) trained, and (d) prepared with technological pedagogical skills, which are essential to apply when modeling how to create a colearning environment and multimodal projects (Condy et al., 2012; Hundley & Holbrook, 2013; Kajder, 2005).

In light of these findings, it is important for preservice teachers to gain pedagogical content knowledge, to learn how to use technology, and to learn how to teach in classroom environments where print and digital literacies/technologies coexist. Researchers suggest that these components be taught simultaneously in education

programs (e.g., Hundley & Holbrook, 2013; Kadjer, 2005). In addition, technology courses needed to be directly connected to the content area in which the preservice teachers will be teaching (Friedman & Kadjer, 2006). For further research, Kadjer (2005) recommended designing and administering formal assessments to gauge the pedagogical development at the beginning and end of the preservice teachers' field placements. Additionally, the complexity of understanding new literacies and creating surveys to monitor the developing views and attitudes of preservice teachers in future research is recommended. Therefore, designing and administering sound survey instruments that are utilized through repeated research is essential to understanding the complexity of developing views that preservice teachers possess about new literacies (Al-Hazza & Lucking, 2012).

The subsequent chapter, Chapter III, establishes the appropriate methodology for conducting a hermeneutic content analysis (HCA) that sought to find the relationship, or the lack thereof, between digital technologies being used to create multimodal ensembles in teacher education programs. In addition, Chapter III includes the sampling design, data collection, software, and analysis of the data.

I wanted to answer the following question:

1. In what ways are preservice teachers taught to create multimodal ensembles using digital technologies in preservice teacher preparation programs?

CHAPTER III

Methodology

This chapter aims to provide the methodology used to conduct the hermeneutic content analysis. In addition, an explanation of how the mixed methods approach is used to compliment the qualitative approach with the quantitative data analysis. The first section of this chapter consists of the restatement of the problem, the mixed methods question, and the methodological framework for the study. Following this information are the participants for qualitative and quantitative phases, the mixed methods sampling scheme, and the qualitative and quantitative instruments such as words and phrases that were coded and analyzed throughout the study. Next, the procedures, ethical nature of the data collection, research paradigm, and research design for the qualitative and quantitative phases of the study are described. Then, the mixed methods research paradigm, design, purpose, and analysis for qualitative, quantitative, and mixed phases are addressed. Finally, the chapter concludes with a delineation of findings section.

Is a content analysis quantitative, qualitative, or both? To answer this question, it depends on the research being conducted and the researchers research and words that are used to justify the design of the study. The content analysis method has an extensive history dating back to over 4,000 years. In the 1700s, Thomas Young quantified three scripts after discovering the Rosetta Stone (Neuendorf, 2002). In Sweden, scholars used content analysis during the 18th century to analyze hymns for anti-Christian thoughts (Hoffman et. al., 2012; Krippendorff, 2004). The content analysis method grew in popularity during the 20th century, specifically, in the United States and in Western Europe. In the 1930s and 1940s, analyzing textual data from journals, speeches,

newspapers, and other forms of written text was conducted using a content analysis (Bergman, 2010; Hoffman et.al., 2012; Krippendorff, 2004).

Whether or not to conduct a content analysis as qualitative, quantitative, or both, has long been debated between researchers (Holsti, 1969). According to White and Marsh (2006), a content analysis is an exceedingly flexible method used to analyze texts and textual artifacts. Therefore, the content analysis research method has been useful for qualitative, quantitative, or both research methods. Berelson (1952) stated that a content analysis is "a research technique for the objective, systematic, and quantitative description of manifest content of communications" (p. 15). On the other hand, solely quantifying the results can exclude all communications that are not quantifiable and might cause meaning to be lost for symbols, definitions, photographs, and other things of this nature (Selltiz et al., 1959). Smith (1975) states that both types of content analysis are appropriate strategies "because qualitative analysis deals with forms and antecedent consequent patterns of forms, while quantitative analysis deals with duration and frequency of forms" (p. 218). Smith mentions a second reason for using both qualitative and quantitative analysis. He states that the qualitative analysis has "emphasis on problem significance," whereas quantitative analysis "emphasizes precision of measurement" (p. 218). In addition, each analysis is essential for operationalization (Smith, 1975).

As previously stated, quantitative and qualitative analysis has been around for a long time and used explicitly since the 1950s and used for the social science methodology. According to Bergman (2010), there have been zero systematic efforts to pair a qualitative analysis and a quantitative analysis together using a mixed methods

framework; however, one way to bring the two traditions together is by using a hermeneutic content analysis (HCA). Usually, any attempt to use mixed methods for a content analysis consists of identifying codes and/or themes that researchers use to perform a statistical analysis. When conducting an HCA, data can be viewed through a constructivist, an interpretive, or a postpositivist framework. In this case, the quantitative part of this study complements the qualitative part because it provides additional insights about the results (Bergman, 2010). The purpose of this mixed methods research is complementarity. The quantitative and qualitative methods can overlap, but each analysis describes different parts of the study to provide an enhanced and intricate understanding of each analysis. Therefore, a partially mixed sequential equal status design (Leech & Onwuegbuzie, 2009) was the best analysis to conduct that would provide answers for the mixed methods question.

This particular mixed methods study was framed to show the relationship, or lack thereof, between multimodal ensembles, digital technologies, and teacher education programs. Furthermore, digital technologies and preservice teachers' perceptions provided the information, both inclusive and apart, to use digital technologies to create multimodal ensembles in teacher preparation programs. For example, if preservice teachers cannot read and decipher the digital literacies on or in the digital technology, this might imply how well or often digital technologies are used to create multimodal projects in their coursework and in their pre-K-12 classrooms.

The first section of this chapter consists of the restatement of the problem, the mixed methods question, and the methodological framework for the study. Following this information are the participants for qualitative and quantitative phases, the mixed

methods sampling scheme, and the qualitative and quantitative instruments such as words and phrases that were coded and analyzed throughout the study. Next, the procedures, ethical nature of the data collection, research paradigm, and research design for the qualitative and quantitative phases of the study are described. Finally, the mixed methods research paradigm, design, purpose, an analysis for qualitative, quantitative, and mixed phases are explained, and the chapter concludes with a delineation of findings section.

Role of the Researcher

My role as the researcher consisted of conducting and completing a hermeneutic content analysis. I chose to conduct the study by analyzing 14 journals and the published articles in those journals. During the analysis, journal articles were coded using the computer software QDA Miner, and emerging connections were sorted, analyzed, and reviewed for any relationship between digital technologies, multimodal ensembles, and teacher preparation programs.

In addition, the role of the researcher was to eliminate bias, so it does not interfere with the data collection, data analysis, or the results of the study. Throughout the process, personal biases and preconceived notions about the topic were identified and set aside to avoid interference with data collection, data analysis, or the results of the study. In addition, past personal experiences as an educator were continually reflected upon to avoid partisan interpretations of the analysis process; in other words, to ensure that my personal biased and beliefs did not affect the results of the study (Creswell & Creswell, 2018).

Participants for the Qualitative Phase

Academic journals and articles were chosen as the unit of analysis for the qualitative phase of this study. Abstracts and summaries of academic journals using search words and phrases such as multimodal, multimodal ensembles, digital literacies, digital technologies, preservice teachers, and teacher preparation programs were selected. Thus, academic journals and articles are the unit of analysis for the qualitative phase. In the spring semester of 2021, the probing began using search engines such as Academic Search Complete, Educational Resource Information Clearing House (ERIC), and Education Source using the Sam Houston State University (SHSU) website. Within these databases, the Boolean search operators using "AND" was employed to ensure that all words and phrases were included; this, however, resulted in a limited outcome. In addition, words and phrases used in each search engine included "multimodal AND digital technologies AND teacher education programs," "multimodal ensembles AND digital technology AND preservice teachers," and "multimodal AND digital technologies AND preservice teachers." During these searches, the "peer reviewed" and "education" boxes were selected to ensure that sound journals were chosen for this study. Narrowing the search and choosing only peer reviewed and educational journals that underwent rigorous peer review process increased the creditability of selected journals.

The ERIC database yielded the most journals and journal articles from the different searches. The highest number of hits was eight when using the words and phrases "multimodal AND digital technologies AND preservice teachers." Thus, I did not feel I had reached saturation or had a good sample size to conduct the study.

Therefore, further searches were conducted with each set of the aforementioned words and phrases using SHSU's library search engine, Engine Orange, which yielded 991 hits and 199 journals using the words and phrases "multimodal AND digital technologies AND preservice teachers." A purposeful random sampling scheme was used (Onwuegbuzie & Collins, 2007) to make the final selection of peer reviewed scholarly journals. From a list of 199 journals, the top 7% on the list, containing 12 or more articles with the aforementioned words and phrases, were selected. The 14 journals that were selected and included in the study are the following: *The Reading Teacher, British Journal of Educational Technology, Educational Technology Research & Development, Theory into Practice, Journal of Adolescent & Adult Literacy, Art Education, Australian Journal of Language & Literacy, Techtrends: Linking Research & Practice to Improve Learning*, *Education Sciences*, *TESL Canada Journal*, *Curriculum & Teaching Dialogue*, *Journal of Educational Technology & Society*, *McGill Journal of Education*, and *Reading Psychology*.

In addition to journals, websites and blogs were searched using the terms "multimodal AND digital technologies AND preservice teachers" Criteria included (a) discussing using digital technologies to create multimodal projects in preservice teacher education programs, (b) being current and active, and (c) writing by reliable individuals who belong to reputable educational organizations or higher education institutions. The search gleaned two blogs discussing what educator preparation programs could do to prepare preservice teachers to creating multimodal ensembles or projects using digital technologies. One blog is from everylearnereverywhere.org, titled Meet the Expert: How This Education Professor Fosters Multimodal Learning with Linguistically Diverse

Students, and another was from the International Literacy Association (ILA) website titled Five Shifts of Practice: Multimodal Literacies in Instruction.

Participants for the Quantitative Phase

Similar to the qualitative portion of this study searches for the quantitative phase began in the spring semester of 2021 using the same search engines: Academic Search Complete, ERIC, Education Source, and Engine Orange using the Sam Houston State University (SHSU) website. The quantitative phase counted emerging codes and connections among multimodal ensembles, digital technologies, and preservice teachers from abstracts and summaries of selected academic journals using the search words and phrases multimodal, multimodal ensembles, digital literacies, digital technologies, preservice teachers, and teacher preparation programs. Journal articles deemed appropriate for the study were further counted, analyzed, and selected via convenience sampling (Onwuegbuzie, & Collins, 2007).

Selected journals and articles were quantified and compared by the number of words and the number of developing connections between multimodal ensembles, digital technologies, and preservice teachers that arose out of the qualitative phase of the study via cluster analysis. The articles chosen were from the same 14 journals as selected for the qualitative phase of the study: *The Reading Teacher, British Journal of Educational Technology, Educational Technology Research & Development, Theory into Practice, Journal of Adolescent & Adult Literacy, Art Education, Australian Journal of Language & Literacy, Techtrends: Linking Research & Practice to Improve Learning, Education Sciences, TESL Canada Journal, Curriculum & Teaching Dialogue, Journal of*

Educational Technology & Society, McGill Journal of Education, and Reading Psychology.

Websites and blogs were searched for the terms "multimodal AND digital technologies AND preservice teachers" with the criteria that they (a) discussed using digital technologies to create multimodal projects in preservice teacher education programs, (b) were current and active, (c) were written by reliable individuals who belong to reputable educational organizations or higher education institutions. Two blogs discussed what teacher preparation programs could do to prepare preservice teachers to create multimodal ensembles or projects using digital technologies. One blog was from everylearnereverywhere.org, and it is titled Meet the Expert: How This Education Professor Fosters Multimodal Learning with Linguistically Diverse Students, and the other blog titled Five Shifts of Practice: Multimodal Literacies from the International Literacy Association (ILA). Data from the qualitative phase was used to gather data for the quantitative analysis, which in turn was quantified and analyzed to compliment the qualitative data.

Mixed Methods Sampling Scheme

A mixed purposeful sampling scheme was used for this mixed methods research study (Onwuegbuzie & Collins, 2007). For the qualitative phase, a random purposeful sampling scheme was used to select eligible journals. A convenience sampling scheme was used for the quantitative phase to complement the qualitative phase of the study. As a result, a more enriched and enhanced understanding of the analysis emerged. Therefore, a mixed purposeful sampling scheme was appropriate to complement the selected samples using different sampling strategies (Onwuegbuzie & Collins, 2007).

Qualitative Instruments

During the qualitative analysis, articles were chosen that aligned with two criteria, (a) coding the material and (b) identifying connections between multimodal ensembles, digital technologies, and preservice teachers. The ability to interpret and explain results, along with the acquired skills and knowledge, makes the researcher of this study a primary instrument for the qualitative analysis phase of this study and influencer of the validity of this research (Bahrami et al., 2016; Creswell & Creswell, 2018; Merriam & Tisdell, 2016). In addition, specific words and phrases from the electronic documents, i.e., journal articles and blogs, were utilized as relevant instruments for this qualitative study (Creswell & Creswell, 2018; Merriam & Tisdell, 2016).

Quantitative Instruments

As previously mentioned in Chapter I, the objective of the quantitative phase of the study was exploration, for which the hierarchical cluster analysis was chosen as the exploratory statistical technique. This technique does not assume that the variables are "mutually exclusive or normally distributed" (Bazeley, 2010, p. 448); therefore, the cluster analysis was suitable to analyze the qualitative coding (Bazeley, 2010; Bergman, 2010). The hierarchical cluster analysis technique explored the counted codes and connections from the electronic documents. The cluster analysis grouped the variables that were similar in their "pattern of distribution across the other axis"; thus, aiming to explore the information in-depth for new ideas and future research by way of the statistical information gained from the cluster analysis to interpret the findings (Bazeley, 2010; Bergman, 2010; Johnson & Christensen, 2014).

Qualitative Procedures

The subsequent procedures were taken from Creswell and Creswell (2018) and Merriam and Tisdell (2016) for this basic qualitative research study:

1. Journals were chosen using purposeful random sampling.
2. Articles were identified that contained the selected search words or phrases in the abstracts or summaries.
3. Article abstracts and summaries were read in their entirety.
4. The data was coded utilizing QDA Miner (Version 6) software.
5. Patterns and connections were focused on that emerged from the coded data.
6. Open codes were aggregated into more comprehensive categories.
7. Connections from the data were generated between multimodal ensembles, digital technologies, and preservice teachers, and the codes were scrutinized for more complex connections among the variables (Creswell & Creswell, 2018).
8. A detailed general description was provided of the emerging codes and connections that appeared during the data analysis experience.

Ethical Nature of Data Collection

A code of ethics was applied by (a) securing the documents in the office, (b) discussing the research with only select committee members, and (c) reporting the findings accurately (Christians, 2005). In addition, ethical advice, data collection boundaries, ethical and methodological choices were discussed with my dissertation chair and committee members (Patton, 2015). One of the significant factors affecting the validity and reliability of a study is the researcher. Patton (2015) states, “ultimately, for

better or worse, the trustworthiness of the data is tied directly to the trustworthiness of those who collect and analyze the data—and their demonstrated competence" (p. 706). Therefore, the researcher's experience, consistent process of thought, and training ultimately determine the credibility of a qualitative research study. To produce reliable results from the study, the researcher needs to be trustworthy and transparent (Merriam & Tisdell, 2016).

Ethical practice is dependent upon the researcher's own ethics and standards. The ethical issues that occur in qualitative research studies are more likely to occur during the collection phase and the circulation of the data results. For this study, the public had access to the same journals and journal articles as collected and analyzed by the researcher, making the ethical issue less problematic. However, data analysis can be more problematic for the researcher is biases are overlooked. Therefore, biases must continually be reflected upon and set aside, even when the researcher is the main instrument for the collection and analysis process. In other words, data was filtered through my theoretical perspective and biases that might not have been evident at the time of the collection analysis, or when deciding which information should or should not be included to avoid unknown biases that could potentially filter through the researcher's theoretical perspective. The aforementioned qualitative steps were followed exactly as written. The findings were reported using the codes and the connections that emerged from each document during the study. In addition, only positive findings were disclosed or those that provided a holistic view of the research findings (Creswell & Creswell, 2018; Merriam & Tisdell, 2016).

Research Paradigm

The qualitative phase of this hermeneutic content analysis (HCA) was viewed through a social constructivist lens (Bergman, 2010; Creswell, 2013; Tracey & Morrow, 2012; Vygotsky, 1978). Realities were reviewed from a multitude of lenses, and the data collected was honored from each document. Additionally, an inductive method of analyzing the documents was used to create codes, and a literacy style of writing was utilized to report the findings (Creswell, 2013).

Research Design

Merriam and Tisdell (2016) state, "Basic research is motivated by intellectual interest in a phenomenon and has as its goal the extension of knowledge" (p. 3). Of Newman et al. (2003) nine goals, three pertain to this study: (a) to add to the knowledge base, (b) to generate new ideas, and (c) to inform constituencies. This study aimed to add to the knowledge base and analyze the current conducted research.

During this study, novel ideas or concepts were allowed to organically emerge by setting aside preconceived ideas and biases and focusing on the information from the data analysis. The results of this study were intended to inform the constituencies about the relationship between digital technologies, multimodal ensembles, and preservice teachers. In turn, those who design and implement curriculum in teacher preparation programs could use the information to implement, change, or conduct further research on how best to incorporate more digital technologies to create multimodal ensembles in the teacher preparation courses. The main goal in this study was to uncover data and interpret the meaning revealed from the data analysis. Therefore, a basic qualitative study was appropriate for this study (Merriam & Tisdell, 2016). Commonly, in the field of

education, researchers designate their inquiry as a qualitative research study rather than specifying a particular type of qualitative study (Merriam & Tisdell, 2016), such as a phenomenological, a grounded theory, a narrative analysis, an ethnographic, or a case study (Creswell, 2013; Creswell & Creswell, 2018; Merriam & Tisdell 2016). It has long been disputed how to classify a common qualitative study. Merriam and Tisdell (2016) state three words that have been used to label this type of qualitative study: (a) generic, (b) basic, and (c) interpretive. Researchers believe that the word interpretive describes all qualitative research, and the word generic does not provide a precise meaning, so Merriam and Tisdell (2016) concluded that this type of qualitative research study is best regarded as a basic qualitative study.

Qualitative research is characterized by constructing reality from interactions with the world. Crotty (1998) states that people or researchers construct meaning by engaging with the world they seek to understand. To this end, researchers who conduct a basic qualitative research study are interested in (a) how experiences are construed, (b) how people construct worlds that pertain to them, and (c) what meaning is associated with their personal experiences. Thus, the general purpose of a basic qualitative study is to understand how individuals make meaning throughout their existence and experiences.

Quantitative Procedures

These were the subsequent procedures that were followed and completed during this study:

1. QDA Miner 6 was used to generate a hierarchical cluster analysis from the qualitative data.

2. The quantitative data complimented the qualitative data; therefore, data from the hierarchical cluster analysis was used to provide additional insights into the content of the qualitative data.

Ethical Nature of Data Collection

The qualitative data came from the quantitative data that was input using QDA Miner 6. A code of ethics was applied via (a) securing the journals and articles in the researcher's office, (b) discussing the research with select committee members, and (c) reporting the findings accurately (Christians, 2005). In addition, the quantitative steps listed under the quantitative procedures were followed exactly as written. Finally, the findings were honestly and holistically reported using the data that emerged in the cluster analysis, and all the findings, whether they were positive, negative, or contrary, were disclosed to provide a holistic view of the research findings (Creswell & Creswell, 2018; Merriam & Tisdell, 2016).

Research Paradigm

A postpositivist view was used in this HCA to analyze the quantitative data derived from the cluster analysis for each journal (Bergman, 2010; Creswell, 2013). Postpositivists view research as ever-changing and not absolute; researchers can never be completely sure of their research results when studying human behaviors and actions. Therefore, the results of the HCA were verified by the emergent data rather than by theory or pure logic. So, the variables from the cluster analysis of each journal were used to enhance and provide additional insight into the qualitative data. Through controlled, researcher bias, new knowledge was presented to inform educators about modifications

and recommendations that can be made where warranted in teacher preparation programs (Creswell & Creswell, 2018).

Research Design

A descriptive design was used in the quantitative phase of this study to numerically organize and present the data, which provided an adequate representation and increased understanding of the data. It appears that little is known about the use of digital technologies in regard to creating multimodal ensembles in teacher preparation programs. Therefore, the researcher aimed to (a) describe the research that exists, (b) note the relationship of the variables pertaining to a specific construct, and (c) categorize the information into specific constructs via QDA Miner 6 (Shea & Onwuegbuzie, 2008).

Mixed Methods Research Paradigm, Design, and Purpose

Throughout the mixed methods research study, a research-based philosophical stance of dialectical pluralism was appropriated. Dialectical pluralism involves a belief in incorporating multiple epistemological perspectives within the same inquiry (Johnson, 2011, 2012). Thus, a better understanding of how multimodal ensembles are created using digital technologies in preservice teacher preparation programs was explored. For this reason, dialectical pluralism assisted the in describing the findings using multiple epistemological perspectives throughout this research study (Johnson, 2011, 2012), and a partially mixed sequential equal status design was utilized (Leech & Onwuegbuzie, 2009).

The previously stated rationales for choosing a partially mixed sequential equal status research design were instrument fidelity and significance enhancement. Therefore, the study was partially mixed, with the qualitative phase being dominant and yielding

results compared to quantitative findings. The data gathered from the electronic journal articles were collected and analyzed sequentially.

The purpose of this mixed methods study was complementary. The study was conducted using different research methods to evaluate different levels of an occurrence. Furthermore, this complementary mixed method study aimed to use the quantitative data for additional insights and to compliment the qualitative data for a more robust interpretation of the results (Bergman, 2010; Greene et al., 1989).

Qualitative Analysis

A hermeneutic content analysis was conducted on data collected from academic journal articles using Engine Orange, a search engine, on the Sam Houston State University (SHSU) database. QDA Miner, Version 6 (Provalis Research, 2014a) was operated to identify emerging codes, and then the codes were counted (Leech & Onwuegbuzie, 2007). Codes that surfaced from the electronic documents were collected and assigned the code name posteriori (Constas,1992). Additionally, an exploratory stance was used to analyze the data. Finally, using a referential strategy helped justify selecting specific validated categories throughout the research findings (Constas, 1992).

After data were collected, a hermeneutic content analysis was conducted (Bergman, 2010). The software program, QDA Miner, Version 6 (Provalis Research, 2014a) was used to organize and to code the data. Counted codes yielded a detailed account of the connections that emerged from the data.

Quantitative Analysis

An exploratory statistical technique was conducted using a hierarchical cluster analysis. As a result, an exploratory analysis was used to conduct and analyze the

variables sequentially (Onwuegbuzie & Combs, 2010; Shea & Onwuegbuzie, 2008). After data collection and analysis, a descriptive analysis was applied to the data yielded by the cluster analysis (Bazeley, 2010; Bergman, 2010). Finally, the variables in each data set were summarized and observed for how the variables were related and interconnected (Johnson & Christensen, 2014).

Mixed Data Analysis

The mixed methods research study was sequential, with the qualitative and quantitative phases being of equal status (Bergman, 2010; Leech & Onwuegbuzie, 2009). The type of mixed methods analysis was a partially mixed sequential equal status design (Leech & Onwuegbuzie, 2009). Of the nine mixed analysis strategies identified by Onwuegbuzie and Combs (2010), three were utilized in this study: (a) data comparison, (b) data integration, and (c) warranted assertion analysis. A data comparison took place when the keywords of journal articles were compared across all of the journals in the study. Data integration occurred when the qualitative and quantitative data were examined, and the quantitative data were used to complement and enhance the qualitative data. After all the data were collected and analyzed, the qualitative and quantitative findings were comprehensively interpreted to make inferences.

Delineation of Findings

The results of this study were reported to the education field and shared with my dissertation chair and three additional committee members. Additionally, proposals were finalized and submitted to conferences held by the International Literacy Association (IRA) and the Association of Literacy Education Research in the year 2022.

CHAPTER IV

Analysis of Data

The primary purpose of this study was to reveal, through a hermeneutic content analysis, how 14 scholarly journals and two blogs, published between 2010 and 2020, advocated for better ways in which preservice teachers are taught to create multimodal ensembles using digital technologies in preservice teacher preparation programs. Unfortunately, the research about preservice teachers using digital technologies to create multimodal ensembles in teacher preparation programs is scarce (Hundley & Holbrook, 2013; Kadjer, 2005). Nevertheless, schools and curriculum standards require and expect teachers to implement digital technologies to create multimodal ensembles or projects.

These skills are necessary for preservice teachers to be able to mirror the way digital technologies and multimodal ensembles are used in real-world applications to ensure their students are prepared for the workforce (Al-Hazza & Lucking, 2012; Elstad & Christophersen, 2017; Farjon et al., 2019; Hundley & Holbrook, 2013; Howard et al., 2021; Leu et al., 2004; Oberländer et al., 2020; Serafini, 2014; The New London Group, 1996; Valtonen et al., 2015; Voithofer et al., 2019). However, most published research articles lack connections between multimodal ensembles, digital technologies, and preservice teachers.

Therefore, this chapter discloses findings on the connections from three sources of data: (a) 14 scholarly journals, (b) zero websites, (c) two blogs. After analyzing the data from each source, composite findings were summarized, results were coded, and connections that emerged between multimodal ensembles, digital technologies, and

preservice teachers were determined. In chapter V, these findings are explained. Finally, in this chapter, I report the connections that arose through the analysis of the data.

Sample Selection of Journals

From 2010 through 2020, abstracts for every issue published in 14 journals were identified, and an analysis was conducted to determine which articles incorporated multimodal ensembles, digital technologies, and preservice teachers. The question that guided the search was: Are the journals disseminating research supporting preservice teachers using digital technologies to create multimodal ensembles in teacher education programs? The 14 journals selected were: (a) *Art Education*, (b) *Journal of Adolescent and Adult Literacy*, (c) *Theory Into Practice*, (d) *TechTrends*, (e) *Curriculum and Teaching Dialogue*, (f) *Reading Psychology*, (g) *McGill Journal of Education*, (h) *British Journal of Educational Technology*, (i) *Educational Technology Research and Development*, (j) *TESL Canada Journal*, (k) *The Reading Teacher*, (l) *Australian Journal of Language and Literacy*, (m) *Journal of Educational Technology and Society,* and (n) *Education Sciences*. The *Education Sciences* journal was removed from the study for failing to meet the yearly 2010-2020 criteria. Journal articles from 2010 – 2020 were found by using the entries (a) preservice teachers, (b) digital technologies, and/or (c) multimodal ensembles. The initial search yielded 8,927 journal article abstracts, out of which 523 were selected for review because the journals referenced one or more of the aforementioned key terms. Of these, five of the journal articles were identified and selected for making a connection between the three key terms: (a) preservice teachers, (b) digital technologies, and/or (c) multimodal ensembles. Results of the initial search for published journal articles are as follows: *Art Education*, N=667; *Journal of Adolescent*

and Adult Literacy, N=996; *Theory Into Practice*, N=486; *TechTrends*, N=1105; *Curriculum and Teaching Dialogue*, N=297; *Reading Psychology*, N=351; *McGill Journal of Education*, N=454; *British Journal of Educational Technology*, N=1,299; *Educational Technology Research and Development*, N=688; *TESL Canada Journal*, N=249; *The Reading Teacher*, N=1,059; *Australian Journal of Language and Literacy*, N=247; *Journal of Educational Technology and Society*, N=1029. These scholarly journals revealed that one or two key terms were incorporated in the articles but lacked a connection with all three key terms. The specific research topic and research question revolved around the connection between preservice teachers using digital technologies to create multimodal ensembles in teacher education programs. Therefore, it was imperative to find the connection between all three key terms to answer the research question explicitly.

Journal Article Selection

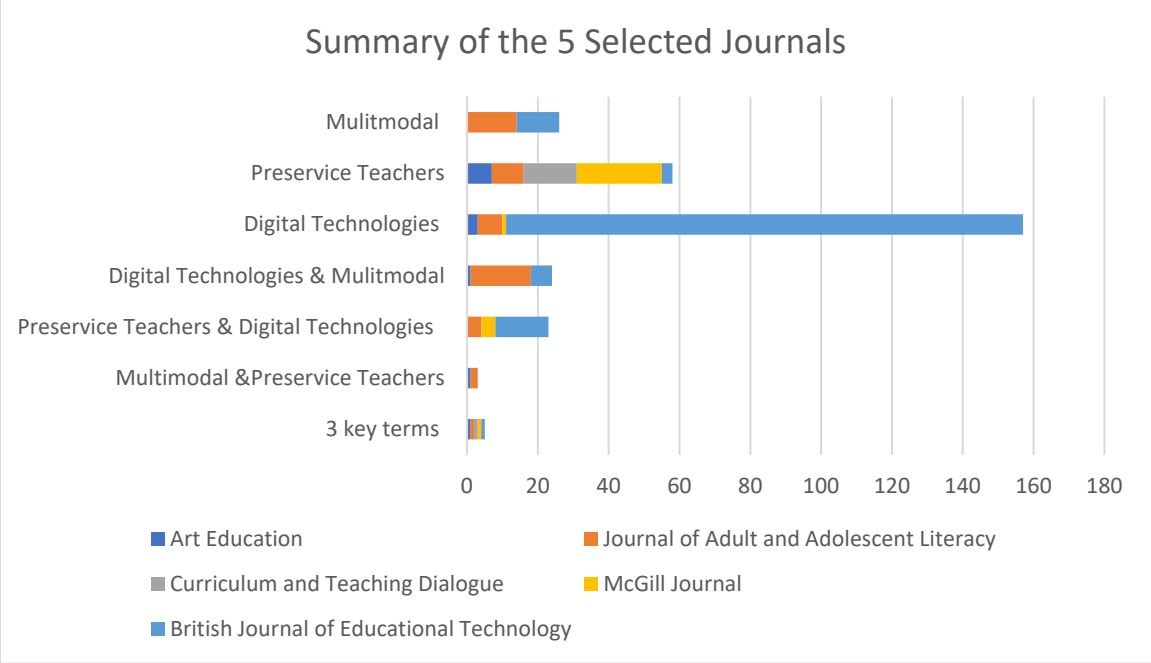
When the analysis of the journals concluded, there remained five journals that connected all three key terms advocating for teaching preservice teachers how to use digital technologies to create multimodal ensembles in teacher education programs. The goal for selecting these five journals was to examine further the five journal articles that combined all three key terms that I identified for this research. The five abstracts from each journal article selected for further examination included: (a) *Art Education*, N=13; (b) *Journal of Adult and Adolescent Literacy*, N=54; (c) *Curriculum and Teaching Dialogue*, N=16; (d) *McGill Journal of Education*, N=30; (e) *British Journal of Educational Technology*, N=183. The purpose of this research study was to find the connection between all three key terms.

Next, I coded all of the articles with the specific key terms found between the years 2010 and 2020. The codes included: (a) preservice teachers, (b) digital technologies, and (c) multimodal ensembles. Journals excluded from the study for lacking the relevant research criteria were (a) *Theory Into Practice*, (b) *TechTrends*, (c) *Reading Psychology*, (d) *Educational Technology Research and Development*, (e) *TESL Canada Journal*, (f) *The Reading Teacher*, (g) *Australian Journal of Language and Literacy*, (h) *Journal of Educational Technology and Society*, and (i) *Education Sciences*. Finally, the sampling selection of journals was narrowed considerably to five that contained articles with the specific key term incorporating and showing a connection between preservice teachers, multimodal ensembles, and digital technologies.

Additionally, 291 article abstracts discussed one or two of the key terms but did not encompass all three key terms to make the connection needed to answer the question for this study. Of the 291 article abstracts, 50 articles discussed only two of the keywords. Of the 50 articles, three discussed multimodal ensembles and preservice teachers, 23 discussed preservice teachers and digital technologies, and 24 discussed digital technologies and multimodal ensembles. In addition, 241 articles only discussed one of the key words. Of the 241 articles, 157 discussed digital literacies, 58 discussed preservice teachers, and 26 discussed multimodal ensembles.

Figure 1

Summary of the 5 Selected Journals

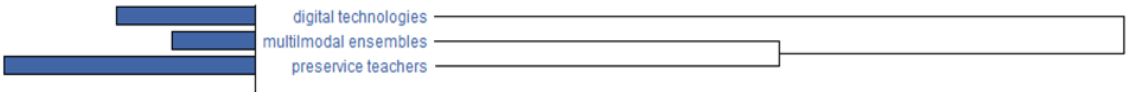


Journal 1: Art Education

This journal had a total of 667 abstracts that were reviewed, with a total of 13 articles identified to meet the requirements of this study. Of these articles, one was selected for incorporating and making the connection between digital technologies, preservice teachers, and multimodal ensembles. Additionally, two article abstracts discussed two of the key terms. Of the two articles, one discussed multimodal ensembles and preservice teachers and one discussed digital technologies and multimodal ensembles. Furthermore, 10 articles only discussed one key term. Of those 10 articles, three article abstracts discussed only digital literacies, and seven article abstracts discussed preservice teachers.

Figure 2

Relationship Between Key Terms: Art Education



The one qualifying by Ivashkevich (2015), which connected all three key terms, discussed the new media class she created for preservice art teachers. She noted that "Today's global digital culture not only engages young people in daily consumption of visual images, texts, and artifacts, but also provides them with the tools to actively participate in the production of imagery and narratives" (Ivashkevich, 2015, p. 1). The researcher created a course that allowed preservice teachers to remix and rework images, videos, music, and other multimodal literacies. Ivashkevich (2015) recognized that preservice teachers often do not possess the tools to analyze and interpret existing media text or their creations. Furthermore, preservice teachers often lack the skills to create multimodal projects to exhibit their potential as prosumers. For these projects, toys were chosen because they have been important to children in Western societies since prehistoric times. To complete the project, the preservice teachers chose a popular children's toy, created a script about the toy, and took pictures with digital cameras and tripods. Finally, the preservice teachers created films with digital pictures and added sound, text, music, and transitions to the footage using iMovie. The preservice teachers used recontextualizing to change environments and situations not typical of the toy that was chosen, a narrative disruption that interrupted predictable or linear narrative events, and Parodies that created a playful script and film.

Ivashkevich (2015) stressed that animation film production using figurines can be taught and is relevant at any grade level. Teaching these skills allowed students to

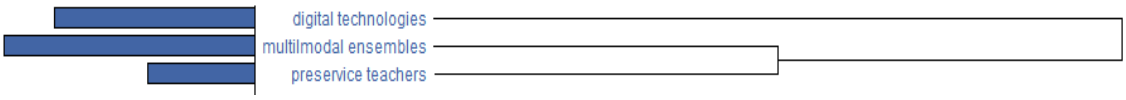
become critical and skilled prosumers of digital media and visual culture in society. However, to create these multimodal projects, students required digital tools. Thus, learning to design these projects at school is one of the only ways many students learn to create multimodal and multimedia projects due to a lack of resources in their homes. Ivashkevich (2015) concluded with the understanding that creating these projects calls for access to digital technologies, critical thinking, and thought-out ways to reuse and remix cultural images and texts. In turn, creating these projects can provide the potential for students to possess digital citizenship in the 21st century.

Journal 2: Journal of Adult and Adolescent Literacy (JAAL)

When analyzing the *Journal of Adult and Adolescent Literacy*, 996 total abstracts were reviewed, with a total of 54 articles deemed to meet the requirements of this study. Of these articles, one was selected for including and making the connection between digital technologies, preservice teachers, and multimodal ensembles. In addition, 23 article abstracts discussed two of the key terms. Of the 23 articles, two articles discussed multimodal ensembles and preservice teachers, four articles discussed preservice teachers and digital technology, and 17 discussed digital technologies and multimodal ensembles. Furthermore, 30 articles only discussed one key term. Of those 10 articles, three article abstracts discussed only digital literacies, and seven only discussed preservice teachers.

Figure 3

Relationship Between Key Terms: Journal of Adult and Adolescent Literacy



In the article identified as making a connection between multimodal ensembles, preservice teachers, and digital technologies, Harvey et al. (2019) investigated how

multimodal literacy stations could support the eighth-grade students' learning of an introductory Shakespeare unit. Of the three researchers, one researcher was a teacher, one was a preservice teacher completing her student teaching, and one was an assistant professor. Because of the preservice teacher being included as a researcher in the study through the student teaching program, she was involved in planning the stations, equipping the stations with supplies, and helping the students with digital literacies or other problems during the learning process. Thus, the authors hoped students would be active and investigative learners rather than passively learning about Shakespeare.

The students moved through the stations to view virtual tours, explore videos, examine websites, retrieve scholarly excerpts and articles, and engage with other resources to find new information. After completing all five stations, the students acted out scenes from Shakespeare's play in class before attending a professional live performance at the closing of the Shakespeare unit. There were five stations set up for this study. Station one equipped students with a book, QR codes, and virtual reality devices. During this time, the students were able to tour the theatre where Shakespeare's plays took place. Station two allowed the students to scan several QR codes to explore websites that helped them immerse themselves in the era in which Shakespeare lived. Station three allowed the students to focus on different facets of Shakespeare's life by using the computer corner to access videos and biographies. Station four provided the students with QR codes, biographies, a graphic text, and a longer piece of work to learn about Shakespeare's writing. Finally, station five gave the students a choice to read a printed article on why Shakespeare's work is relevant even today, or they could scan a QR code on a smartphone or a classroom tablet to access the same information.

Throughout this process, students were to complete the objective of each station and use the provided guide to support them in completing the given information at each station. Furthermore, the students' interactions with digital technologies were closely monitored through audio transcriptions, video recordings, photographs, completed station guides, and survey responses. Harvey et al. (2019) found that virtual reality helped the students immerse themselves in the information, the stations allowed the students to collaborate at a deeper level, and the students were enthusiastic about participating in the learning process "because the classroom's modalities matched their literary appetites" (Harvey et al., 2019, p. 563).

In conclusion, the researchers' found students are equipped and eager to learn the information through different modalities. However, are teachers willing to have students collaborate, are schools willing provide the technology needed for this type of multimodal learning, are preservice teachers being taught how to practice digital integration in teacher preparation programs? Harvey et al. (2019) advocated for further research that is need to learn how teacher educators and in-service teachers can assist students in their literature studies through multimodal learning, and I agree. Our students require an educational experience that prepares them for a digital and multimodal society. What better place to begin these reformations than in teacher preparation programs?

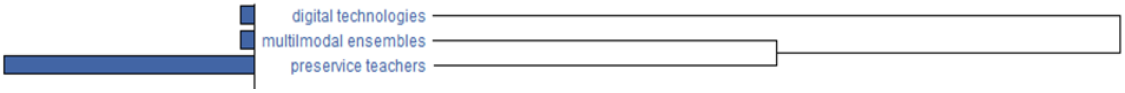
Journal 3: Curriculum and Teaching Dialogue

When analyzing the third journal, *Curriculum and Teaching Dialogue*, 297 articles were reviewed, with a total of 16 articles identified as meeting the requirements of this study. Of these articles, one was selected for having a connection between the three key terms digital technologies, preservice teachers, and multimodal ensembles.

Zero article abstracts discussed two of the key terms. Of the 16 articles, 15 abstracts discussed preservice teachers in some capacity.

Figure 4

Relationship Between Key Terms: Curriculum and Teaching Dialogue



The article written by Zoss et al. (2014) met the criteria for this study. Specifically, the authors connected all three key terms to describe how preservice teachers created multimodal projects using image, sound, print and digital technologies to create more writing projects. Zoss et al. (2014) sought to create a flexible learning environment to accommodate individual learning differences in their education courses. There were multiple forms of presentation built into the lectures, the projects and assignments were open-ended and flexible, the texts included print in addition to images, films, videos, and podcasts, and revisions and reflections of the students' work was used to enhance and deepen their learning. The authors modeled how to teach multimodal projects and use digital literacies in hopes that one day the preservice teachers would use these teaching pedagogies and practices in their classrooms filled with pre-K-12 students.

Zoss et al. (2014) implied that communication technology has changed literacy to literacies. Additionally, the researchers recognized that our society uses several communicative modes that include words, images, sounds, and gestures. Basic print texts now include images, hyperlinks, and other multimedia to help the reader make meaning of the text. The preservice teachers were asked to use images, sound, and words to create digital compositions. At the inception of the project, students are challenged to create an inquiry question about pre-K-12 education. Then, the preservice teachers chose three

genre pieces to create a multimodal ensemble to investigate and answer their inquiry question about pre-K-12 education. “For example, a student exploring community literacies created an image of a city park as an organizing visual metaphor and inserted links from swing set, sandbox, and merry-go-round to three related genre pieces” (Zoss et al., 2014, p. 58).

Throughout this meaning-making experience, the preservice teachers became more aware of their audience through composing with digital technologies. They had to think through how the audience would engage with their project and physically interact with the digital tools. The researchers advocated for joining technology with flexible and accommodating teaching practices. Through this flexible environment, the content was accessible, and expression was made possible. Zoss et al. (2014) imply, and I infer that digital technologies are being infused in educational settings, but there is still work to be done in teacher preparation programs to equip future teachers with the knowledge of how digital technologies play a role in student learning. The authors hope to challenge preservice teachers to reconsider what learning in pre-K-12 schools can look like. Zoss et al. (2014) hope that the pedagogical practices in preservice teacher programs will one day affect children in the pre-K-12 classrooms.

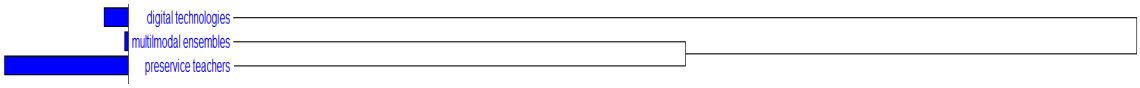
Journal 4: McGill Journal of Education

This journal had a total of 454 abstracts that were reviewed, with a total of 30 articles identified as meeting the requirements of this study. Of these 30 articles, one was selected for incorporating and making a connection between digital technologies, preservice teachers, and multimodal ensembles. Additionally, four abstracts discussed two of the key terms. The four articles mentioned above discussed preservice teachers

and digital technologies. Moreover, 25 articles only discussed one key term. Of those 25 articles, one article abstract discussed only digital literacies, and 24 article abstracts discussed preservice teachers.

Figure 5

Relationship Between Key Terms: McGill Journal of Education



The article deemed to fit the criteria of this study discussed preservice teachers' use of digital technologies to create a multimodal ensemble about critical moments that have taken place in their teaching practice. Radford and Aitken (2014) found that creating multimodal ensembles aide preservice teachers in engaging meaningfully with their personally unresolved conflicts. Furthermore, preservice teachers were challenged to produce three-minute films to depict moments they identified as critical during their teaching practices. Radford and Aitkens (2014) were trying to answer the following question: "What should our response be to becoming teachers' moments of pain that linger following their practicum" (Radford & Aitkens, 2014, p. 642)?

The researchers of this study explicitly stated how multimodal practices allow teacher educators to address specific ethical questions the preservice teachers might be conflicted with in their teaching practices. Moreover, preservice teachers might be conflicted within their teaching practices by creating space for preservice to practice with digital technologies to create multimodal projects to address their "critical moments" that occur throughout their teacher preparation programs. "The isolation of teachers, the dependency and vulnerability teaching accrue, and the problems of knowledge teachers

are supposed to possess" are some problems that continue to be unaddressed in preservice teacher programs (Britzman, 2003, p. 6).

During a three-year period, three cohorts participated in this study while enrolled in a required 72-hour interdisciplinary course that preservice teachers take in their last year of the teacher preparation program. Additionally, to complete the project, preservice teachers chose and participated in discourse about teaching incidents, replied to viewing experiences, worked with and created visually appealing elements while making the film, and participated in public viewing and discussion. Through, the back-and-forth process of generating the digital storytelling project might resolve personal conflicts during their teaching experiences.

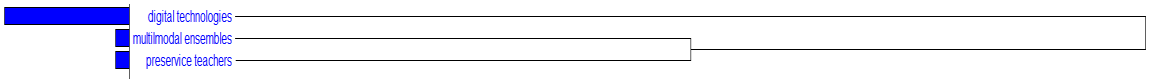
The digital stories were comprised of a script (roughly 300 words), images, videos, and music. The preservice teachers expressed themselves during this process, revisited and revised the digital story about their experiences, and discussed it publicly. In turn, this allowed their difficult or painful experiences to be validated.

Journal 5: British Journal of Educational Technology

This journal had a total of 1,299 abstracts between 2010-2020 that were reviewed, 183 articles identified to meet the requirements of this study. Of these 183 articles, one was selected for connecting digital technologies, preservice teachers, and multimodal ensembles. In addition, 21 abstracts discussed two of the key terms. Of the 21 articles, 15 discussed digital literacies and preservice teachers, and six articles discussed digital technologies and multimodal ensembles. Also, 161 articles only discussed one key term. Of those 161 articles, 146 article abstracts discussed only digital literacies, three discussed preservice teachers, and 12 discussed multimodal ensembles.

Figure 6

Relationship Between Key Terms: British Journal of Education



The final journal reviewed was the *British Journal of Education.* Starčič et al. (2016) contended that teacher preparation programs are criticized for inadequately preparing preservice teachers to feel confident using digital technologies in teaching. Digital technologies afford preservice teachers and students the opportunity to create multimodal ensembles and digital storytelling. Through these meaning-making opportunities, students can shape their social practices and identities. Starčič et al. (2016) conducted this study to integrate digital technologies to create digital stories. Their goal was to investigate if this integration affected the mathematic capabilities of preservice teachers.

The researchers considered the preservice teachers' lived experiences with technology and any university technology courses they had taken. Based on the study results, the student-teachers are capable of developing their content knowledge in mathematics problem solving by integrating mathematical problem-solving abilities with digital storytelling to solve mathematical problems. It is important to note that the preservice teachers thought of digital storytelling and multimodal design as new practices. In the beginning, they were passive learners and progressed to active producers of media content throughout this process. In the end, the preservice teachers perceived digital storytelling as means to empower students' voices and an active way to construct knowledge.

The evidence provided by this study showed that instruction included digital storytelling and multimodal ensembles can improve preservice teachers' pedagogical competencies and mathematical content knowledge. Starčič et al. (2016) revealed that combining digital storytelling and learning practices can provide preservice teachers and children they teach with opportunities to develop content skills and digital literacy skills. Starčič et al. (2016) conclude that teacher preparation programs should incorporate authentic content-based assignments to ensure the maximum effectiveness of multimodal ensembles in digital storytelling.

Data Analysis of Data Source 2: Zero Website

During the search for my second data source, the websites, no website met the criteria for this research project. For example, when I searched for "multimodal AND digital technologies AND preservice teachers" websites either discussed one key term or two of the key terms, but not all three key terms were discussed. I used search terms such as "multimodal AND digital technologies AND preservice teachers," "multimodal AND digital technologies AND teacher education programs," "multimodal ensembles AND digital technology AND preservice teachers," and "multimodal AND digital technologies AND preservice teachers." I looked for additional key terms that are also related to the three key terms used for this study: multimodal, digital literacies, and teacher preparation programs. In addition, my selection process also consisted of inspecting the website content (a) that discussed using digital technologies to create multimodal projects in preservice teacher education programs, (b) that are current and active, (c) that are written by reliable individuals who belong to reputable educational organizations or higher education institutions.

Data Analysis of Data Source 3: Blogs

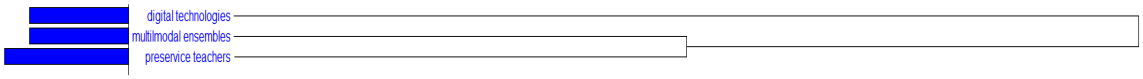
The third and final data source, and the source in which I repeated the same three coding cycles, resulted in two blogs that directly discussed what educator preparation programs can do to prepare preservice teachers to use digital technologies to create multimodal ensembles. During the selection process, I also searched for current and active blogs written by reliable individuals who belong to reputable educational organizations or higher education institutions. Many of the blogs considered for this study either discussed one key term or two key terms. Therefore, blogs that failed to integrate all three key terms were excluded from this study.

First Blog

The first blog (https://www.literacyworldwide.org/blog/literacy-now/2015/07/22/five-shifts-of-practice-multimodal-literacies-in-instruction) contained nine paragraphs discussing the integration of multimodal projects and digital technologies in teacher preparation programs. Seven of the nine paragraphs integrated or mentioned preservice teachers, multimodal ensembles, and digital technologies.

Figure 7

Relationship Between Key Terms: Five Shifts of Practice



The author of this blog discussed how the educational needs of 21st century learners are ever-changing. Because of this change, preservice preparation programs are responsible for equipping preservice teachers with the pedagogies, skills, and knowledge required to integrate these new literacies and digital technologies into multimodal instruction. Williams (2015) expressed that preservice teachers enter into teacher

preparation programs with deeply held beliefs concerning the use of digital technologies due to their own experiences of being taught using conventional teaching practices. Consequently, the preservice teachers are disinclined to incorporate digital technologies into their teaching practices. Williams (2015) reasoned that digital tools are usually used as a stand-alone practice in teacher preparation programs and that these programs need to provide multimodal literacy instruction infused with digital technologies. The author suggests that teacher preparation programs (a) should integrate multimodal literacies and digital technologies across all courses, (b) should focus on student-centered practices in learning spaces that promote exploration to compose multimodal literacies along with digital technologies, (c) should support preservice teachers critical thinking skills to investigate problems of the world and, in turn, produce multimodal projects to express their ideas.

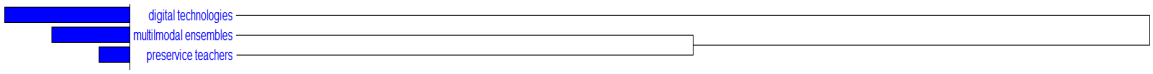
Of the nine paragraphs, two focused on discussing what teacher preparation programs can do to prepare preservice teachers for multimodal and digital practices. The first of the two paragraphs discussed using verbs to empower preservice teachers to select, to connect, and to discover ways to select methods and materials to create and to teach how to create multimodal projects. The second paragraph discussed how setting time aside for metacognitive thinking and reflection can benefit preservice teachers. Additionally, teacher preparation programs can provide these benefits by encouraging the preservice teachers to be curious, innovative, and offer preservice teachers a safe space to explore their ideas. Finally, teacher preparation programs and preservice teachers can reassess instructional practices to instigate change to make a difference in the lives of their current and future students.

Second Blog

The second blog (https://www.everylearnereverywhere.org/blog/meet-the-expert-how-this-education-professor-fosters-multimodal-learning-with-linguistically-diverse-students/) discussed how a professor fosters multimodal learning in her courses with preservice teachers. Similarly, this blog integrated multimodal ensembles, preservice teachers, and digital literacies. In this blog, the digital literacies code was used eight times, the multimodal ensembles code was used five times, and the preservice teacher code was used two times. Figure 7 reflects the relationship between the key terms.

Figure 8

Relationship Between Key Terms: Meet the Expert



Baker (2021) stated that Dr. Smith, works with culturally and linguistically diverse students. Because of this, the professor encourages the preservice teachers to choose real-world problems to express their ideas through visuals, texts, sounds, and movements to design multimodal projects. For example, the preservice teachers choose topics such as climate change, the border wall, and being an emergent bilingual. In addition, the student-centered assignments allow students to practice using digital technologies to create multimodal ensembles and reassure them that they can successfully develop scholarly projects.

Dr. Smith believes in composing multimodal projects because “there’s really power for students to express themselves in personally meaningful ways- ways they can leverage their linguistic and cultural backgrounds” (Baker, 2021). She strongly suggested that a written essay is only one way to practice analysis skills. Dr. Smith proposed that

preservice teachers should be challenged to create hyper-linked multimodal ensembles or a video that allows them to analyze literature through several modes and media. The key here is that preservice teachers are creating projects that are meaningful to their lives. Furthermore, students need to have the skills to read and write, but they also need the necessary skills to express their ideas multimodally with digital technologies through many different designs. In addition, Dr. Smith provides strategies to implement multimodal and digital learning successfully. Some of these strategies include: (a) providing a survey to measure preservice teachers' access to and knowledge about using digital tools, (b) modeling and providing clear instructions on how to use the needed digital tools, (c) fostering student-centered projects and feedback given by peers, (d) designing multimodal projects that students can share outside of the classroom, (e) preparing for glitches to happen when working with technology, (f) giving students time to reflect on their learning process. Dr. Smith argued, and I agree, that students should be creating multimodal projects that are applicable to the real world and to their personal lives.

Composite/Core Message

The connection between preservice teachers, digital technologies, and multimodal ensembles were made among the two data sources examined throughout this study. During my final analysis of the five journal articles in data source one and the analysis of the two blogs in data source three, the core message across these journal articles and blogs is that the teacher preparation programs need to prepare preservice teachers to use digital literacies to create multimodal ensembles through various formats. The various formats are multimodal, but they all had videos or short movies included in the projects.

The authors and researchers identified in the data sources expressed that they hoped the preservice teachers use their knowledge and skills to teach their pre-K-12 students how to use digital technologies to create multimodal ensembles. In turn, the skills and knowledge presented by the preservice students will prepare pre-K-12 students for the ever-changing and digitally infused workforce of the 21st century.

Summary

This is a hermeneutic content analysis, and this chapter shows the data from exploring and examining the three data sources, including five scholarly journals, zero websites, and two blogs. First, I explored the data for one or more of the specific key terms (preservice teachers, multimodal ensembles, digital technologies) through the hermeneutic content analysis. Next, I coded the data specifically, looking for connections made between all three key terms. Finally, through this research study, I aimed to answer the following question:

1. In what ways are preservice teachers taught to create multimodal ensembles using digital technologies in preservice teacher preparation programs?

In Chapter V, I present the implications, outcomes, discussions, and limitations of the research study. Additionally, Chapter V contains a review of the results and connections to literature in the field. Finally, a discussion of the limitations and concluding views on the outcomes and implications of this research study are shared.

CHAPTER V

Discussion, Findings, Limitations, Recommendations for Future Studies, Implications, and Conclusions

The original focus of this study was to explore and examine ways preservice teachers are being taught to use digital technologies to produce multimodal ensembles (Friedman & Kadjer, 2006; Hundley & Holbrook, 2013; Kadjer, 2005). As future in-service teachers, it is imperative that preservice teachers know how to create a classroom that prepares students for the technological and multimodal workforce they will inevitably enter after graduation (Elstad & Christophersen, 2017; Farjon et al., 2019; Hundley & Holbrook, 2013; Howard et al., 2021; Leu et al., 2004; Oberländer et al., 2020; Serafini, 2014; The New London Group, 1996; Valtonen et al., 2015). The three data sources for this inquiry encompassed scholarly journals, blogs, and websites that contained information about digital technologies, preservice teachers, and multimodal ensembles. This study was a hermeneutic content analysis with the framework of a partially mixed sequential equal status designed study (Leech and Onwuegbuzie, 2009; Nastasi et al., 2010). It can be debated that there are many reasons as to why this research needed to be conducted. The main reason for conducting this research was to add to the knowledge base by contributing to the current research conducted thus far. In addition, this study was used to inform the constituencies about the relationship between digital technologies, multimodal ensembles, and preservice teachers. In other words, I sought to inform teacher educators about how preservice teachers are being taught to use digital technologies to generate multimodal projects. With the results of this study, teacher educators who facilitate teacher preparation programs can implement, change, or conduct

further research to design multimodal projects using digital technologies in the teacher preparation programs. However, the hermeneutic content analysis results show that less than 1% of the abstracts and only two blogs met the criteria for this study. These findings lead me to conclude that there is an insufficient amount of research being conducted in this field of research.

In Chapter I, the reader was informed about the limited research conducted on how preservice teachers are being equipped to use digital technologies to create multimodal ensembles. The following researchers who have been influential to the study are Elstad, Christophersen, Holbrook, Hundley, Leu et al., Serafini, The New London Group, Friedman, and Kadjer. Chapter II contains the review of the literature that reflects the consensus of the scholarly journals on the topics of preservice teachers, digital technologies, and multimodal ensembles. I explained the reason for conducting a hermeneutic content analysis, my role as a researcher, research sites, set for the data collection, and the three data sources for this study in Chapter III. In Chapter IV, I analyzed the data the emerged throughout the data analysis for the three data sources: scholarly journals, websites, and blogs. The discussion of findings, limitations, implications, possible areas for future studies, and conclusions from the researcher are found in Chapter V. This chapter encompasses a discussion of the findings and possibilities for future research to expand upon this research to answer the research question:

1. In what ways are preservice teachers taught to create multimodal ensembles using digital technologies in preservice teacher preparation programs?

The research findings are summarized from the data collection of the three data sources. Furthermore, I discussed the pertinent findings that connect preservice teachers, digital technologies, and multimodal ensembles.

Discussion of Findings

The novel reason for this research analysis of 14 journals was to discover and reveal how preservice teachers are being taught to use digital technologies to create multimodal projects in teacher preparation programs. Are the journals publishing articles that are supporting teacher preparation programs to prepare preservice teachers to use digital technologies to create multimodal projects? My efforts to answer these questions included exploring and explaining how teaching with digital technologies and creating multimodal ensembles is being advocated to teacher educators through a hermeneutic content analysis of 14 scholarly, peer reviewed journals and two blogs. The results from the analysis show that less than one percent or (.056%) of the journal articles explicitly reported on practices linking digital technologies, multimodal ensembles, and preservice teachers. To answer the aforementioned question, no, the journals examined in this study are not supporting teacher educators to use practices that equip preservice teachers with the skills and pedagogies to prepare their future students for a digital and multimodal world. However, of the less than one percent, I determined that out of the five journals and two blogs the practice of using digital literacies to create multimodal projects is slowly becoming more pertinent. For example, two articles were published in 2014, and the other three articles and two blogs were published in 2015 to 2021.

In previous chapters, I discussed the curriculum requirements for teachers to teach their pre-K-12 students, a global digital and multimodal world, and preservice teachers' reluctance to use digital technologies to create multimodal projects.

Curriculum Requirements and Changes

Previously in this study, it was mentioned that curriculum requirements require students to "collect and organize information from a variety of formats, including text, audio, video, and graphics" (Texas Education Agency, 2011, para. 126.7, 3B). Curriculum requirements for technology use in grades 3-5 include drafting, editing, and publishing using different media, font, colors, graphics, and use appropriate collaboration tools (Texas Education Agency, 2011, para. 126.7, 2 a-d). The curriculum requirements for pre-K-12 students affect the curriculum and what is being taught in teacher preparation programs.

To meet the curriculum requirements, teacher educators can use Halliday's (1978) three metafunctions: (a) the ideational metafunction, (b) the interpersonal metafunction, and (c) the textual metafunction, which provide "a conceptual framework for representing the social context as the semiotic environment in which people exchange meanings" (p. 110). These metafunctions aim (a) to aide teacher educators to help preservice teachers to examine how thoughts and concepts are implied through selective language, (b) to indicate how a relationship between the producer and receiver is established via language use, (c) to demonstrate when the organization of language is completed in specific ways. Halliday's (1978) framework explains what multimodal texts do; therefore, the three metafunctions can help teacher educators implement digital technologies and create

meaningful relationships between the content in the multimodal ensembles (Serafini, 2014).

While reviewing the literature, it was found that teacher educators are beginning to recognize that incorporating digital technologies to create multimodal ensembles is vital and should be included in introductory courses (Friedman & Kadjer, 2006; Hundley & Holbrook, 2013; Kadjer, 2005). To highlight this, the findings of Ivashkevich's (2015) study stressed choosing a figurine and using animation film production can be taught and has relevance at any grade level. In addition, state curriculums and national curriculums require students to become skilled users of digital and visual media. Becoming skilled users of digital and visual media was reflected by Ivashkevich's (2015) study when preservice teachers were challenged to create a film using the skills they had acquired in this course. Ivashkevich (2015) reiterates that digital tools are needed to create these projects, and creating these projects at school is one of the only ways students can learn and acquire skills to use the digital literacies to create multimodal projects because of the lack of resources at home.

All three articles by Ivashkevich (2015), Zoss et al. (2014), and Starčič et al. (2016) support the need for digital literacies and multimodal ensembles to be taught in teacher education programs. Zoss et al. (2014) expressed hope that preservice teachers will use their knowledge and skills to teach children in pre-K-12 classrooms. Starčič et al. (2016) noted the necessity for preservice teachers and the children they will teach to learn and acquire skills for digital literacy development.

Preservice Teachers' Reluctance

Earlier in this study, it was mentioned that supporting preservice teachers' views is crucial for successfully getting them to use digital technologies willingly to produce multimodal ensembles. In addition, preservice teachers will be preparing their future students for a digital and multimodal workforce the students will enter upon graduation. Therefore, how the preservice teachers view their experiences learning to use digital technologies affects how they will incorporate these skills and pedagogies to prepare their future students to be successful in our digital and multimodal workforce. Leu et al. (2013) believe that teacher education programs can provide favorable environments for preservice teachers and foster their views and beliefs about making meaning with multimodal ensembles, and these skills can be carried into their teaching careers.

A thorough review of the literature showed that teacher candidates in Hundley and Holbrook's (2013) study were eager users of digital technologies in their everyday lives but resisted when asked to implement digital literacies into their writing assignments. Participants believed that creating writing projects using anything but conventional writing was not "real" writing. Nevertheless, they clung to the idea and were convinced that the correct way to write was the conventional way they learned to write in school (Hundley & Holbrook, 2013).

A review of the literature also revealed preservice teachers' tendencies to shy away from implementing technology into their classrooms because they possess too much or too little knowledge about technology. The preservice teachers expressed concern about losing control of the classroom environment, and they wanted to be viewed

as superior to the students when integrating technology in their lessons (Hundley & Holbrook, 2013; Kadjer, 2005).

To highlight this, the two blogs and three of the five journal articles recognized the reluctance of preservice teachers to use digital technologies to create multimodal ensembles. They express their thoughts about how to foster a positive learning environment for preservice teachers throughout their research. Williams (2015) stated that due to preservice teachers' experiences of being taught using conventional teaching practices, they enter into teacher education programs with deeply held beliefs about using digital technologies to create multimodal projects. Similarly, Starčič et al. (2016) point out that teacher education programs are criticized for underpreparing preservice teachers to feel confident using digital technologies in their pedagogies. They considered the past and present lived experiences of preservice teachers' use of and experiences with technology. In Starčič et al. (2016) study the preservice teachers thought of digital storytelling and multimodal design as new practices. The researchers conclude that through these types of meaning-making experiences, preservice teachers could form social practices and identities.

In addition, the results of the study found that researchers advocate for providing preservice teachers a safe, flexible, student-centered environment to choose real-world problems to express their ideas through visuals, texts, sounds, and movement to design multimodal projects. The objective was to have preservice teachers creating projects that are meaningful to their lives (Baker, 2021; Radford & Aitken, 2014; Starčič et al., 2016; Williams, 2015; Zoss et al., 2014). Teacher preparation programs and preservice teachers

can reassess instructional practices to instigate change to make a difference in the lives of their current and future students (Baker, 2021; Williams, 2015).

Global World

The workforce around the world is changing at a rapid pace. People are surrounded by different modes such as graphics, font, color, sound, images, and icons in their personal, community, and work lives (Leu et al., 2013). Multimodal ensembles are "a cohesive entity that uses a variety of semiotic resources, including written language, visual images, and design elements to represent and communicate ideas and meanings" (Serafini, 2014, p. 172). Members of society are expected to make meaning of these different multimodalities (Leu et al., 2013). Part of the curriculum requirements expect students to be able to "collaborate and communicate both locally and globally using digital tools and resources to reinforce and promote learning" (Texas Education Agency, 2011, para. 126.7, b2). Teacher educators need to teach these global skills to preservice teachers to ensure they are adequately prepared to teach their future students. Hundley and Holbrook (2013) posed a great question in their research study, "If the charge of teacher educators is to prepare teacher candidates, we must ask, what kinds of knowledge, skills, and experiences will they need to prepare their students for an increasingly complex multimodal, textual world?" (p. 502).

In the findings, both blogs and three of the five articles supported the idea of preparing preservice teachers to prepare their students for a digital and multimodal world. Baker (2021) claimed that Dr. Smith maintains that preservice teachers should be allowed to create hyper-linked multimodal ensembles or videos to analyze literature through several modes and media. These skills assist the preservice teachers in creating

multimodal projects that apply to the real world (Baker, 2021; Williams, 2015). To take this a step further, Radford and Aitken (2014) asked preservice teachers (a) to work with and create visually appealing elements, (b) to reply and respond to their viewing experience, (c) and to participate in a public viewing and discussion. As in the real world, conflicts might be resolved through the back-and-forth process of generating the digital story project. In our global society, creating multimodal projects with digital technologies conveys meaning to the targeted audience. Zoss et al. (2014) support this claim. They note that communication technology has changed literacy to literacies. Using multiple literacies and placing them strategically in multimodal projects, preservice teachers became more aware of their audience and enhanced their meaning making skills (Zoss et al., 2014). In addition to preparing preservice teachers, Harvey et al. (2019) created five multimodal literacy stations infused with digital technologies to assist school-aged students in making meaning of the content at each station. As a result, the students were able to collaborate, deliberate, and come to conclusions about the meaning of the content. This process is much like what students are sure to encounter when they enter the global workforce.

Limitations

There were some limitations to this research study. When I selected journals to review the articles, I specifically included scholarly, peer reviewed journals that resulted from the specific Boolean search operators. I used different combinations of the key terms multimodal, digital technologies, and teacher education programs with the word AND between the three terms. Perhaps using OR between the key terms would have cast a wider net and different set of journals to choose from and to conduct a purposeful

random sampling scheme (Onwuegbuzie & Collins, 2007). During the selection process, I chose to look for articles that connected all three key terms. This process resulted in five out of the 14 journals being selected. The journals included were: *Art Education*, *Journal of Adult and Adolescent Literacy*, *Curriculum and Teaching Dialogue*, *McGill Journal of Education*, and *British Journal of Educational Technology*. Thus, a more extensive selection of journals could have resulted in more journals and journal articles that showed a relationship between multimodal ensembles, digital technologies, and teacher education programs. I used the same set of aforementioned key terms in the Google search engine to look for the blogs. Perhaps using more terms related to the key terms or using OR in place of AND would have resulted in more blogs to include in the study.

Researchers have debated for years about the methodology of a content analysis. Should it be conducted as a qualitative, quantitative, or mixed methods type study? (Holsti, 1969). As a novice researcher, most of the content analysis studies that I have read, and been exposed to, are strictly conducted using a qualitative research design. I tend to agree with the researchers that advocate for a mixed methods research approach. Bergman (2010) stated that there had been zero systematic efforts to combine a qualitative analysis and a quantitative analysis using a mixed methods framework. Therefore, I chose to conduct a hermeneutic content analysis using a partially mixed sequential equal status designed study (Leech and Onwuegbuzie, 2009; Nastasi et al., 2010). For this hermeneutic content analysis study to be strong, rich descriptions, exploratory research, and the quantitative data should complement the qualitative data. Again, because I am a novice researcher, the descriptions and connections might lack a thick and rich explanation of the results. Maybe I could have explored the subject and

journals more deeply and complimented the qualitative with the quantitative data. As I become more knowledgeable and gain more experience as a researcher, I believe I could see more connections between the data and provide a more detailed and thicker description of the data for the consumer of the research. Nonetheless, this study is a starting point for similar research to be conducted in the future.

Implications

According to Al-Hazza & Lucking (2012) and Howard et al. (2021), it is essential to support preservice teachers' pedagogical understanding and skills for teacher educators to assist them in designing and producing lessons using digital technologies to create multimodal means in their courses. Preservice teachers are responsible for teaching and equipping the future students who enter their classrooms how to connect and how to collaborate effectively using digital technologies to create multimodal projects (Elstad & Christophersen, 2017; Leu et al., 2004; The New London Group, 1996; Valtonen et al., 2015). Through their study, Hundley and Holbrook (2013) found that preservice teachers face challenges when incorporating technology into their course assignments. Likewise, Friedman and Kadjer (2006) found that preservice teachers (a) did not participate in technology instruction before the course and wanted faculty members to model how to integrate technology, (b) thought technology in education courses should be current and mirror what is available in pre-K-12 schools, and (c) recognized the value of integrating technology. Therefore, to meet the demands of educating youth in a digital and multimodal society, it is vital for teacher educators to modify and to design the course work required for preservice teachers to incorporate digital technologies and multimodal

ensembles (Farjon et al., 2019; Hundley & Holbrook, 2013; Oberländer et al., 2020; Serafini, 2014; Voithofer et al., 2019).

As discussed in this study, the connections between preservice teachers, multimodal ensembles, and digital technologies provide examples of how and why digital technologies are used to create multimodal ensembles in teacher preparation programs. This paper provides ways digital technologies can be incorporated into courses in teacher preparation programs to produce multimodal ensembles. Furthermore, teacher educators can assess the studies and implement the ideas into their teacher preparation courses. The research conducted for this study suggests that preservice teachers need to have a positive outlook on using digital technologies so they are able to teach their students these skills to prepare them for the digital and multimodal world.

Implications for Preservice Teachers

Preservice teachers might be more open to learning about how to design, produce, and create multimodal ensembles using digital literacies, knowing that state and national standards for public schools can and do require these skills for pre-K-12 students to be able to function in a digital society successfully. Perhaps, this study can provide more collaboration between preservice teachers and the teacher educators who teach their courses. Furthermore, preservice teachers might feel empowered to work more collaboratively with teacher educators and make suggestions while taking courses.

Implications for Teacher Preparation Programs

Hundley and Holbrook (2013) pose a great question, “If the charge of teacher educators is to prepare teacher candidates, we must ask, what kinds of knowledge, skills, and experiences will they need to prepare their students for an increasingly complex

multimodal, textual world?" Hundley & Holbrook (2013, p. 502). This research could be a starting point for teacher educators to begin answering this question. Rather than continuing to teach traditional print to produce multimodal ensembles and teaching technology in isolation, teacher educators could look at how digital technologies are being used to create multimodal ensembles. From this study, teacher educators can take the ideas from the studies and implement these pedagogical skills in to their courses. Specifically, teacher educators can provide preservice teachers with the pedagogical skills to prepare their future pre-K-12 students to enter the workforce of the ever-changing digital and multimodal society they will inevitably encounter.

In addition, this research study provides teacher educators with knowledge about preservice teachers' self-efficacy surrounding using digital technologies and producing multimodal ensembles. Teacher educators are becoming increasingly aware of preservice teachers' self-doubt and negative attitudes when using digital technologies. The findings in this research could empower teacher educators to learn along with the preservice teachers while providing them with modeling and support throughout the process of creating multimodal ensembles (Al-Hazza & Lucking, 2012; Howard et al., 2021).

It is especially important due to the growing pressure of producing pre-K-12 students who can successfully function in a digital and multimodal society. In addition, the global workforce is changing for students who are graduating from school. As a result, they are expected to be able to use digital technologies and create multimodal ensembles to make meaning for various audiences (Farjon et al., 2019; Hundley & Holbrook, 2013; Leu et al., 2004; Oberländer et al., 2020; Serafini, 2014; The New London Group, 1996; Voithofer et al., 2019).

Conclusion

For this hermeneutic content analysis (Bergman, 2010), I gathered and analyzed data to present various ways digital technologies are being used to design and create multimodal ensembles in preservice teacher preparation programs, if at all. I am confident that my attempt to bring awareness to the connection between multimodal ensembles, digital technologies, and preservice teachers and how the information is being circulated to teacher educators has been satisfied. Two articles were published in 2014, with the remaining articles and blogs being published from 2015 to 2021. The findings in these five journals and two blogs indicate that educators and researchers are slowly but certainly moving in the direction toward recognizing the need to use digital technologies to produce multimodal ensembles in teacher education programs.

Previous research has been conducted with digital technologies used in isolation or text based multimodal projects (Williams, 2015). However, to my knowledge, few studies have been conducted that connect digital technologies, multimodal ensembles, and preservice teachers (Hundley & Holbrook, 2013; Kadjer, 2005). Furthermore, the literature review revealed a gap in research conducted with preservice teachers enrolled in preservice teacher education programs. Hence, the lacking research in this area. Nevertheless, the current body of knowledge provides suggestions and examples supporting preservice teachers (a) to create multimodal ensembles, (b) to cohesively use digital technologies rather than use them as an isolated tool, (c) to design and create multimodal ensembles with digital technologies, and (d) to prepare preservice teachers to prepare their pre-K-12 students for a digital and multimodal society (Williams, 2015).

Preservice teachers use digital technologies in their everyday lives but fail to connect to their pedagogy and production of projects. Preservice teachers have been taught using conventional methods (Williams, 2015). Therefore, preservice teachers often see digital technologies as intimidating and challenging to use when creating multimodal ensembles in their course work (Hundley & Holbrook, 2013; Kadjer, 2005). Teacher educators can model how to use digital technologies to create multimodal ensembles, take on the role of the facilitator, and support teachers when they struggle to use digital technologies for educational purposes. If preservice teachers are to successfully incorporate digital technologies and multimodal learning into their course studies and pedagogies, the types of aforementioned support from teacher educators are vital (Williams, 2015).

Oftentimes digital technologies are used as an isolated tool. For example, preservice teachers could search for an answer to a question using their smart phones or tablets. This is hardly the cohesive type of learning that needs to be taking place with digital technologies. Learning how to use digital technologies to design, create, and evaluate a multimodal project takes a different set of skills than conventional teaching and learning. To teach this set of skills, teacher educators should provide multiple opportunities for preservice teachers to use digital technologies to design and produce multimodal ensembles. In addition, using digital technologies in this way throughout teacher education programs would be most beneficial (Williams, 2015).

To further entice preservice teachers to be open to learning and creating in a digital and multimodal world, a student-centered environment and a personal reason to create multimodal ensembles are essential to the learning process. In the review of the

literature and the research that was used for this study, researchers noted that giving the preservice teachers choice in choosing a topic that was personal to them allowed for more creativity, expression, and a more profound desire to complete the project (Baker 2021; Ivashkevich, 2015; Radford & Aitken, 2014; Zoss et al., 2014).

The ultimate goal of teacher preparation programs is to equip preservice teachers with the essential pedagogies and skills that are required to prepare their future pre-K-12 students to enter the workforce after graduation. Our society has evolved and now includes digital technologies and multimodal ensembles as part of the workforce. Therefore, it is essential to prepare preservice teachers the skills and pedagogies to successfully use digital technologies to create multimodal ensembles (Al-Hazza & Lucking, 2012; Elstad & Christophersen, 2017; Farjon et al., 2019; Hundley & Holbrook, 2013; Howard et al., 2021; Leu et al., 2004; Oberländer et al., 2020; Serafini, 2014; The New London Group, 1996; Valtonen et al., 2015; Voithofer et al., 2019). Fostering a positive and student-centered learning environment can help change preservice teachers' preconceived beliefs and attitudes toward using digital technologies to produce multimodal ensembles (Williams, 2015). Preservice teachers should leave teacher preparation programs with the knowledge, skills, and confidence to prepare their future students to succeed in our digital and multimodal society (Williams, 2015; Zoss et al., 2014).

Future Studies

There are several opportunities for future studies to be conducted in the field of preservice teachers, digital technologies, and multimodal ensembles. First, teacher preparation programs can be explored in-depth to uncover what professional development

teacher educators are receiving in digital technologies and multimodal ensembles. In addition, preservice teachers and teacher educators' attitudes and perspectives pertaining about the technology used to create multimodal ensembles can be studied comparatively. Finally, the role of digital technologies at the collegiate level can be explored in-depth. What are preservice teachers specifically using digital technologies for in the courses?

Furthermore, curriculum requirements can be explored in teacher preparation programs for digital technologies and multimodal learning. Is what is being taught matching the requirements? A different set of scholarly journals could be randomly selected to replicate this study.

Researcher's Reflections

As a doctoral student, I became interested in using digital technologies to create multimodal ensembles through the elective courses I completed throughout the program. Investigating this topic and conducting this study was important to me. I have taught elementary and secondary students, taught as a private tutor, taught ESL online, and taught preservice teachers enrolled in teacher education programs face-to-face and online. I understand the demands that are put on teachers in schools to meet the curriculum requirements. As an instructor, I noticed preservice teachers' reluctance to use digital literacies and create multimodal projects in their courses. In addition, I noticed my lack of skills and knowledge as far as using digital technologies to create multimodal ensembles. As an instructor, I felt I needed more professional development to learn these skills and teach the students to the best of my ability.

Moreover, the curriculum requirements are not being met to the fullest extent. As a teacher educator, I feel responsible to help my students reach their full potential. What

is taught in teacher preparation programs has ripple effect to pre-K-12 students. All educators have an obligation to ensure our students are ready for a technological and multimodal society.

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APPENDIX

Table 1

Internal Credibility in the Qualitative Phase

Limitations	Explanation	Possible Occurrences During the Research Study
Design/Data Collection:		
Voluptuous legitimation	Level of interpretation exceeds the researcher's knowledge base determined by the data	After gathering data, the results the level of interpretation might surpass the researcher's knowledge
Descriptive validity	Researcher's accuracy and adequacy of the account that occurred during data collection	The researcher might misinterpret the account when gathering information from journals
Researcher bias	This type of bias arises when a researcher actively or passively has personal bias that they are unable to detect	Researcher bias might arise after the data are collected from the universities
Illusionary correlation	Detects relationships when in actuality the relationship is nonexistent	Researcher bias can be formed when the researcher is interpreting data
Effect size	Contributes a denser description of the data	The number of selected journals might not contribute to dense description of the data

Note. Adapted from Onwuegbuzie, A. J., & Leech, N. L. (2007). Sampling designs in qualitative research: Making the sampling process more public. *The Qualitative Report*, *12*, 238-254. Retrieved from http://www.nova.edu/ssss/QR/QR12-2/onwuegbuzie1.pdf

Table 2

External Credibility in the Qualitative Phase

Limitations	Explanation	Possible Occurrences During the Research Study
Design/Data Collection:		
Catalytic validity	Extent to which a particular study empowers and liberates the research community (Lather, 1986)	Findings can assist further research and change in preservice teacher education programs
Action Validity	Whether or not the findings are useful to the research community (Kvale, 1995)	Findings can assist researchers in duplicating the study or conducting further research
Investigation validity	Represents the researcher's skill and quality control (e.g., ethical conduct)	Findings might be miscounted or incorrectly categorized
Researcher bias	Causes the results of the data to be ungeneralizable	Bias might arise during the interpretation of the data that were collected from the journal articles
Effect size	Effect size can determine the meaningfulness of the data interpretation	The journals selected might not provide an adequate effect size

Note. Onwuegbuzie, A. J., & Leech, N. L. (2007). Sampling designs in qualitative research: Making the sampling process more public. *The Qualitative Report*, *12*, 238-254. Retrieved from http://www.nova.edu/ssss/QR/QR12-2/onwuegbuzie1.pdf

Table 3

Internal Validity in the Quantitative Phase

Limitations	Explanation	Possible Occurrences in the Research Study
Design/Data Collection:		
Researcher bias	Researcher might exhibit a bias toward one technique	A researcher might compromise certain data while collecting data

Note. Onwuegbuzie, A. J. (2003). Expanding the framework of internal and external validity in quantitative research. *Research in the Schools*, *10*(1), 71-90.

Table 4

External Validity in the Quantitative Phase

Limitations	Explanation	Possible Occurrences during the research study
Design/Data Collection:		
Researcher bias	The bias may be exclusive to the researcher causing the result to be ungeneralizable	A possible bias might exist of which the researcher is unaware
Ecological validity	How much findings can be generalizable "across settings, conditions, variables, and contexts" (Onwuegbuzie, 2003, p. 80).	The findings might be generalized to all journals
Temporal validity	How much findings can be generalized across time	This study will be conducted on journals in a 10-year period. More journal articles can be published during the year it takes to conduct and write this study.
Specificity of variables	Common in many studies, and the more distinctive the participant characteristics, time, environment, circumstances, and variables the less generalizable the results	The study will represent the larger sample size as closely as possible

Note. Onwuegbuzie, A. J. (2003). Expanding the framework of internal and external validity in quantitative research. *Research in the Schools*, *10*(1), 71-90.

VITA

Jacquelyn Rene Rust

1. Education

Ed. D.	Sam Houston State University	2021	Literacy
M. S.	Texas A & M University-Kingsville	2008	Reading
B. S.	Texas A & M University-Kingsville	2006	Ag. Science
A. A. S.	Coastal Ben College-Beeville	2003	Science

2. Teaching Experience

Currently. Online ESL. Self-employed.

Fall 2018. Sam Houston State University. Graduate Assistant. I taught READ 4215 Sec. 01 and READ 4215 Sec. 02

Spring 2018. Sam Houston State University. Graduate Assistant. I taught READ 4215 Sec. 02 and READ 4215 Sec. 06.

Fall 2017. Sam Houston State University. Graduate Assistant. I taught READ 4215Sec. 02 and READ 4215 Sec. 06

Spring 2017. Sam Houston State University. Graduate Assistant. I taught READ 4215 sections 02 & 07.

Fall 2016. Sam Houston State University. Graduate Assistant. I taught READ 3370 & 3371, while Shelly Landreth is teaching READ 3372.

Spring 2016. Sam Houston State University (SHSU). Graduate Assistant. I assisted professors and wrote a column for the SHSU journal.

Fall 2015. Sam Houston State University. Graduate Assistant. I taught READ 3370 & 3371, while Barbara Stanford teaches 3372.

Spring 2015. Sam Houston State University. Graduate Assistant. I taught READ 3370, 3371, 3372 at Sam Houston Elementary School.

Spring 2015. Sam Houston State University. Graduate Assistant. I assisted Dr. Brooks with READ 3370, 3371, 3372 for a portion of the semester.

Fall 2014. Sam Houston State University. Graduate Assistant. I taught READ 3373 & 3374 4-8 Literacy Methods.

Spring 2014. Sam Houston State University. Graduate Assistant. I co-taught READ 3370, 3371, and 3372 with Ajjima Utaravichien.

Fall 2013. Sam Houston State University. Graduate Assistant. I assisted Dr. Greybeck with READ 3370, 3371, 3372.

August 2011- 2016. Texas A&M University - Kingsville. Adjunct Professor. I taught EDRG 4314 and EDRG 3321.

August 2009 - May 2013. Beeville I.S.D., Beeville, TX. Reading Specialist-Grades 1-5.

August 2006 -August 2009. Beeville I.S.D., Beeville, TX. First Grade Teacher.

3. Certifications

Generalist-Grades (EC-4), Texas, 2006

Reading Specialist-Grades (EC-12), Texas, 2009

Principal-Grades (EC-12), Texas, 2011

4. Professional Activities

Co-Advisor of NEHS (National Elementary Honor Society, 2012-2013)

Facilitator of Literacy Activities (Launch Me to Literacy Grant, 2011-2012)

Attended Dr. P. David Pearson Presentation at Spring Branch I.S.D. (Spring 2014)

Attended Write for Texas Summer Institute Conference (June 29 – July 2, 2014)

Costa Rica Study Abroad (July12-26, 2014)

ALER Member (2014 – Present)

TCTELA Member (2014 – Present)

ILA Member (2010 – Present)

5. Presentations

Rust, J. (2015, November). Content analysis examining digital literacy components of teacher preparation programs' courses from a small southern university. Association of Literacy Educators and Researchers (ALER) annual conference, Costa Mesa, CA. (Unable to attend)

Ingram, J. M. & Rust, J. (2015, January). Demonstrating the importance of vocabulary engagement to pre-service content area teachers. Presented at Texas Council of Teachers of English Language Arts (TCTELA) annual conference, Houston, TX.