Factors to Integrate Technology for Student Collaboration in the Elementary School: An Action Research Study

Lisa Roseanne Goldey

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FACTORS TO INTEGRATE TECHNOLOGY FOR STUDENT COLLABORATION IN THE ELEMENTARY SCHOOL: AN ACTION RESEARCH STUDY

by

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DEDICATION

I dedicate this dissertation work to my husband Jon and daughter Raegan, who have been patient and supportive through this process. Thank you for all your encouragement to get to me to the “finish line.” To my colleagues in the school district, this work could not have been done without you. To my colleagues in Cohort Vader at the University of South Carolina who provided me support and ideas, especially my writing group colleagues. Also, to my dissertation chair, Dr. Arslan-Ari for all the help you have provided me through this journey. You have truly been a mentor to me during this process.
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The guidance provided by the members of my dissertation committee who supported my personal and professional growth allowed me the opportunity to stretch my abilities, provided me with confidence in my writing, and helped me to examine my beliefs about the role of research in education. I truly appreciate the hours of review and encouragement, the answers to many different questions, and most of all their patience with me during this process.
ABSTRACT

The problem of practice in this research study focused on the inconsistent use of Google Workspace for Education Fundamentals (formerly G Suite for Education) for student collaboration. The purpose of this action research was to investigate how elementary teachers used Google Workspace for Education Fundamentals for student collaboration during the COVID-19 pandemic. The goal was to make recommendations for technology integration in Grades 3 through 5 in a school in central New Jersey.

The focus of this study was on three overarching research questions:

1. How do elementary teachers at a school in central New Jersey integrate technology using Google Workspace for Education Fundamentals for student collaboration into their daily lessons in a gapped hybrid learning environment?

2. How do elementary teachers perceive first- and second-order barriers to integrating Google Workspace for Education Fundamentals for the purpose of student collaboration in a gapped hybrid learning environment?

3. What are elementary teachers’ perceptions about the integration of Google Workspace for Education Fundamentals for the purpose of student collaboration in their classroom lessons in a gapped hybrid learning environment?

The study was guided by the convergent parallel mixed methods design. Data were collected through a survey, semi-structured interviews, and a review of 307 lesson plan entries during November 2020. Nineteen teachers completed a survey regarding
technology integration, first- and second-order barriers, and their perceptions of the use of Google Workspace for Education Fundamentals for the purpose of student collaboration. Additional quantitative data were collected through a review of lesson plans. Qualitative data were collected from eight teachers via semi-structured interviews. Open-ended responses from the surveys and interviews were analyzed using inductive analysis. The quantitative findings indicated teachers found time to be a barrier to technology integration and Google was used for collaboration in the classroom. Three main themes emerged from the qualitative data. These themes included the use of technology, including Google Workspace for Education Fundamentals; the benefits of technology integration for socialization, student learning, and teacher growth; and barriers to technology integration. Personal, school, and future research implications were identified and explained based on the results of this study.
# TABLE OF CONTENTS

Dedication .......................................................................................................................... iii
Acknowledgements ............................................................................................................... iv
Abstract ............................................................................................................................... v
List of Tables ......................................................................................................................... x
List of Figures ......................................................................................................................... xi

Chapter 1: Introduction ......................................................................................................... 1
  Local Context ....................................................................................................................... 5
  Statement of the Problem .................................................................................................... 12
  Researcher Subjectivity and Positionality ....................................................................... 13
  Definition of Terms ........................................................................................................... 15

Chapter 2: Literature Review .............................................................................................. 17
  Technology Integration ....................................................................................................... 19
  Student Collaboration ....................................................................................................... 37
  Google Workspace for Education Fundamentals ............................................................... 45
  Chapter Summary ............................................................................................................ 48

Chapter 3: Method .............................................................................................................. 50
  Research Design ............................................................................................................... 50
  Setting and Participants .................................................................................................... 53
  Data Collection Methods ............................................................................................... 59
  Data Analysis .................................................................................................................... 69
Appendix I: Interview Questions and Protocol ................................................................. 221
Appendix J: Board Approval to Conduct Study ............................................................... 226
Appendix K: Institutional Review Board Approval Letter ................................................. 227
Appendix L: Invitation Letter for Exempt Research ......................................................... 228
Appendix M: Consent Form ............................................................................................ 230
Appendix N: All in Vivo and Descriptive First Round Codes and Subcodes ..................... 233
LIST OF TABLES

Table 3.1 Profile of the Survey Participants ................................................................. 57
Table 3.2 Profile of Interview Participants ................................................................. 58
Table 3.3 Research Questions and Data Sources ....................................................... 59
Table 3.4 TTQ Subscales and Corresponding Questions ............................................. 61
Table 3.5 Teacher Open-Ended Questions Alignment ................................................. 65
Table 3.6 Teacher Interview Protocol Alignment ....................................................... 66
Table 3.7 Research Questions, Data Sources, and Data Analysis Method ................. 70
Table 3.8 Procedures and Timelines ............................................................................... 73
Table 4.1 Technology Training and Certification of the Participants ............................. 84
Table 4.2 TTQ Survey Questions: Cronbach’s Alphas ............................................... 86
Table 4.3 TTQ Perceptions of Technology Integration ................................................... 87
Table 4.4 Technology Integration Survey Questions Cronbach’s Alphas ....................... 88
Table 4.5 Technology Integration Survey Barrier Perceptions ..................................... 89
Table 4.6 Perceptions Towards ICTs in the Teaching-Learning Process Scale Cronbach’s Alphas ................................................................. 89
Table 4.7 Perceptions Towards ICTs in the Teaching–Learning Process Scale .............. 90
Table 4.8 Lesson Plan Frequency of Technology Integration for November 2020 ..................... 93
Table 4.9 Summary of Qualitative Data Sources ....................................................... 95
Table 4.10 Categories to Themes and Assertions ....................................................... 105
LIST OF FIGURES

Figure 4.1. Sample lesson plan ................................................................. 91
Figure 4.2. Sample completed lesson plan organizer ................................. 92
Figure 4.3. Sample first round coding in Delve ........................................ 97
Figure 4.4. Sample in vivo and descriptive coding in Delve ....................... 98
Figure 4.5. Sample in vivo and descriptive coding .................................... 99
Figure 4.6. Sample of simultaneous coding .............................................. 100
Figure 4.7. Audit trail/analytic memo for category development after peer debriefing ................................................................. 101
Figure 4.8. Categories created after peer debriefing .................................. 103
Figure 4.9. Categories identified after second peer debriefing .................... 104
CHAPTER 1

INTRODUCTION

To improve student learning and better prepare young learners to enter a future workforce in an increasingly technological world, today’s students must learn while using technology advancements and collaboration. This expectation can be seen in international and national standards (International Society for Technology [ISTE], 2016). The ISTE is an international association that supports the use of technology to accelerate and innovate teaching and learning (ISTE, 2016). This organization, which guides educators, has published standards for administrators, teachers, instructional coaches, and students to provide a roadmap to direct student learning. These standards are written to empower student learning with the use of technology. Within the ISTE standards, standards 1 through 4, 6, and 7 include the need for students to use technology within the classroom to complete their work. Standard 7 explicitly relates to how students can use technology to collaborate with others. The standard reads, “Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally” (ISTE, 2016, Student Standard 7). The ISTE teacher standards also outline the need to incorporate technology within the classroom. Standard 6 reads, “Educators facilitate learning with technology to support student achievement of the ISTE Standards for Students” (ISTE, 2016, Educator Standard 6).

The Partnership for 21st Century Learning (P21), a national organization, focuses on collaboration as one of the four learning and innovation skills students need to
understand to be prepared for life and the work environment in the 21st century.

According to the organization, to successfully display collaboration skills, students must demonstrate the ability to work effectively and respectively together, possess the flexibility and willingness to achieve a goal, and assume shared responsibility for collaborative work while valuing each person’s contribution (P21, 2018). Collaboration through the integration of technology in the classroom enables students to demonstrate the ability to work together in the class or connect with people across the world (U.S. Department of Education, Office of Educational Technology, 2017).

The Common Core State Standards (CCSS) Initiative (Council of Chief State School Officers, 2010), initially adopted by 41 states, includes several references to collaboration and the integration of technology. Collaboration is noted within the first standard on the list of anchor standards for speaking and listening. It is noted that students must “prepare for and participate effectively in a range of conversation and collaborations with diverse partners, building on others’ ideas and expressing their own clearly and persuasively” (Council of Chief State School Officers, n.d.-a, para. 1). The English language arts standards for Grades K–12 support the general use of technology within the curriculum and the use of technology for students to collaborate. An example of this is found in CCSS ELA Writing Standard W3.6., which reads “with guidance and support from adults, use technology to produce and publish writing (using keyboarding skills) as well as to interact and collaborate with others” (Council of Chief State School Officers, n.d.-b, Production and Distribution of Writing Section, para. 3).

As of 2014, leaders in the State of New Jersey no longer expected teachers to instruct according to the guidance of the CCSS, as during that year, the New Jersey
Student Learning Standards (NJSLS) were created for all subject areas. The English language arts and mathematics standards were closely aligned to the CCSS. Within the NJSLS, technology integration and collaboration are addressed in the technology standards, the writing standards, and the 21st century learning themes. Specifically, the technology NJSLS focus on the application of technology skills across different subject areas (New Jersey Department of Education, 2014). The homepage of the NJSLS for technology (New Jersey Department of Education, 2014) states, “students actively engage in critical thinking, communication, collaboration, and creativity. Technology empowers students with real-world data, tools, experts, and global outreach to actively engage in solving significant problems in all areas of their lives” (para. 4).

The New Jersey Department of Education’s monitoring and self-evaluation system for public schools, the New Jersey Quality Single Accountability Continuum (NJQSAC), maintains a focus on technology integration. Within the Curriculum and Instruction Indicator of the NJQSAC, the integration of technology must be documented in the curriculum of every subject and every grade level. Current evidence to meet this indicator is the explicit citation of the technology standards or how they are integrated across the curricula (New Jersey Department of Education, n.d.).

Numerous research studies have been completed on technology integration and results have uncovered a variety of ways in which teachers can successfully integrate technology into the classroom. Additionally, some researchers have reviewed the barriers that prevent the integration of technology within the classroom (Ertmer, 1999, 2005; Ertmer & Ottenbreit-Leftwich, 2010; Hew & Brush, 2007; Hsu, 2010, 2016; Inan & Lowther, 2010). These studies have shown integrating technology into classroom
instruction is a slow and complicated process that is influenced by many factors originating from the school setting, equipment usage, training needs, time concerns surrounding teaching with technology, and planning (Ertmer, 1999; Hew & Brush, 2007; Hsu, 2010). When not addressed successfully, these factors become barriers to successful technology integration. Ertmer (1999) classified these barriers as first-order barriers. Further studies have shown teacher beliefs and attitudes to be a critical factor in successful technology integration (Ertmer 1999, 2005; Ertmer & Ottenbreit-Leftwich, 2010; Hsu, 2016; Inan & Lowther, 2010). Ertmer (1999) classified this as a second-order barrier to technology integration. In many studies, researchers recommend professional development to promote successful integration along with the use of a technology coach to support teachers’ instruction (Ertmer, 1999, 2005; Ertmer & Ottenbreit-Leftwich, 2010; Hew & Brush, 2007; Hsu, 2010; Pittman & Gaines, 2015).

In March 2020, the landscape of education changed, as school leaders across the country were forced to close their physical doors in response to the COVID-19 pandemic. Teachers were required to teach remotely and students had to learn from home. Technology issues became apparent and one-to-one access issues became problematic. School leaders were scrambling to get devices to students to use at home and an Internet connection needed to be secured for all students. Teachers needed to learn how to deliver the content through a computer instead of in person. During this time where teachers were required to use technology, 94% of teachers reported using virtual collaboration tools (e.g., Google Meet, Zoom) as effective for teaching remotely and 86% reported the use of learning management platforms (e.g., Google Suite, Google Classroom) as effective for teaching remotely (Research for Action, 2020). Subscription-based online
content/sites were identified by less than 70% of teachers as effective (Research for Action, 2020). The nation’s teachers were forced to rethink how they could use technology to provide students with an education.

Technology integration and the first- and second-order barriers that exist are heavily studied topics when all students are present in the classroom. However, the use of technology in different ways has affected the education of students. This was even more complicated by the COVID-19 pandemic. As this study was being completed, other researchers were looking at ways in which technology can be used to provide students with an education through myriad configurations due to a worldwide pandemic.

Few studies exist on how to use technology to support student collaboration in the classroom during a traditional school year (McKnight et al., 2016; Oliver, Cook, & Wiseman, 2019; Suwantarathip & Wichadee, 2014; Zhou, Simpson, & Domizi, 2012), with none identified as having been conducted during the COVID-19 pandemic. Within the standards and expectations, collaboration is included as an important part of students’ education. How to integrate technology while maintaining a collaborative focus requires further research to find a consistent approach for the nation’s students.

**Local Context**

The school district in which I work is a preschool to Grade 8 school district in central New Jersey that comprises three schools. Each school has approximately 500 students. I conducted this study in the Grade 3 through 5 school in this school district.

Starting in the 2017–2018 school year, every student at this school was given access to an HP Chromebook that was stored in a laptop cart in each homeroom classrooms. All teachers had an interactive whiteboard and a document camera in their
classroom. During the 2014–2015 school year, all teachers were provided with training on using the interactive whiteboard and the document camera. Each subsequent year, new teachers are provided with a 4-hour training on the use of classroom technology.

In September 2020, all students in the school were provided with carrying cases to carry their Chromebooks from school to home. Teaching staff were provided with a laptop computer and a Chromebook if requested and were able to bring these devices back and forth from school to home. Teachers who needed to teach from home for an extended period of time due to quarantine or school closure were also permitted to bring their interactive document cameras home.

All students and staff have access to Google Workspace for Education Fundamentals. Access to these tools was initially provided in the 2016–2017 school year. During the 2016–2017 and 2017–2018 school years, the teachers participated in three full in-service days (6 hours each day), and some teachers chose to participate in a professional learning community (PLC) regarding the use of Google in the classroom. Additionally, during the 2017–2018 school year, a science, technology, engineering, and mathematics (STEM) instructional coach was added as a district employee to support the use of technology in the classroom.

While in the school building, teachers and students have Internet access provided through a wireless network. The Internet speed has been recorded as 322.0 kbps, which is above the recommended Internet speed of 100 kbps (New Jersey Department of Education, 2020a). The technology support staff consists of two desktop support personnel and one network administrator. The school also has a technology teacher to assist teachers with technology problems and instructional needs. When at home, staff
and students are required to use their own Internet to connect virtually to each other.
Teachers and students who do not have access to wireless Internet are provided with alternatives through Internet companies for free Internet or the district provides a personal hotspot to which they can connect.

Since 2017, the teaching staff have been expected to use technology in their classrooms, especially through the use of Google Workspace for Education Fundamentals. Teachers at the elementary level are expected to maintain a Google Classroom and to integrate the productivity tools of Google Docs, Google Slides, Google Forms, and Google Sheets for students to use to complete classroom assignments. All these tools have a collaborative feature that enables students to work together to complete an assignment or project for a common goal.

Within the school environment, despite the level of connectivity, the number of one-to-one devices, previous training provided, the expectations set forward, and the support of a coach and additional teachers, the teaching staff integrate technology at different rates and rarely use it within their classrooms for student collaboration. Evidence to support this statement was obtained through a review of lesson plans, informal and formal observations, and post-observation conferences in the 2017–2018 school year.

After a review of lesson plans of classroom teachers in Grades 3 to 5, no plans explicitly provided a design for how to incorporate technology for collaborative purposes. Based on these documents, collaboration was noted as occurring outside the use of technology to brainstorm answers to questions and ideas for writing assignments, to work together for science experiments, and to discuss information related to reading
comprehension. During the 36 formal observations I conducted during the 2017–2018 school year at the elementary school, I found no lessons that incorporated technology for student collaboration. Students were observed to be collaborating for similar purposes listed above. Additionally, the teachers used technology to enhance their instruction and students used technology to complete writing assignments, answer questions on Google Forms, view instructional videos, or access online curricular programs for guided and independent practice.

Additional evidence of this problem was uncovered in the spring of 2018. At this time, district leaders convened a district-level committee of administrators, teachers, and technology personnel to review the Future Ready Schools New Jersey application for potential certification. This process started with a self-assessment to obtain an understanding of the status of the district in each of the Future Ready New Jersey certification categories. The members of the committee rated and discussed areas for certification related to leadership, education and classroom practices, and technology support and services. The issues identified surrounding this topic pertained to the category of education and classroom practice.

The committee created a Digital Learning Readiness Report (Future Ready Schools-New Jersey, 2018) for the school district that included the following information deemed relevant to this study. The report is an automatically generated document based on answers to the self-assessment questions. For the 21st Century Skills/Deeper Learning indicator, a readiness score of 10 (which represents the highest level) was obtained. However, it was noted that there was a gap in the 21st Century Skills/Deeper Learning indicator explicitly related to “support materials, information resources, professional
development, and pilot program have not been developed” (Future Ready Schools-New Jersey, 2018, p. 6). Strategies listed in this report to close the gap in this area included the creation of an online library as well as ensuring the teachers have the opportunity to learn the science behind the critical skills as well as instructional practices that support the skills. Another gap noted in the report was that “the district does not assess and report student attainment of 21st-century skills” (Future Ready Schools-New Jersey, 2018, p. 6). Strategies to close the gap included the development of an informational document explaining what these skills are and why they are essential.

Additionally, the committee assessed the indicator for Collaborative, Relevant, and Applied Learning as a score of 3. This falls into the investigating category, the lowest category on the 1–10 rubric. Gaps identified included that the “district has not yet researched, documented, and communicated the value of authentic learning in K-12 education” (Future Ready Schools-New Jersey, 2018, p. 9). Recommendations to close the gap included conducting a literature review of authentic learning, including the variants of project-based learning and collaboration. Another gap area noted was that the “district has not yet revised the curriculum, instruction and assessments that align to and support collaborative and authentic learning” (Future Ready Schools-New Jersey, 2018, p. 9). Strategies to close this gap included identifying critical components of what is meant by authentic, collaborative work in other districts and a review of the relevant literature. There was a recommendation to review current research and best practices for student work using inquiry in learning and to note relevancy beyond the classroom walls. These statements were valid for the district and for the school.
On March 16, 2020, teachers at the chosen school (and all teachers in the school district) were tasked with providing instruction to all students remotely. The physical school buildings were closed for the remainder of the school year due to the COVID-19 pandemic. Teachers relied heavily on the use of technology in all subject areas. Students in Grades K through 5 were provided Chromebooks as a take-home material if they did not have the technology to use at home. Internet connectivity was also offered through local Internet providers for free to families that did not have access. The use of technology at home required teachers to think critically about how assignments were being assigned and assessed. All teachers at the school used Google Workspace for Education Fundamentals as a primary tool to assign, instruct, and assess work. Yet, an initial assessment of the use of Google Workspace for Education Fundamentals for remote learning revealed inconsistencies existed as to how teachers were using these tools. During this time, it was critical that both students and teachers collaborated in order to complete assignments successfully.

In the summer of 2020, the New Jersey Department of Education provided a guide for the reopening of schools (New Jersey Department of Education, 2020b). In order to abide by the guidance provided by the state, a school schedule had to be reorganized in order to maintain a school environment with social distancing. A gapped hybrid model for scheduling purposes was implemented within the district and four cohorts of student learning settings were created. Cohort A attended in-person learning on Mondays and Tuesdays, and on Wednesdays, Thursdays, and Fridays they attended school remotely. Cohort B attended school remotely on Mondays, Tuesdays, and Wednesdays and in person on Thursdays and Fridays. Cohort C were full remote
students. They never attended school as per parent request. Drop off and pick up dates were established to turn in and retrieve necessary educational materials. Finally, Cohort D attended school in person for 4 days a week, with a remote day on Wednesday. This scheduling model was used to provide opportunities to maintain social distancing in the school and minimize the effects of COVID-19 in the community. A technology help desk procedure was implemented for students attending school in person and at home. The school district leaders used the guidance of the Centers for Disease Control (CDC) and the New Jersey Department of Health to create a safe and healthy return to school.

In the 2020–2021 school year, as a way to organize learning opportunities for students regardless of their location, teachers used Google Classroom as the primary learning management system (LMS). Students used Google Classroom to access links for live lessons and to complete and submit assignments. Lessons were delivered through Google Meet and Zoom so teachers could instruct students who were logging on remotely as well as students who were physically present in school.

Based on previously collected evidence, it became apparent that the integration of technology was inconsistent and student collaboration was a problem. District leaders have made an effort to encourage technology integration by providing high-speed wireless Internet access, providing professional development, providing access to devices and the use of the collaborative tools within Google Workspace for Education Fundamentals, and providing additional teacher support. This action research study was designed in an attempt to uncover the situation that currently exists regarding the use of technology and collaborative learning experiences for students of the Grade 3 through 5 school in central New Jersey.
Statement of the Problem

Elementary classroom teachers have inconsistently integrated technology into their lessons and rarely use Google Workspace for Education Fundamentals (formerly G Suite for Education) for students to collaborate.

Purpose Statement

The purpose of this action research was to investigate how elementary teachers used Google Workspace for Education Fundamentals for student collaboration during the COVID-19 pandemic. The goal was to make recommendations for technology integration in Grades 3 through 5 in a school in central New Jersey.

Research Questions

1. How do elementary teachers at a school in central New Jersey integrate technology using Google Workspace for Education Fundamentals for student collaboration into their daily lessons in a gapped hybrid learning environment?

2. How do elementary teachers perceive first- and second-order barriers to integrating Google Workspace for Education Fundamentals for the purpose of student collaboration in a gapped hybrid learning environment?

3. What are elementary teachers’ perceptions about the integration of Google Workspace for Education Fundamentals for the purpose of student collaboration in their classroom lessons in a gapped hybrid learning environment?
Researcher Subjectivity and Positionality

I am a doctoral student in the Curriculum and Instruction program at the University of South Carolina. I chose to focus my dissertation research on the integration of technology for the purpose of student collaboration in Grades 3 to 5 at a school in central New Jersey during the COVID-19 pandemic in a gapped hybrid learning environment. As a soon to be educational technology professional, I believe an educational technologist should complete research that will move the profession forward and positively influence teaching and learning. Within this program, I have gathered evidence from research to begin to understand what makes a successful integrated technology program within elementary classrooms.

In my current school district, I am the Superintendent of Schools, which means I am the chief school administrator for my district. I am responsible for the direction of the district in all aspects, including instruction. This is where my passion lies. It has been my mission to improve teaching and learning for students when I was in the classroom and for my school as a building principal, and now for the district as a district-level administrator. As an educator, I have always believed in the substantial benefits technology can bring to the classroom. This is based on my instructional experience as a teacher for 10 years as well as on observations I have conducted for 12 years as an administrator. As I have seen technology change over the past 22 years of my career, I have also seen minimal change in how teachers use technology with their students for the purpose of student collaboration. Technology is still a tool where students are consumers and not producers. Students go to tutorial sites for practice and use word processing tools to write assignments.
My research paradigm followed the pragmatic worldview as described by Creswell (2014). The pragmatic worldview provides a more holistic approach to research. In this worldview, “Researchers emphasize the research problem and use all approaches available to understand the problem” (Creswell, 2014, p. 10). The pragmatic researcher can maintain both subjectivity in reflections while reflecting on objectivity in data collection and analysis (Shannon-Baker, 2016). The model I used to conduct my research was the convergent parallel mixed methods design (Creswell, 2014). My hope was to use the results from this mixed methods action research study to implement change in my school district.

According to Herr and Anderson (2005), the positionality of the researcher is a vital concept to review when conducting action research. The authors proposed a continuum of positionality based on the insider–outside concept. Within this continuum, I find myself to be an insider in collaboration with other insiders. I believe this to be true even though I am no longer in the classroom teaching students, as I organized and implemented instructional programs through my leadership as the Assistant Superintendent of Instruction from July 2012 until June 2018, and as the Superintendent of Schools since July 2018. All decisions and initiatives related to instruction, including the rollout of one-to-one technology for all students in Grades 3 to 8 and the use of Google Workspace for Education Fundamentals for all students in the district, was ultimately my decision with the support of district teacher committees. This positionality contributes to the “knowledge base, improved and critiqued practice, and professional/organizational transformation” (Herr & Anderson, 2005, p. 31). Inside researchers in collaboration with other insiders sometimes lead to power relations within
the setting (Herr & Anderson, 2005). Although I am an administrator, I believe I institute collaborative leadership. This approach and a shared decision-making style enabled me to work with teachers as a researcher with the insiders who are implementing the lessons.

Every researcher has a bias when it comes to the implementation of the research. I believe technology should be used in every classroom to create a student-centered environment, and this belief had the potential to become a problem during the research study. One way to deal with this bias was though acknowledging my own beliefs and engaging in reflection throughout the process by keeping a reflective journal documenting my experiences during the study. During this study, I used the critical friends model and established validation meetings with other University of South Carolina and district colleagues to help me reflect on my practice and validate my research (Herr & Anderson, 2005).

**Definition of Terms**

*First-order barriers.* Those barriers that are extrinsic to teachers, including the lack of access to computers, software, time to plan instruction, and time to deliver instruction, as well as inadequate technical and administrative support (Ertmer, 1999; Hew & Brush, 2007).

*Gapped hybrid learning environment.* A model that splits the in-person students into a two on and three off with a gapped scenario for in-person learning. For example, students in group A attend school in person on Monday and Tuesday and on Wednesday, Thursday, and Friday they attend virtually. Students in group B attend virtual learning on Monday, Tuesday, and Wednesday with in-person opportunities on Thursday and Friday (Hooker, 2020).
Google Workspace for Education Fundamentals (formerly G Suite for Education).

A free suite of easy-to-use tools designed to provide a secure foundation for learning, collaboration, and communication. These communication and collaboration tools include Classroom, Docs, Slides, Sheets, Drive, Forms, Jamboard, Gmail, Meet, and Chat (Google, 2021).

Second-order barriers. Those barriers that are intrinsic to teachers and include beliefs about teaching, beliefs about computers, established classroom practices, and the unwillingness to change (Ertmer, 1999, 2005).

Student collaboration. Collaboration occurs when students work together by participating in experiences in which they are asked to speak, listen, and apply their learning. Three types of collaboration using technology include remote collaboration, role-based collaboration, and shared-screen collaboration (Burns, 2018).

Technology integration. The use of hardware such as laptops, scanners, interactive whiteboards, document cameras, and handheld devices as well as related software and the Internet in the classroom to enhance learning (Hew & Brush, 2007; Hsu, 2016).
CHAPTER 2
LITERATURE REVIEW

The purpose of this action research was to investigate how elementary teachers used Google Workspace for Education Fundamentals for student collaboration during the COVID-19 pandemic. The goal was to make recommendations for technology integration in Grades 3 through 5 in a school in central New Jersey. I collected both quantitative and qualitative data to answer the following research questions:

1. How do elementary teachers at a school in central New Jersey integrate technology using Google Workspace for Education Fundamentals for student collaboration into their daily lessons in a gapped hybrid learning environment?

2. How do elementary teachers perceive first- and second-order barriers to integrating Google Workspace for Education Fundamentals for the purpose of student collaboration in a gapped hybrid learning environment?

3. What are elementary teachers’ perceptions about the integration of Google Workspace for Education Fundamentals for the purpose of student collaboration in their classroom lessons in a gapped hybrid learning environment?

Based on the research questions, I used the following terms to guide the literature search: technology integration, collaboration, Google Suite for Education, first-order barriers, second-order barriers, teachers’ beliefs and perceptions, constructivist learning
theory, social constructivism, and COVID-19 pandemic. I collected resources for this review in a variety of ways. First, I used electronic databases, such as ERIC (EBSCO Host), Academic Search Complete, Education Source, Google, and Google Scholar, to search for articles by combining different key terms. These key terms included technology integration, first-order barriers, second-order barriers, constructivist learning theory, social constructivism, Google, Google Suite for Education, elementary school, and collaboration. I searched key terms individually and then through the following combinations: constructivist learning theory, social constructivist learning theory, technology integration [and] first- [and] second-order barriers, elementary school [and] collaboration, technology integration [and] student collaboration, Google [and] collaboration [and] technology integration, COVID-19 pandemic [and] technology integration. For some of the searches, I placed limits based on the dates the articles were published. The date range was between 2014 and 2021. However, I conducted some searches without date limits to gather additional essential studies. I also used references from articles found by mining other resources. After mining the reference information, I conducted a search for the journal article using the online resources available through the University of South Carolina library. Additionally, I used the Internet to discover online resources to provide access to essential websites relevant to technology integration and collaboration. A few of these websites included the U.S. Department of Education website, the P21 website, the New Jersey Department of Education website, and the ISTE website.

This review of the literature is organized into three sections. The first section is a comprehensive review of the literature looking at different aspects of technology
integration with a focus on (a) technology integration and the impact on student achievement and student motivation, (b) technology integration and one-to-one technology device use, (c) the Technology Pedagogical Content Knowledge (TPACK) model, (d) the Substitution Augmentation Modification Redefinition (SAMR) model, (e) technology learning models to support instruction in the fall of 2020, and (f) technology integration barriers. The second section focuses on student collaboration, including (a) constructivist learning theory, (b) social constructivist learning theory, and (c) collaboration and technology integration. The third and final section of the review covers the use of Google Workspace for Education Fundamentals for collaboration in the classroom. All of these areas are explored in this chapter to provide a complete synthesis of the literature and to connect the areas to the purpose of the study and the research questions.

**Technology Integration**

Many studies have been conducted on the integration of technology in the classroom and have shown there are positive benefits in terms of student achievement where technology is integrated into learning experiences (Cifuentes, Maxwell, & Bulu, 2011; Glassett & Schrum, 2009; Harper & Milman, 2016; Harris, Al-Bataineh, & Al-Bataineh, 2016; Lee, Longhurst, & Campbell, 2017; Lowther, Inan, Strahl, Strahl, & Ross, 2008). Some studies have shown there is a negative impact or no impact of technology integration in terms of student achievement (Daniel, 2012; Hamilton, Rosenberg, & Akcaoglu, 2016; Storz & Hoffman, 2013). When reviewing the literature on the integration of technology, it is crucial to consider one-to-one access to computing devices. As more schools have a one-to-one ratio of computers to students, recent
research has uncovered benefits in the areas of student achievement, engagement, and motivation when operating in a classroom environment with this type of access (Harper & Milman, 2016; Harris et al., 2016). There is a positive impact of the use of technology on student motivation (Harper & Milman, 2016; Harris et al., 2016).

Research studies have been conducted on the barriers to teachers’ attempts to integrate technology into their classrooms. The barriers have been categorized as first-order and second-order barriers (Ertmer, 1999). First-order barriers are extrinsic to the teachers, including a lack of access to computers, software, time to plan instruction, and time to deliver instruction, as well as inadequate technical and administrative support (Ertmer, 1999). Second-order barriers are intrinsic to the teachers and include beliefs about teaching and learning, beliefs about computers, established classroom practices, and the willingness to change their instruction (Ertmer, 1999). There is emphasis in the literature on changing negative teacher attitudes and beliefs regarding technology integration (Ertmer & Ottenbreit-Leftwich, 2010; Inan & Lowther, 2010; Kim, Kim, Lee, Spector, & Demeester, 2013; Mueller, Wood, Willoughby, Ross, & Specht, 2008).

**Technology Integration, Student Achievement, and Student Motivation**

Researchers have studied the relationships among technology integration, student achievement, and student motivation and have found both positive and negative benefits. Harper and Milman (2016) completed an analysis of 46 articles and found themes related to student achievement, such as a positive effect on student academic achievement when students used computers to improve learning through educational games and reinforcement activities. In another study, students demonstrated an improvement in literacy skills when using computers for an entire school year (Suhr, Hernandez, Grimes,
& Warschauer, 2010). The studies examined showed that in many different learning environments, student use of computers positively influenced achievement in a variety of content areas across many grade levels (Harper & Milman, 2016).

When examining student achievement findings, trends continue to emerge that show students who are involved in technology programs outperform control students in all instances. In one study, Lowther et al. (2008) investigated computer use and the Tennessee EdTech Launch (TnETL), a statewide technology program designed to meet the No Child Left Behind (NCLB) mandate. Results showed students performed higher on achievement assessments after participating in this technology integration program (Lowther et al., 2008). Lee et al. (2017) reported students in the classrooms of science teachers who were in a 2-year technology professional development program using the integration technology tools demonstrated higher science achievement. In yet another study, students who were in the classrooms of teachers who participated in the MINTY program, a large scale 200-hour training program, performed better than did students who did not have MINTY instruction on critical thinking activities (Glassett & Schrum, 2009). When analyzing student performance, one study showed students who used technology in a one-to-one environment had increased achievement as measured by math topic tests and Discovery Education Assessment results (Harris et al., 2016). Students in program classrooms were more engaged and performed higher on achievement assessments and assessments in critical thinking (Harris et al., 2016). Based on these studies, it is clear multiple technology-integrated learning opportunities can have a positive impact on student achievement.
Although some studies support the argument that the integration of technology positively affects student achievement, some reviews do not support this claim. In one study, students who were involved in classrooms where technology was integrated performed slightly worse on the Mississippi Subject Area Testing Program (Daniel, 2012). In another study, students in classes using the SAMR model for technology integration had no significant difference in their academic achievement (Hamilton et al., 2016) and in yet another, there was no noted impact on student achievement (Storz & Hoffman, 2013). In the meta-analysis performed by Harper and Milman (2016), several studies were reviewed that showed no significant impact was found in terms of student achievement in an integrated one-to-one technology environment. Based on these studies, there can be a negative effect or no effect on student achievement when integrating technology in the classroom.

When analyzing the impact of technology integration on student motivation, some positive implications have been noted. In one study, researchers reviewed monthly attendance records as the variable accounting for student motivation in each class where one-to-one technology was used. Students who were in the experimental group and used one-to-one technology regularly had better attendance (Harris et al., 2016). In another study, results showed that in classes in which there was a one-to-one technology device to student ratio, students experienced a positive increase in initial motivation and engagement; however, these levels of motivation and engagement were not sustained (Harper & Milman, 2016). It was reported by teachers in a survey of their beliefs that technology is motivating and makes mathematics fun (Wachira & Keengwe, 2011). These studies support the benefit of using technology in the classroom to improve student
motivation and engagement. However, when researching student engagement in the hybrid environment with both remote and face-to-face learners, studies have shown remote students learn less and are more passive (Huang, Shu, Zhao, & Huang, 2017; Morquin, 2016).

It is essential to address the benefits and be mindful of the pitfalls when it comes to integrating technology in the classroom in terms of student achievement, motivation, and engagement. Studies that highlight the benefits support school district initiatives in both time and money spent on technology initiatives, training, and devices toward the improvement of student learning experiences. However, it is essential to be mindful of studies that contradict these claims when investing in this sizable budgetary expense and commitment.

**Technology Integration and One-to-One Technology Access**

Throughout the years, it has become more economically feasible for school district leaders to purchase more mobile computing technology tools and devices for student use. As a result, school leaders purchased more than 23 million devices for classroom use in 2013 and 2014 alone (Herold, 2016). Two significant mandates spearheaded the push for using one-to-one technology in the classroom: state standardized tests being delivered online and the widespread adoption of the CCSS (Herold, 2016). Claims have been made that providing each student a device will enable teachers to deliver more personalized content, improve student achievement, help students become technologically skilled, empower students to do more complex and creative work, and improve classroom management to make it easier to gather student data (Herold, 2016).
The use of one-to-one laptops for a variety of activities and the impact on student learning has been studied. Lei and Zhao (2008) found students are using their laptops for a variety of tasks that involve learning, communication, expression, and exploration. Students have gained significant technology proficiency. Increased student achievement and motivation have been noted as benefits of using one-to-one technology devices in classrooms as measured by teacher surveys and student achievement data (Harper & Milman, 2016; Harris et al., 2016). Sultan, Woods, and Koo (2011) conducted a quantitative study of the combination of constructivist teaching principles and one-to-one laptop programs and found employing constructivist instructional principles was critical to the success of a one-to-one environment. Although the implementation of one-to-one mobile devices is positive, school district leaders, administrators, teachers, and students have faced challenges related to using them correctly and sustaining the funding to support these initiatives. The successful adoption and implementation of a one-to-one initiative in K–12 schools is a complicated task that requires supportive resources, communication of a vision for adoption, and collaboration among all stakeholders (Topper & Lancaster, 2013).

**Technological Pedagogical Content Knowledge (TPACK) Model**

When looking at technology integration, there are two prevalent models: the TPACK model and the SAMR model. Both of these models represent ways to integrate technology in the classroom. The TPACK model has been used in classrooms to guide teachers on how to integrate technology into the classroom. The model was initially introduced by Mishra and Koehler of Michigan State University in 2006 and identifies three primary forms of knowledge as integral in teachers’ planning activities and lesson
design. These forms include content knowledge (CK), technology knowledge (TK), and pedagogical knowledge (PK). Each is a component of lesson design and the delivery of instruction, which leads to a full understanding of how to teach with technology. In this model, teachers’ knowledge about technology is necessary but not separate from the context of teaching. The TPACK model is used to describe the interplay between the knowledge that exists in technology, content, and pedagogy (Koehler & Mishra, 2006).

The TPACK model can be used to bring technology use, engaging pedagogy, and meaningful context together to provide more effective instruction. Koh and Divaharan (2011) described the use of the TPACK model as effective for enhancing the confidence of pre-service teachers to integrate a new technology tool into their classroom instruction. Using the TPACK model enables teachers to reflect on their previous lessons and plan for future technology integration opportunities in their classroom (Hilton, 2016). According to Koehler and Mishra (2006), true technology integration demonstrates educators can negotiate between how to teach, what they need to teach, and how the technology resources support meaningful learning opportunities for students.

The TPACK framework is applicable in a virtual schooling environment. TPACK becomes a critical part of instruction where asynchronous and synchronous lessons are provided. Teachers instructing in a virtual environment need to have a grasp of their content area and how technology affects the content and pedagogy of what is being taught. The integration of content, pedagogy, and technology is the core of TPACK and using this model is a way to establish successful instruction while teaching students both in person and online (Avgerinou & Moros, 2020).
**Substitution Augmentation Modification Redefinition (SAMR) Model**

A second popular technology integration pedagogical model is the SAMR model. This instructional framework is designed to help educators infuse technology into teaching and learning. This model, popularized by Dr. Ruben Puentedura in 2013, supports and enables teachers as they design, develop, and infuse digital learning experiences that use technology. The goal of the model is to transform learning to result in student achievement. SAMR stands for substitution (S), augmentation (A), modification (M), redefinition (R), which appears in a hierarchal fashion. Substitution is the use of technology for a task that could be accomplished without technology, augmentation provides a technological improvement for a task that could be completed without technology, modification allows a task to be significantly altered in a way not possible without technology, and redefinition is the creation of an entirely new task that would be impossible without technology (Hilton, 2016).

Although this model has recently gained popularity, the literature appears to be lacking a theoretical explanation of the SAMR model and there is limited qualitative or quantitative evidence to support its use (Hamilton et al., 2016). According to Hamilton et al. (2016), there are three challenges presented with SAMR. The first challenge is that the SAMR model includes no accommodation for context. Some of the important components found in the technology integration literature, such as technology infrastructure and resources (Ertmer, 1999), student needs (Koehler & Mishra, 2006), teacher knowledge, and support (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012), are not recognized in this model. The second challenge is that the SAMR model is structured as a hierarchical framework and technology integration is
siloed into one of the four SAMR categories. This does not take into account the complexity of teaching with technology. It is assumed that when a teacher enacts a higher level of SAMR, such as modification or redefinition, the teacher is using technology with better learning outcomes (Hamilton et al., 2016). The third challenge associated with the model is the focus on the product over the process of learning. The use of technology focuses on the end product as opposed to the educational knowledge that is transpiring. Because the SAMR model has not been analyzed using peer-reviewed literature, educators involved with technology integration using SAMR may apply the model in fragmented ways (Hamilton et al., 2016).

**TPACK Versus SAMR.** Hilton (2016) conducted a case study of two different social studies classrooms to examine the use of technology through the lens of TPACK and SAMR. Information was collected through teacher technology journals in which teachers recorded their efforts to integrate iPads into their eighth-grade social studies classrooms. In the second year, teachers and researchers met in two separate 2-hour sessions to participate in a semi-structured interview format focusing on questions to reflect on their technology use. Findings indicated the two teachers were able to associate these models based on the teacher-centered design (TPACK) and student-centered design (SAMR). It was described that SAMR places the student as the primary subject and TPACK focuses on the teacher. However, both of these technology integration models provided teachers with a critical direction with which to integrate technology into their classrooms (Hilton, 2016).

In the TPACK model, there is a relationship between technology, content, and pedagogy and the purposeful planning to blend these three components of lesson design. 

27
In the SAMR model, teachers assess the impact of the purpose and intent of a technology tool to ensure student learning is influenced in such a way that it fosters growth and deeper understanding. By understanding these models, teachers can determine how to use technology with their classroom lessons to positively affect student learning.

**Technology-Infused Scheduling Models to Support Instruction in Fall of 2020**

In response to the COVID-19 pandemic, educators are being required to instruct students in different ways. Factors that must be considered in the creation and use of different models include Internet access, social-emotional learning, health concerns related to COVID-19, classroom space incorporating social distancing recommendations, and learning/assessment expectations (Hooker, 2020).

While trying to educate students in the midst of a pandemic, there are different scheduling models to use. All require the integration of technology at some level. These models of in-person schooling, virtual schooling, and hybrid schooling all have pros and cons that need to be assessed. Regardless of the model selected, if students are not in school full time, school district leaders need to provide additional support to ensure the continuity of learning (Richmond, Cho, Gallagher, He, & Petchauer, 2020). Instructional models need to be identified and developed to provide the best instruction using synchronous instruction (Grant & Cheon, 2007; Raes, Detienne, Windey, & Depaepe, 2020). Because the need to provide additional learning options for students is so new, there are limited research studies that support a benefit to selecting a model for elementary students during a pandemic. Three different scheduling models include in-person learning, virtual school, and hybrid schooling. There are pros and cons associated with each of these models (Hooker, 2020).
**In-person learning.** In-person school is the traditional school model. In schools using this model, teachers are still making modifications to the classroom environment, including reduced class sizes, face masks, limited movement in the classroom, and student cohorts. The benefits of this model include less need for teacher training, a greater sense of community and belonging, and the ability to have childcare for parents. The negative of this model is the additional staff and space needed to accomplish in-person schooling for all students. Because of the social distancing requirements associated with the COVID-19 pandemic, classroom spaces can only have 10 to 12 students (Hooker, 2020).

**Virtual school.** During the fall of 2020, many students were fully virtual and attended classes entirely online. The type of instruction provided was dependent on the spread of the virus in areas across the country, facility issues, or in-person staffing concerns. Teachers needed to turn to different types of instructional models through the integration of technology, including synchronous online instruction, asynchronous instruction, or an eHybrid model (Hooker, 2020).

Synchronous online instruction is provided through video chat/conferencing software. The teacher provides all instruction to remote learners through the computer. The positives of this type of instruction include that whole class online meetings maintain a sense of community and allow for feedback and online support. The major disadvantages of this type of instruction are the extra screen time, reliance on bandwidth, and technology connectivity issues (Hooker, 2020). This model is more reliant on whole group instruction as the teacher is delivering the content.
Asynchronous instruction can be used in a virtual classroom. In this model, teachers send home weekly work via shared documents using the LMS or through email or websites. Teachers create these resources in self-guided projects. Students have the ability to submit work with much more flexibility than in synchronous instruction. Positives of this type of instruction include the flexibility in the submission of work and fewer issues with connectivity. Disadvantages to this model include the lack of organization of a schedule, the inability to track attendance, and a lack of building a school and classroom community (Hooker, 2020).

The eHybrid model features a mix of both synchronous and asynchronous learning. Teachers schedule times throughout the school day and week to check in with students via whole group instruction and office hours. The pros of this model include taking the best parts of synchronous instruction, allowing students to have a schedule and routine, and limiting the amount of seat time while staying connected throughout the day and the school week. Additionally, asynchronous learning opportunities provide students a level of ownership over their work while having multiple opportunities for feedback through an LMS or video chat. Cons with this model still exist. Connectivity concerns still exist during the synchronous part of the school day and continue to put pressure on parents during the asynchronous part of the work. Attendance can be an issue as some students may not be available during preset meeting times. An important part of this model is the use of small groups and individual feedback on instruction (Hooker, 2020).

**Hybrid school.** Some school leaders are selecting models that combine in-person learning and a virtual component to create a hybrid of the two models. Having virtual classes built into learning means that regardless of the virus, instruction can take place
inside or outside of the school building. Students can still report to school even part time, allowing for a sense of community and feedback. This model allows for “better small-group collaboration in which students can begin a project together and then continue online” (Hooker, 2020, p. 11). Four models of hybrid schooling have been developed: a blended learning model, a staggered hybrid model, a gapped hybrid model, and an alternating hybrid model.

In the blended learning model, some students are in class and others are at home and all are watching the lesson synchronously. In a staggered hybrid model, the school day is split in half in order to reduce the number of students who attend school at the same time. In the morning, one cohort attends and then the school is sanitized, and in the afternoon the second cohort attends. When not attending school in person, the other group is provided with asynchronous opportunities. A gapped hybrid model splits the weeks into 2 days in school and 3 days outside of school. For example, a cohort attends school in person on Monday and Tuesday and the other cohort attends school in person on Thursday and Friday. Wednesday is reserved for sanitizing the building while all students work remotely on this day. Finally, the alternating hybrid model includes the ability for students to attend in-person school on full weeks or every other day (Hooker, 2020).

There are pros and cons to the hybrid model of schooling as well. Regardless of which model is selected, all take significant planning and coordination. The benefit to the hybrid model is that students get the best of both worlds. A sense of community is established when students are in school. School leaders and teachers are able to fill the gaps of virtual learning with in-person sessions. Additionally, because there may be a
need to close a school based on virus levels, any of these models can switch to a full virtual model easier than models in which students are attending school completely in person. The cons of these models relate to the logistics of scheduling school. Also, teachers will be stretched to teaching twice as much throughout the week as they prepare lessons for both groups, whether in person or virtual (Hooker, 2020).

**Technology Integration Barriers**

There has been extensive research into why teachers integrate technology at different rates within individual classrooms. Researchers have concluded there are significant barriers to overcome when integrating technology successfully in the classroom that can be categorized as first-order and second-order barriers. First-order barriers relate to barriers that are external to the teacher, such as time, accessibility, training, and a lack of skills and administrative support. Second-order barriers are obstacles that are internal to the teacher and include the need for teacher control, attitudes, self-efficacy, and decision-making abilities (Ertmer, 1999). A large body of research exists on teachers’ beliefs regarding how technology should be used and integrated into classroom instruction and how these beliefs affect implementation.

**First-order barriers.** First-order barriers, as defined by Ertmer (1999), are external to the teacher. They are classified as incremental and institutional barriers that hinder teachers’ technology integration efforts. A few first-order barriers include training and a lack of technology skills, time, and technology accessibility and reliability. These barriers all affect how teachers integrate technology into their classrooms. When these items are missing or inadequately provided, teachers are unable to integrate technology in the classroom successfully. Having to deal with several first-order barriers may frustrate
teachers. However, a majority of these barriers are easy to identify and eliminate (Ertmer, 1999).

Teacher training is an important component identified as a barrier to successful technology integration (Ertmer, 1999; Hew & Brush, 2007; Pittman & Gaines, 2015). Hsu (2016) reported half of the teachers surveyed lacked training and exposure to technology. In a study evaluating technology integration in a middle school environment, teachers reported professional development was needed to support technology integration (Reddit, 2007).

Time is another first-order barrier supported by previous research (Ertmer, 1999; Ertmer & Ottenbreit-Leftwich, 2010; Ertmer et al., 2012; Hew & Brush, 2007; Hsu, 2016; Pittman & Gaines, 2015; Tondeur, van Braak, Ertmer, & Ottenbreit-Leftwich, 2017). Teachers should be provided with additional time to play with technology, be given access to knowledgeable peers, and be provided suitable models (Ertmer & Ottenbreit-Leftwich, 2010; Thompson, 2015).

Technology accessibility and reliability is another first-order barrier. According to Young (2012), one documented barrier to successful technology integration is a complicated networking system. Previously conducted research emphasized the need for reliable technology and specific setups to conduct synchronous learning for students in a face-to-face environment and those at home. Specific classroom setups with technology, such as in environments with Here or There Instruction (HOT), require facilitators to use specific classroom technology using cameras and desktop computers (Zydney, McKimm, Lindberg, & Schmidt, 2019). If technology fails because of technical difficulties, the result will be a loss of instructional time. Technical quality has been found to be the
highest contributor to instructional quality because the delivery is reliant on technology resources (Grant & Cheon, 2007). Technology equipment and support are key components of successful technology integration (Ertmer, 1999; Ertmer et al., 2012; Hew & Brush, 2007).

These findings show first-order barriers make it difficult to integrate technology into the classroom. Researchers have provided solutions to eliminate these barriers to help support teachers in the quest for technology integration. These solutions include providing more professional development to teachers, time for teachers to collaborate to share effective strategies, and additional financial investments in computer hardware and software (Ertmer, 2005; Ertmer & Ottenbreit-Leftwich, 2010; Reddit, 2007; Young, 2012).

**Second-order barriers.** Second-order barriers, as defined by Ertmer (1999), also impede technology integration and include teachers’ underlying beliefs about teaching and learning that may not be outwardly apparent. They include the need for teacher control, attitudes, self-efficacy, and decision making. Even when all first-order barriers are removed, teachers may still not integrate technology into their lessons because of their underlying beliefs about teaching and learning. These barriers all affect how teachers integrate technology. Changing teachers’ beliefs about teaching and learning is more challenging. The relationship between first- and second-order barriers is complex and changing second-order barriers is difficult (Ertmer, 1999).

Technology integration efforts are directly influenced by second-order barriers. Hew and Brush (2007) reported teachers’ attitudes and beliefs toward using technology directly affected implementation. In response to survey questions, teachers indicated they
did not feel comfortable designing learning environment experiences that integrated technology in classroom instruction, with only 31.5% indicating they were comfortable doing so (Reddit, 2007). Forty-five percent of the teachers surveyed believed the use of technology was somewhat important, with very important as the top rating (Reddit, 2007). Results of a study conducted by Hsu (2016) indicated teachers who held constructivist pedagogical beliefs about the technology used technology in their instruction more frequently. They also placed a high value on technology and had two or more practices of high-level learning in their lesson plans. When teachers are asked to use technology to facilitate learning, beliefs, attitudes, or pedagogical ideologies play an important role (Ertmer & Ottenbreit-Leftwich, 2010).

**Changing attitudes and beliefs.** It can be difficult to change teachers’ attitudes about technology integration but there are recommendations for ways to do this found within the literature. Self-efficacy beliefs are a key variable in making changes to second-order barriers. Time and effort should be devoted to increasing teachers’ confidence in using technology to achieve student learning objectives. This confidence can be increased by providing teachers with successful personal learning experiences (Ertmer & Ottenbreit-Leftwich, 2010). Ongoing PLCs can be organized as a means for teachers to provide support and help to each other to implement appropriate classroom technology to meet the needs of their students (Li, Worch, Zhou, & Aguiton, 2015).

According to research conducted by Ertmer (2005), teachers’ pedagogical beliefs can be changed by having conversations regarding existing beliefs and explicit discussions about ways in which technology supports these teaching beliefs. Teachers should work in small collaborative groups to explore new methods and technology tools
to help one another as they begin to transform practices. Teachers should have opportunities to observe classroom practices, including technology use, that support different pedagogical beliefs. Technology tools should be introduced slowly to support teachers’ practices and to expand high-level goals. Additionally, ongoing technical and pedagogical support will help teachers develop additional confidence and competencies with new strategies and technical tools.

Improving both the self-efficacy of teachers and their pedagogical beliefs is the key to breaking down the second-order barriers to ensuring a positive integration experience for students. This can be accomplished by providing teachers with positive experiences and outcomes with using computers in the classroom. Specific positive experiences with technology will enable teachers to see that innovation has the potential to improve learning (Ertmer, 2005). Additionally, teachers should be a part of developing a vision for technology use, and the culture in which teachers learn and work must embrace the change in teacher pedagogy (Ertmer & Ottenbreit-Leftwich, 2010; Mueller et al., 2008). Hands-on and direct practice with computer technology in a teacher’s classroom or in the teaching context will build the confidence necessary for a teacher to take the risk to use computers as a tool to support learning (Mueller et al., 2008). However, it is unlikely that a one-time effort will change a teacher’s belief system or transform teachers. These changes do not happen quickly or automatically. To accomplish sustained change and growth of teachers, continual supports recommended in the literature should be put in place (Kim et al., 2013; Tondeur et al., 2017).
Student Collaboration

When students collaborate, they work effectively and respectfully with diverse teams of learners to achieve an overall goal. Collaboration is essential to the learning process because it brings together multiple perspectives and ideas. Complex problems can be solved using the skills and knowledge of different learners within the collaborative team (Yuen et al., 2014).

Collaboration is seen in classrooms when students participate in experiences in which they are asked to speak, listen, and apply their learning authentically (Burns, 2018). When students have the opportunity to work in small groups, they can contribute to a common understanding as well as develop social and verbal abilities. Peers who work together in a common context and have insight into the needs of others understand the best way to explain a concept or focus on a task. When students explain a concept, both students benefit (Nussbaum, Alvarez, McFarlane, Gomez, & Claro, 2009).

Working with peers alone does not create learning. Effective collaboration opportunities require that students participate in well-defined groups, abide by rules guiding their interaction, and accept guidance on how they should complete the task (Nussbaum et al., 2009). Some collaborative tasks can be open-ended without predetermined answers. The level of knowledge is gained and emphasized as students pose questions or define problems. Effective collaboration is demonstrated by increased participation in group discussions and students who can engage in successful discourse by providing intellectually valuable contributions (Nussbaum et al., 2009). In this section, literature is reviewed regarding learning theories that support student collaboration: (a) constructivist learning theory, (b) social constructivist learning theory, and (c)
collaboration and technology integration. Research-based recommendations for how to use collaboration and technology are described.

**Constructivist Learning Theory**

Constructivism is a synthesis of behaviorism and cognitive ideas. Constructivists believe learning is a process of constructing meaning through making sense of experiences (Amineh & Asl, 2015; Ertmer & Newby, 1993). From the constructivist perspective, learning is active. Learners negotiate their understanding based on what is experienced in a new learning situation (Ertmer & Newby, 1993; Hoover, 1996).

Constructivist learning theory was founded by John Dewey. Jerome Bruner and Jean Piaget are also considered the main theorists of this approach. Dewey (1938) believed students learn at their best when they are provided with authentic learning experiences in which they can apply learned concepts. Hein (1991) described the five guiding principles of constructivism as follows. The first principle is that learning is an active process in which the learner uses input and constructs meaning. The second principle is that learning is not the passive acceptance of knowledge, as it requires engagement in the world. The third principle of learning consists of constructing meaning and constructing systems to incorporate that meaning. Physical actions and hands-on experiences, especially for children, may be necessary for learning as are activities to engage the mind. The fourth principle is that learning involves language, and the language used among each other influences learning. Social activities help to formulate understanding; there is a relationship between the content being learned and the learner. Fifth, learning is contextual and occurs in relationship to what we know, believe, and conceive. Knowledge is the key to learning. It is not possible to assimilate new
knowledge without having some structure to our understanding and then associating additional knowledge (Hein, 1991).

Based on the work of Jerome Bruner, there are three levels of learning. The first level is the mastery of knowledge and skills in the learner’s society. The second level is to understand how to comprehend other people’s beliefs, intentions, and desires. The third level is for students to understand through communication with teachers and students the characteristics of their learning, remembering, and thinking (Takaya, 2008). Bruner explained the second and third levels of learning as metacognition. Understanding these levels requires understanding what takes place in the classroom (Takaya, 2008).

Constructivism in the classroom is defined as multiple interactions of different activities and contexts of teaching that bring together students and teachers in a community (Sultan et al., 2011). There is a level of personal relevance in the classroom because it connects the school experiences of students to their out-of-school experiences. There is a component of cultural embeddedness to learning where students’ everyday experiences are meaningful for the development of student knowledge (Sultan et al., 2011).

According to Hoover (1996), two important notions exist around the idea of constructed knowledge. Learners build new knowledge around the idea of what they already know. Students come to learning situations with knowledge previously acquired and modify their existing knowledge with newly constructed knowledge. The second notion is that learning is active. Students apply their current understanding to their new learning experiences. Students judge the consistency of their prior knowledge and modify their existing knowledge based on these new experiences.
The integration of technology may influence teachers to incorporate constructivist principles within the classroom. Nanjappa and Grant (2003) reviewed three case studies of technology integration and constructivist learning practices. In the first case study, pre-service teachers developed an electronic portfolio around a literacy-related topic, which included data collection, reflection pieces, and critical responses. In the second case study, a distance learning course was designed with experiential and constructivist learning perspectives. In the final case study, constructivist strategies were used for the development of course modules to support the professional learning of faculty to understand the integration of technology. In all three case studies, the infusion of technology was supported by implementing constructivist-based activities (Nanjappa & Grant, 2003).

Although technology supports constructivist teaching, teachers’ pedagogical beliefs about technology integration can influence their teaching methods. It is suggested that constructivist beliefs are positively correlated with the use of technology in the classroom and traditional beliefs are negatively associated with technology use in the classroom (Ertmer, 2005; Inan & Lowther, 2010; Liu, 2011). There are times when beliefs do not mirror practice because of other barriers such as time, resources, and incompetency of technology use (Ertmer, 2005; Liu, 2011). Additionally, available technology, skill level, and use may not guarantee the use of purposeful technology or constructivist principles (Nanjappa & Grant, 2003).

By integrating technology with constructivist teaching methods, students become more responsible for their learning (Grant, 2002). Through technology applications, such as word processing tools and presentation tools, students can engage in authentic learning
experiences. Constructivism enables teachers to provide personalized and individualized learning to students (Nanjappa & Grant, 2003). By integrating technology into constructivist teaching practices, students participate in meaningful student-centered learning. Teachers need professional development sessions to learn how to design constructivist learning opportunities for their students (Hoover, 1996).

**Social Constructivist Learning Theory**

Taken from the constructivist theory, social constructivism, which was influenced by Vygotsky’s work, indicates knowledge is constructed in a social context. Social constructivists believe learning occurs in social contexts when students are provided with collaborative learning experiences. This knowledge is then internalized and used by the individual student (Amineh & Asl, 2015). Social constructivist theorists believe the process of sharing these individual perspectives results in learners creating an understanding together that cannot be created alone (Amineh & Asl, 2015). Vygotsky (1978) described how learning is a social experience and explained that understanding human thinking and knowledge is dependent on an understanding of the individual’s social experience. Vygotsky’s zone of proximal development is included within the social constructivist learning theory. Within the zone of proximal development, students can perform activities with some assistance (Vygotsky, 1978). This is an important premise for the theory.

Social constructivists view knowledge construction as being the intersection of people’s interactions that involve sharing and comparing among learners. This highly interactive process, directly tied to Vygotsky’s sociocultural theory of learning, is how learners make meaning for themselves and help others to find meaning (Applefield,
Huber, & Moallem, 2001). The socially situated activity is enhanced by providing learners with a stimulating and relevant context.

Teaching discrete and isolated skills in a linear sequence is rejected by constructivists and social constructivists alike. Engagement in higher-order thinking and advanced learning is desired, and mastery of basic skills and concepts is attained through these socially-based interactions.

A social constructivist view of teaching enables teachers to facilitate learning opportunities that involve learning with others (Schunk, 2000). Classroom instruction based on the social constructivist perspective brings to the forefront the need for collaboration among learners. Instructors using this approach are viewed as facilitators (Amineh & Asl, 2015). The teacher helps learners get to their understanding of the content. A teacher in a social constructivist classroom designs learning opportunities that allow the students to validate and support each other’s learning and ideas (Palincsar, 1998).

Social constructivism, like constructivism, acknowledges the uniqueness and complexity of each learner. Interactions between students and knowledgeable members of society are critical for learning to take place. From the social constructivist viewpoint, it is important to take into account the background and culture of the learner. The learner’s background helps to shape the learning process for each person (Amineh & Asl, 2015).

Many technology applications support 21st learning tenets. Teachers should explore different strategies to integrate technology in the classroom and different approaches where peers are used as a resource to help support learning. This will help to
support technology integration in a social constructivist classroom (Louis, 2012). Through social constructivism, teachers can examine and explore ways students can use technology and collaborate with each other. This theory helps facilitate the understanding of the context of the classroom and the value of peers in learning (Louis, 2012).

**Collaboration and Technology Integration**

Research studies on collaboration and technology integration have demonstrated effective learning opportunities. Student collaboration is seen when students work together and participate in experiences together using technology devices in which they are asked to speak, listen, and apply their learning. Three types of collaboration using technology are remote collaboration, role-based collaboration, and shared-screen collaboration (Burns, 2018).

Remote collaboration occurs when students work together on individual devices to contribute to a shared creation. As it relates to Google Workspace for Education Fundamentals, remote collaboration might look like two or more students working on one Google Doc or Google Slide to achieve a goal. Role-based collaboration occurs when students work on individual devices to complete assigned tasks for a group project. Students are still working to complete a collaborative project, but they may be working independently on their portion. Shared-screen collaboration occurs when students work together in pairs to complete a task using one device. All different forms of collaboration are appropriate for the elementary grades (Burns, 2018).

Using technology such as email provides an opportunity for conversations to take place among large groups of students as a way to share information (Blumenfeld, Marx, Soloway, & Krajcik, 1996). Researchers have suggested there is a benefit of using
handheld technology devices to allow students to engage in collaborative activities both in and out of the classroom (Zurita & Nussbaum, 2004). In another study, it was found that appropriately designed technology activities supported the use of group discussion within a constructivist classroom to help facilitate collaboration. Within this study, both teachers and students welcomed this type of work as it ensured greater interaction between all classroom peers (Nussbaum et al., 2009). A study on connecting learners through the use of a global project assignment showed students benefited from cultural awareness opportunities when technology was used to connect and collaborate with international peers (Oliver et al., 2019). These are a few of the benefits of collaboration while using technology to support learning.

Many different technology products offer productive applications to use for collaborative learning. Wikis, blogs, and discussion boards enable students to share information in written form and publish their thoughts for others to see and comment (McKnight et al., 2016). Skype and Google Hangouts enable students to collaborate virtually and communicate face-to-face via electronic means. Other Web 2.0 presentation tools such as Prezi, Cacco, and Vyew enable students to create presentations collaboratively and publish shared information. Google Workspace for Education Fundamentals offers collaborative features within all the products through the share feature (Google, 2020; Suwantarathip & Wichadee, 2014; Zhou et al., 2012). Because Google offers a variety of products to use for collaborative purposes, the next section presents a closer look at Google Workspace for Education Fundamentals.
Google Workspace for Education Fundamentals

Google Workspace for Education Fundamentals is a free product that can be used by teachers and students within educational institutions. This suite includes products that have a collaborative component. These communication and collaboration tools can be accessed from any device, at any time, from anywhere. In the year 2020, over 120 million students and teachers were using Google Workspace for Education Fundamentals, with over 100 million students and teachers using Google Classroom (Google, 2020). Teachers came to rely on Google Workspace for Education Fundamentals to instruct students during the COVID-19 pandemic. During this time, Google upgraded some features to make virtual learning possible for more learners. For example, Meet now provides the ability to include 250 people and additional ideas as to how to keep students engaged while not physically present in the classroom. Google advertised more than 50 updates for early fall 2020 in time for back to school. These updates were for Google Meets, Google Classroom, Google Assignments, Google Docs, and a Tech Toolkit for Families and Guardians (Shah, 2020).

Research provides insight on how teachers have used and feel about Google Workspace for Education Fundamentals. Teachers have positive perceptions of the use of Google (Bartolo, 2017; Nevin, 2009; Robertson, 2013). Teachers have reported using Google tools in student-centered instruction (Bartolo, 2017). Google Workspace for Education Fundamentals provides easy access via cloud computing (Nevin, 2009).

Studies have been conducted on how Google Docs and Google Classroom promote collaboration within the classroom environment. One general study was found with reference to the use of Google Workspace for Education Fundamentals as a
collaborative tool (Bartolo, 2017). However, most of the literature reviewed specifically on the use of Google as a collaborative tool contained a focus on college-level students. The literature illustrates a positive view of the use of Google as a collaborative tool (Iftakhar, 2016; Kessler, Bikowski, & Boggs, 2012; Mahmood, 2017; Nithya & Selvi, 2017; Suwantarathip & Wichadee, 2014; Zhou et al., 2012). A gap exists in the literature when it comes to using Google Workspace for Education Fundamentals products in an elementary school for collaborative purposes.

**Google Workspace for Education Fundamentals and Collaborative Uses**

The Google Workspace for Education Fundamentals tools are cloud-based solutions available for free for use within educational institutions (Google, 2020). These tools promote collaborative activities and projects that can occur inside or outside of the instructional day. Google products enable multiple users to contribute, edit, and interact together on one document, presentation, spreadsheet, or note-taking tool. Each of the Google tools can be used in the classroom to accomplish a different set of objectives through a classroom organizational tool, Google Classroom, an LMS, which creates a virtual learning environment for all students included in the class. Google Meet enables students to collaborate in virtual meetings. As an accountability feature, the teacher can view the collaborative history in Google and see who contributed to what segment of the work (Google, 2020).

There are several types of educational tools included in Google Workspace for Education Fundamentals that can be used in a collaborative environment. Google Docs is a word processing tool and can be used for collaborative writing. Google Slides is a linear slide presentation that enables collaboration using presentation templates and includes the
ability to add multimedia. Google Sheets is a collaborative spreadsheet for data sharing, calculation, and graphing. Google Sites allows students to create a website, working with collaborative features. Google Forms is a web form that can be used by students to gather information and create a spreadsheet from the responses. Additionally, Google Forms enables students to complete assessments. Google Draw is a collaborative canvas students can use to sketch ideas and combine elements of text, images, and other multimedia forms. Google Folders can be used as a shared folder where students can store shared documents and be given viewing or editing access (Google, 2020).

Collaborative writing activities have been studied with the use of Google’s shared tools, primarily Google Docs (Kessler et al., 2012; Nithya & Selvi, 2017; Suwantarathip & Wichadee, 2014; Zhou et al., 2012). Google Docs is a web-based word processing tool and lends itself to collaborative academic activities where team members work together in real time even if they are in different locations. Google Docs can support collaboration and problem solving, which are essential 21st century skills. Kessler et al. (2012) found students use Google Docs to complete writing assignments. In another study, students worked together to complete the writing process focusing on making changes to grammar and to the overall product. Suwantarathip and Wichadee (2014) focused on students who participated in collaborative writing activities using Google Docs. The participants reported positive attitudes toward collaborative writing and demonstrated a higher level of writing achievement than did students who did not use this tool. A significant difference was found between the mean writing score of the group who used Google Docs and that of the group who did not (Suwantarathip & Wichadee, 2014). In a study by Zhou et al. (2012), the use of Google Docs had no bearing on student grades. However,
over 93% of the students reported Google Docs was a useful tool for group work, and changed the way the groups communicated regarding a class project (Zhou et al., 2012).

In completing the review of the literature, limited articles appeared specifically on the other tools in Google Workspace for Education Fundamentals. Iftakhar (2016) completed a study on Google Classroom and found teachers reported Google Classroom allowed them to have more interaction with their students. It was also noted that Google Classroom promoted collaborative learning by enabling students to submit assignments together (Iftakhar, 2016).

Although few studies highlighted the use of Google in the elementary school setting, none were discovered that specifically addressed collaboration. A reported study was conducted in a third-grade classroom focusing on developing digital literacies and the use of Google. Students in the study described that the use of the applications affected their thinking, communication, and collaboration (Gierhart & Brown, 2018). There is a significant gap in the research related to using Google tools with elementary students and how this use supports collaborative learning activities. The use of Google tools with younger students to promote collaborative activities should be studied further.

**Chapter Summary**

Technology integration has both positive and negative impacts on student achievement and positive benefits for student motivation (Daniel, 2012; Glassett & Schrum, 2009; Harper & Milman, 2016; Harris et al., 2016; Lee et al., 2017; Lowther et al., 2008; Storz & Hoffman, 2013; Sultan et al., 2011; Wachira & Keengwe, 2011). When reviewing the technology integration research, it is important to consider two integration models, the TPACK model and the SAMR model. There are different benefits to both
models (Hilton, 2016). Instructional models used during the COVID-19 pandemic were described and their pros and cons were provided (Hooker, 2020).

Although there are noted benefits to integrating technology, teachers integrate at different rates based on first- and second-order barriers faced in the learning environment and the school (Ertmer, 1999, 2005; Ertmer & Ottenbreit-Leftwich, 2010; Hew & Brush, 2007; Hsu, 2016; Li et al., 2015; Reddit, 2007; Young, 2012). Changing teachers’ attitudes and beliefs can be difficult. However, recommendations to make positive changes include devoting time, professional development, successful personal learning experiences, cultivating discussions about pedagogical beliefs, and working in small collaborative groups to support each other’s efforts (Ertmer, 2005; Kim et al., 2013; Mueller et al., 2008). The review of the research showed creating a collaborative educational environment and using collaborative technology applications with access to one-to-one technology devices will benefit student achievement, motivation, and engagement when first- and second-order teacher barriers are eliminated.

Students who participate in collaborative activities benefit from the knowledge and expertise of others (Applefield et al., 2001). Technology tasks that support collaborative learning opportunities provide effective learning opportunities for students (Blumenfeld et al., 1996; Nussbaum et al., 2009; Oliver et al., 2019; Zurita & Nussbaum, 2004). Different technology applications enable students to work collaboratively, especially Google Workspace for Education Fundamentals (Google, 2020; Iftakhar, 2016; Kessler et al., 2012; Mahmood, 2017; Suwantarathip & Wichadee, 2014; Zhou et al., 2012).
CHAPTER 3

METHOD

The purpose of this action research was to investigate how elementary teachers used Google Workspace for Education Fundamentals for student collaboration during the COVID-19 pandemic. The goal was to make recommendations for technology integration in Grades 3 through 5 in a school in central New Jersey. This action research study was guided by three research questions:

1. How do elementary teachers at a school in central New Jersey integrate technology using Google Workspace for Education Fundamentals for student collaboration into their daily lessons in a gapped hybrid learning environment?

2. How do elementary teachers perceive first- and second-order barriers to integrating Google Workspace for Education Fundamentals for the purpose of student collaboration in a gapped hybrid learning environment?

3. What are elementary teachers’ perceptions about the integration of Google Workspace for Education Fundamentals for the purpose of student collaboration in their classroom lessons in a gapped hybrid learning environment?

Research Design

In this study, I used action research to describe the current conditions of technology integration using Google Workspace for Education Fundamentals, barriers to
technology integration, and teachers’ perceptions about using Google Workspace for the purpose of student collaboration during the COVID-19 pandemic in a gapped hybrid learning environment. Action research was the most appropriate type of study to conduct as this topic is a contextualized problem within my school environment (Buss & Zambo, 2014). I will use the results of this study to make recommendations for current and future teaching practices within the school district.

This research study involved the elements of action research, which is a systematic inquiry on the part of teaching staff and administrators within their environment to gather information about teaching and learning (Mertler, 2017). The action research approach empowers teachers to solve everyday problems in their schools to improve both student learning and teacher effectiveness. Action research is different from traditional research because it focuses on the development of a deep understanding of the problem, the implementation of action steps, investigation of the effects of the action, and recommendations for future next steps (Buss & Zambo, 2014). Action research is a systematic inquiry conducted by stakeholders to learn how their schools operate, how the teachers instruct, and how well students are learning. Because action research is conducted within the context in which the researchers are directly involved, the findings are of interest. Educators perform action research for themselves and to focus on change within their local context (Buss & Zambo, 2014). Results of this study and their depiction of current conditions will directly influence future teacher pedagogy, purchases of technology, and professional development within the district.

Action research is one of the most powerful ways to generate new knowledge (Greenwood & Levin, 2007). Action research involves the integration of three elements:
action, research, and participation (Greenwood & Levin, 2007). The element of action focuses on participation, which is used to alter the situation within a self-managing state. Research focuses on uncovering the power of knowledge within the setting. Finally, the element of participation focuses on the value of democracy in the research setting where individuals have control over their life situations. Action researchers are trained researchers who serve as members of local organizations (Greenwood & Levin, 2007).

I also used the pragmatic paradigm to guide this research. The word pragmatism includes the root word *pragma*, which is the Greek word for action. This indicates knowledge comes from taking action and learning from the outcomes. As this research followed the pragmatic paradigm, a mixed methods design is aligned (Creswell, 2014; Morgan, 2014). This type of research design enables a researcher to collect both quantitative and qualitative data and then merge the results of the two strands while looking for relationships (Creswell & Plano Clark, 2011). Using this design “brings together the strengths and weaknesses of quantitative and qualitative methods” (Creswell & Plano Clark, 2011, p. 68). Action research studies tend to align better with a mixed methods research design (Mertler, 2017) as they share common features, such as the collection and analysis of both quantitative and qualitative data (Ivankova, 2015).

Within this mixed methods study, I used both quantitative and qualitative data to provide answers to the research questions. Quantitative data can be analyzed statistically. A total of 19 teachers completed a survey called the Teacher Perception Survey to measure their beliefs and perceptions. Included in the Teacher Perception Survey was the Teacher Technology Questionnaire (TTQ; Lowther & Ross, 2000), which was designed to gather teachers’ perceptions of computers and technology integration. Additionally, the
survey included portions of the Technology Integration Survey (Kopcha, 2012) and the Perceptions Toward ICTs in the Teaching-Learning Process Scale (Baş, Kubiatko, & Sülbül, 2016). I collected lesson plans from selected teachers to determine the frequency of their use of technology and Google Workspace for Education Fundamentals for the purpose of student collaboration. Qualitative data provided opportunities for the teachers to express their opinions and perspectives on the research questions through open-ended survey questions and semi-structured interviews.

**Setting and Participants**

I conducted this research study at a Grade 3 through 5 elementary school in central New Jersey that serves approximately 500 students. There is only one Grade 3 through 5 school in the town; therefore, it is the only public-school students can attend for these grade levels. I obtained Institutional Review Board (IRB) approval from the University of South Carolina to complete this study (see Appendix K). IRB approval is required for any research involving human subjects. Approval was obtained prior to the start of my data collection.

In this school, there are seven general education sections for each grade level. In third grade, teachers instruct students in all core subject areas, including English language arts, mathematics, science, and social studies. In fourth and fifth grades, teachers instruct students in either English language arts and social studies or mathematics, science, and social studies. In these grades, students receive more departmentalized instruction. Students identified with special education needs receive supportive services in an in-class resource co-teaching environment, in a resource room, or in a self-contained classroom. There are three to four special education classrooms within each grade level.
Within the school, there are three intervention classes where students receive supplemental instruction in English language arts or mathematics for one class period per day. Although this is a general education program, students are identified as eligible to receive supplemental small group instruction services through a matrix using multiple academic data points. There is one gifted and talented class where the teacher provides enrichment services to all third-grade students focusing on STEM concepts and provides enrichment and accelerated instruction to small groups of identified students in Grades 3 through 5 who meet the district’s criteria for gifted and talented. There are three physical education teachers, one music teacher, one art teacher, and one technology teacher. These teachers provide special area instruction to all third- through fifth-grade students in the school throughout the school year.

During the fall of 2020, the scheduling model selected due to the COVID-19 pandemic and the need for social distancing of more than six feet was a gapped hybrid model. Within this model, students were assigned to cohorts based on specific criteria. The cohort designated what days (if any) the students would attend school in person. At this school, the cohort model and school attendance were as follows. Cohort A included students whose last names started with A through K. These students attended school on Mondays and Tuesdays, and engaged in remote instruction from home on Wednesdays, Thursdays, and Fridays. Cohort B included students whose last names started with L through Z. These students attended school in person on Thursdays and Fridays and engaged in remote instruction from home on Mondays, Tuesdays, and Wednesdays. Students in Cohort C were full-time remote virtual students, per parental request. They did not come into the school building and learned remotely 5 days a week. Students in
Cohort D attended school in person on Mondays, Tuesdays, Thursdays, and Fridays. Students selected for this cohort were in a self-contained special education class, were identified as English as second language students, or were identified as homeless.

As noted in Chapter 1, each classroom has a Promethean Board, a document camera, and two Dell desktop computers that are hardwired to the network. All teachers are issued a laptop computer. Teachers may also use an additional HP Chromebook if needed. All students at the school have been issued a district Chromebook and carry their Chromebooks to and from school when present in school. In October 2020, all student HP Chromebooks were replaced with updated Dell Chromebooks. All teachers and students have Google Workspace for Education Fundamentals accounts issued by the district. While present in the school building, staff and students all have Internet access provided through a wireless network two times above the New Jersey Department of Education recommended connectivity speed. At home, staff and students use their personal Internet connections. However, staff or students who do not have Internet connectivity at home are provided a hotspot in order to have access to online resources and instruction.

The school is led by a building principal who was hired in August 2020. The supervisor was transferred from the kindergarten through second-grade school because of her knowledge of curriculum and instruction during the 2018–2019 school year. She has worked as a supervisor for over 12 years in the school district. According to the most recent published New Jersey School Performance Report for the 2019–2020 school year (New Jersey Department of Education, 2020a), there are 50 teachers in the school with an average of 9.6 years of public-school teaching experience. Of the teachers, 43 are female
and seven are male. Seventy-six percent of the teachers have taught in the district for more than 4 years. Seventy percent of the teachers obtained a bachelor’s degree and 30% of the teachers a master’s degree in education.

All teachers have received training on the use of Google Workspace for Education Fundamentals. The hours of training vary depending on the number of years the teachers have been in the district. Formal Google training has not taken place in the district since the 2017–2018 school year, year two of Google implementation in the district. Some teachers (the number is not known) have attended out of district professional development on the use of Google. Six teachers in the school are Google Level One certified and four teachers are Google Level Two certified. A district STEM coach who provides support and job-embedded professional development within the classrooms was hired during the 2017–2018 school year. However, during the 2020–2021 school year, this position was eliminated based on the need to open another section of kindergarten to allow for smaller class sizes.

In September 2020, teachers were provided with a 3-hour training on how to “Zoom like a Pro.” This in-service gave teaching staff an understanding of how to use meeting software (e.g., Google Meet and Zoom) along with the ELMO document cameras and the Promethean Board to provide synchronous learning opportunities. Also, teachers were provided 6 hours to collaborate with colleagues on how to use the school-issued technology to deliver synchronous learning opportunities to students, whether in person or at home.

I introduced this study to the school’s teachers via email and through a Screencastify explaining the details of the study in November 2020. In order to
participate in this study, teachers needed to meet the following criteria. First, they needed to be interested in participating. Second, the teachers needed to be a certified member of the staff. Only teachers who met these criteria were provided with a Google Form link to complete the survey questions.

In this study, 19 teachers who taught students in Grades 3 through 5 completed the survey. Table 3.1 illustrates the demographic information of the survey participants. Participants’ age ranges included the following: 15.79% ($n = 3$) were between the ages of 22 and 30, 15.79% ($n = 3$) were between the ages of 31 and 39, 47.37% ($n = 9$) were between the ages of 40 and 49, and 21.05% ($n = 4$) were between the ages of 50 and 59. Of the participants, 89.47% ($n = 17$) were female and 10.53% ($n = 2$) were male. The participants’ ethnicity included 94.74% White ($n = 18$) and 5.26% ($n = 1$) preferred not to say. The years of teaching experience of the participants ranged from 2.5 years to 26 years, with 26.31% ($n = 5$) teaching 1 to 5 years, 10.53% ($n = 2$) teaching 6 to 10 years, 15.79% ($n = 3$) teaching 11 to 15 years, and 47.37% ($n = 9$) teaching 16 or more years.

Table 3.1 Profile of the Survey Participants

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>$N$</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age range</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22–30</td>
<td>3</td>
<td>15.79%</td>
</tr>
<tr>
<td>31–39</td>
<td>3</td>
<td>15.79%</td>
</tr>
<tr>
<td>40–49</td>
<td>9</td>
<td>47.37%</td>
</tr>
<tr>
<td>50–59</td>
<td>4</td>
<td>21.05%</td>
</tr>
<tr>
<td>60 and over</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2</td>
<td>89.47%</td>
</tr>
<tr>
<td>Female</td>
<td>17</td>
<td>10.53%</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

57
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>18</td>
<td>94.74%</td>
</tr>
<tr>
<td>Prefer not to say</td>
<td>1</td>
<td>5.26%</td>
</tr>
<tr>
<td><strong>Years of teaching experience</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–5</td>
<td>5</td>
<td>26.31%</td>
</tr>
<tr>
<td>6–10</td>
<td>2</td>
<td>10.53%</td>
</tr>
<tr>
<td>11–15</td>
<td>3</td>
<td>15.79%</td>
</tr>
<tr>
<td>16 or more</td>
<td>9</td>
<td>47.37%</td>
</tr>
</tbody>
</table>

*Note. N = 19.*

Participants received an additional survey link to sign up to complete a semi-structured interview regarding technology integration perceptions and beliefs for the purpose of collaboration. Eight teachers indicated interest in the semi-structured interview. I contacted those teachers and provided information about the interviews and the need to collect lesson plans for the month of November. All eight teachers signed up and participated in an interview. Six of these teachers were female and two were male. Two teachers were in the age range of 22 to 30, one teacher was in the age range of 31 to 39, four teachers were in the age range of 40 to 49, and one teacher was in the age range of 50 to 59. A more detailed description of these teachers can be found in Table 3.2.

**Table 3.2 Profile of Interview Participants**

<table>
<thead>
<tr>
<th>Name (pseudonym)</th>
<th>Age range</th>
<th>Gender</th>
<th>Years of teaching experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbara</td>
<td>40–49</td>
<td>Female</td>
<td>7 years</td>
</tr>
<tr>
<td>Bob</td>
<td>22–30</td>
<td>Male</td>
<td>3 years</td>
</tr>
<tr>
<td>Chloe</td>
<td>50–59</td>
<td>Female</td>
<td>21 years</td>
</tr>
<tr>
<td>Emily</td>
<td>40–49</td>
<td>Female</td>
<td>21 years</td>
</tr>
<tr>
<td>Jill</td>
<td>40–49</td>
<td>Female</td>
<td>23 years</td>
</tr>
<tr>
<td>Julie</td>
<td>31–39</td>
<td>Female</td>
<td>14 years</td>
</tr>
<tr>
<td>Kelly</td>
<td>40–49</td>
<td>Female</td>
<td>18 years</td>
</tr>
<tr>
<td>Ryan</td>
<td>22–30</td>
<td>Male</td>
<td>3 years</td>
</tr>
</tbody>
</table>

*Note. N = 8.*
Data Collection Methods

I used a variety of data sources to inform the results of the study. These collection methods included (a) a survey, (b) teacher interviews, and (c) lesson plans. Each data source is described in this section and Table 3.3 provides an overview of the research questions and the data sources.

Table 3.3 Research Questions and Data Sources

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Data sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ1: How do elementary teachers at a school in central New Jersey integrate technology using Google Workspace for Education Fundamentals for student collaboration into their daily lessons in a gapped hybrid learning environment?</td>
<td>Interviews</td>
</tr>
<tr>
<td></td>
<td>Lesson plans</td>
</tr>
<tr>
<td>RQ2: How do elementary teachers perceive first- and second-order barriers to integrating Google Workspace for Education Fundamentals for the purpose of student collaboration in a gapped hybrid learning environment?</td>
<td>Surveys</td>
</tr>
<tr>
<td></td>
<td>Interviews</td>
</tr>
<tr>
<td>RQ3: What are elementary teachers’ perceptions about the integration of Google Workspace for Education Fundamentals for the purpose of student collaboration in their classroom lessons in a gapped hybrid learning environment?</td>
<td>Surveys</td>
</tr>
<tr>
<td></td>
<td>Interviews</td>
</tr>
</tbody>
</table>

Quantitative Data Collection Instruments

Survey. I used the survey to acquire information from teachers of Grades 3, 4, or 5 at the elementary school about their thoughts on the first- and second-order barriers and their perceptions of the integration of Google for the purpose of student collaboration in their classroom lessons in a gapped hybrid learning environment. The ultimate goal of conducting survey research is to learn more about the current status of a larger population by surveying a subset of that population, in this case teachers (Mertler, 2017).

I combined three published surveys into one survey entitled the Teacher Perception Survey for the teachers to complete and added four open-ended questions. The
survey items provided additional insight that I used in conjunction with the interviews and a review of lesson plans. I conducted a reliability analysis using Cronbach’s alpha on the survey listed in Chapter 4.

The first part of the Teacher Perception Survey included the directions, participant consent, and a demographic section. In the demographic section, teachers provided information related to their qualifications, teacher experience, technology training, technology certifications, and a rating of their technology skills as a novice to expert on a 5-point Likert-type scale.

The second part of the Teacher Perception Survey included questions from the Teacher Technology Questionnaire (TTQ; Lowther & Ross, 2000; see Appendix A for the original survey). The TTQ, published by Lowther and Ross (2000), is a two-part survey designed to collect teachers’ perceptions of computers and technology integration. On this survey, teachers rate their level of agreement with 20 statements regarding five main technology areas: (a) technology’s influence on student learning and achievement and impact on classroom instruction and learning activities (Teacher Beliefs); (b) feelings and perceptions of their capabilities and skills required for technology integration (Teacher Readiness); (c) perceptions of administrative, peer, and community support for technology integration in classroom instruction (Overall Support); (d) perceptions of the adequacy of technology support, resources, and assistance with troubleshooting (Technical Support); and (e) perceptions of the frequency of technology integration in their instruction (Impact on Students). These subscales correspond to questions in the survey as identified in Table 3.4.
Table 3.4 *TTQ Subscales and Corresponding Questions*

<table>
<thead>
<tr>
<th>TTQ subscales</th>
<th>Question numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher Beliefs</td>
<td>14, 16, 18, 20</td>
</tr>
<tr>
<td>Teacher Readiness</td>
<td>5, 9, 11, 12</td>
</tr>
<tr>
<td>Overall Support</td>
<td>4, 13, 15, 17</td>
</tr>
<tr>
<td>Technical Support</td>
<td>1, 2, 6, 7</td>
</tr>
<tr>
<td>Impact on Students</td>
<td>3, 8, 10, 19</td>
</tr>
</tbody>
</table>

On the survey, items are rated with a 5-point Likert-type scale that ranges from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*). All five subscales from the TTQ were included in the survey. I modified some survey questions to include the terms G Suite for Education (the survey was conducted prior to the official name change to Google Workspace for Education Fundamentals) and student collaboration. See Appendix B for the list of original questions, modifications, and research question alignment.

The TTQ has been validated (Lowther & Ross, 2000) and used in research and validation studies. The reliability of the TTQ was tested on 4,863 teachers who had completed the instrument previously as part of the research projects at the Center for Research in Educational Policy. Reliability coefficients were determined to be high for each subscale of the instrument (described above), ranging from .75 to .89.

The third part of the Teacher Perception Survey included questions from the Technology Integration Survey (Kopcha, 2012). The Technology Integration Survey is broken into five sections based on reported barriers: (a) Vision, (b) Access, (c) Beliefs, (d) Professional Development, and (e) Time. The 15 items in the survey (3 items per barrier) were based on previous studies identifying 32 key practices to address the
barriers associated with effective technology integration in K–12 schools (Clark, 2006). In the original survey, items were written so teachers could report on the extent to which they enacted practices or encountered issues. Survey items are rated using a standard 5-point Likert-type scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Cronbach’s coefficient alpha for the final version of the survey was 0.93. A copy of the original survey can be found in Appendix C.

The survey included four out of the five subscales. I removed the Access subscale from the survey as questions were too similar to the TTQ questions. I made some modifications to the questions to include G Suite for Education (the survey was conducted prior to the official name change to Google Workspace for Education Fundamentals) and the term collaboration (see Appendix D for the questions, changes made, and alignment to the research questions). An example of this is as follows. On the original survey, a vision question was “I expected to use technology to support content objectives.” Within my survey, the question was “I was expected to use technology, especially G Suite for Education, to support content objectives.” Another example where the term collaboration was used, is as follows. On the original survey in the beliefs section, the question read, “I believe using computers with students increase their learning.” Within in my survey this question read “I believe using G Suite for Education with students increases their ability to collaborate with each other.”

The fourth section of the Teacher Perception Survey included questions from the Perceptions Towards ICTs in the Teaching-Learning Process Scale (Baş et al., 2016). This instrument consists of 25 items rated on a scale from 1 (totally disagree) to 5 (totally agree). The survey is broken into three sections. The first section focuses on attitudes, the
second section on usage, and the third section on beliefs. This scale was developed for the primary use of measuring teachers’ perceptions toward information and communication technology (ICT) in the teaching and learning process (See Appendix E for the original survey). This scale has acceptable reliability values (0.92) as well as evidence to support content and structure validity.

Within the survey, I eliminated the usage subsection (10 questions) as it did not align with my research questions. I adjusted some of the questions to address G Suite for Education (the survey was conducted prior to the official name change to Google Workspace for Education Fundamentals) and collaboration. Additionally, the initial questions were written in Turkish; therefore, I made some edits to the survey language for clarity. The modifications did not change the initial intent of the questions (see Appendix F for the original questions, changes made, and research question alignment). An example of this change is on the subscale of beliefs. The original question from the survey in the belief section was “I believe ICTs as powerful tools helping students’ understanding of abstract content.” Within my created survey, the question was rephased to include “I believe G Suite for Education is a powerful tool helping students’ to collaborate on work.”

The final section of the Teacher Perception Survey included four open-ended questions. These open-ended questions focused on teacher perceptions. More is described in the open-ended survey questions section.

**Lesson plans.** Lesson plans are one example of existing documents that are readily available in a school setting (Mertler, 2017). These documents serve as a record of what has been or will be taught in the classroom. Lesson plans can assist in
determining the ways in which technology has been integrated within the classroom over a period of time. These plans provided me with a holistic picture of what has occurred in the classrooms throughout the school day. I collected lesson plans from the month of November from the eight selected teachers who were interviewed to describe the use of technology in the classroom. This equated to 307 lesson plan entries.

As recommended by Mertler (2017), I used an organizer to aid in the collection of data. I used this self-created checklist to organize a month’s worth of lesson plans from the selected teachers. The checklist had a column for the subject matter, type of technology, the Google tool used if applicable, whether the technology was used for collaboration, and a description of how G Suite (also known as Google Workspace for Education Fundamentals) was used for collaboration and a notes section to document overall impressions. A frequency table of these areas is reported in the analysis and findings section. A copy of the checklist is located in Appendix G.

Open-ended survey questions. Open-ended survey questions enabled participants to provide information based on questions that were not restrictive (Creswell & Plano Clark, 2011). By using open-ended questions, the participants were able to share feedback in their own words and elaborate on the responses in the Likert-type survey. In this study, I added four open-ended questions to the end of the Likert-type survey. A copy of the full survey is available in Appendix H. Participants were required to answer these questions in order to finish the survey. These open-ended questions were based on the research questions for this study. Analysis of the open-ended questions follows the qualitative methods analysis listed in this chapter. The alignment of the open-ended questions and the research questions is provided in Table 3.5.
Table 3.5 Teacher Open-Ended Questions Alignment

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Open-ended questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ2: How do elementary teachers perceive first and second-order barriers to</td>
<td>OE 1. What do you perceive as the barriers to integrate G Suite for Education for the purpose of student collaboration in a gapped-hybrid learning environment? List all that apply</td>
</tr>
<tr>
<td>integrating Google Workspace for Education Fundamentals for the purpose of student</td>
<td></td>
</tr>
<tr>
<td>collaboration in a gapped hybrid learning environment?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OE 2. What do you perceive as the number one barrier to student collaboration using G Suite for Education during this gapped hybrid learning environment?</td>
</tr>
<tr>
<td></td>
<td>OE 3. Why is the (answer to the previous question) the number one barrier to student collaboration in a gapped hybrid learning environment?</td>
</tr>
<tr>
<td></td>
<td>OE 4. What are your perceptions regarding the integration of G Suite for Education for the purpose of student collaboration in a gapped hybrid learning environment?</td>
</tr>
</tbody>
</table>

RQ3: What are elementary teachers’ perceptions about the integration of Google Workspace for Education Fundamentals for the purpose of student collaboration in their classroom lessons in a gapped hybrid learning environment?

OE 4. What are your perceptions regarding the integration of G Suite for Education for the purpose of student collaboration in a gapped hybrid learning environment?

Qualitative Data Collection Instruments

Interviews. Interviews are used to gain an understanding of participants’ views and opinions (Creswell, 2014). Through interviews, participants can provide explanations and justifications for their thoughts and actions (Tracy, 2013). In this study, I conducted semi-structured interviews, which involved having several base questions as well as the option to use follow-up questions as needed. This flexibility is typically more desirable when collecting qualitative data (Mertler, 2017). I designed the interviews to understand how technology is integrated into daily lessons and to gain a perspective of the teachers’ perceptions of the first- and second-order barriers to their ability to integrate technology
for the purpose of student collaboration. Also, the interview questions addressed the teachers’ perceptions about the benefits of technology integration using Google Workspace for Education Fundamentals for the purpose of student collaboration.

The interview questions were aligned to the research questions. Table 3.6 provides the alignment of the interview questions with the research questions. Three of the 20 questions were based on questions found in Storz and Hoffman’s (2013) study and were adapted to include G Suite for Education (also known as Google Workspace for Education Fundamentals. These were Questions 8, 9, and 12. The questions taken from Storz and Hoffman address the use of Google Workspace for Education Fundamentals affecting student learning, teaching, and the preparation by the school district for the integration of Chromebooks and other district-provided technology. Additionally, three of the 20 teacher interview questions were from questions found in the Ertmer et al. (2012) study. These were Questions 7, 10, and 11. These questions included information about the successful implementation of Google Workspace for Education Fundamentals in the classroom. All questions in the survey addressed teacher beliefs, perceptions regarding barriers to successful integration, and perceptions of the integration of technology for student collaboration.

Table 3.6 Teacher Interview Protocol Alignment

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Interview question alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ1: How do elementary teachers at a school in central New Jersey integrate technology using Google Workspace for Education Fundamentals for student collaboration into their daily lessons in a gapped hybrid learning environment?</td>
<td>Q4. What technology do you use in your (grade/subject) classroom?</td>
</tr>
<tr>
<td></td>
<td>Q5. Please explain how you use the different forms of technology to teach your (grade/subject) students in the gapped hybrid learning environment.</td>
</tr>
<tr>
<td>Research questions</td>
<td>Interview question alignment</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Q6. What Google Suite for Education tools do your students use regularly in a gapped hybrid learning environment?</td>
<td></td>
</tr>
<tr>
<td>Q7. How frequently are you able to implement Google Suite for Education for student use in your own classroom? Can you provide an example or two of how your students used this technology tool?</td>
<td></td>
</tr>
<tr>
<td>Q14. Do you use G Suite for student collaboration in your classroom in the gapped hybrid learning environment?</td>
<td></td>
</tr>
<tr>
<td>a. Specifically in what subject areas, and for what purpose, what tools they use?</td>
<td></td>
</tr>
<tr>
<td>b. What benefits do you see to student learning when adding a collaborative piece to your lessons?</td>
<td></td>
</tr>
<tr>
<td>RQ2: How do elementary teachers perceive first and second-order barriers to integrating Google Workspace for Education Fundamentals for the purpose of student collaboration in a gapped hybrid learning environment?</td>
<td></td>
</tr>
<tr>
<td>Q11. Have there been situations when you were unable to, or it was difficult to implement technology or Google Suite for Education in the classroom? Please describe the reasons for the difficulty and how you overcame them.</td>
<td></td>
</tr>
<tr>
<td>a. If the teacher explains only one variable, ask is there another situation that you could describe?</td>
<td></td>
</tr>
<tr>
<td>b. If the teacher provides limited ways to overcome the difficulty, ask for more expansion.</td>
<td></td>
</tr>
<tr>
<td>Q12. How well do you think the district prepared you and the students for the integration of Chromebooks and G Suite for Education for the purpose of collaboration?</td>
<td></td>
</tr>
<tr>
<td>Q18. What are the pitfalls of student collaboration in a gapped hybrid model?</td>
<td></td>
</tr>
<tr>
<td>Q19. Please rank the barriers in using technology in your classroom for the purpose of student collaboration while using a gapped hybrid model due to the COVID-19 restrictions. Please rank one being the</td>
<td></td>
</tr>
</tbody>
</table>
Research questions | Interview question alignment
---|---
most limiting barrier to 13 the least of a barrier. (At this point the teacher was provided with a Google Doc to rank the order the barriers and to answer the two questions related to the barriers):

  a. Time to implement,
  b. student behavior,
  c. classroom assessments to be conducted,
  d. unsure of how to use the technology,
  e. unsure of how to design the lesson,
  f. students do not work together well on a task,
  g. the need to have enough grades for the report card,
  h. technology not working correctly,
  i. Time to plan lessons,
  j. Technology makes teaching the content more difficult,
  k. My beliefs for teaching the content,
  l. The content does not lend itself to collaboration and the use of technology,
  m. Administrative beliefs of the use of technology

Q20. Why did you find the _______ barrier to be most limiting on your use of technology for the purpose of student collaboration?

Q21. Why did you find the _______ barrier to be least limiting on your use of technology for the purpose of student collaboration?

Q8. Do you think that Google Suite for Education impacts student learning? Explain your thinking?

Q9. Has the use of Google Suite for Education affected the way that you teach in a gapped hybrid learning environment? Explain?
<table>
<thead>
<tr>
<th>Research questions</th>
<th>Interview question alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q10. Ideally, how should technology, including Google Suite for Education be used in the (insert grade/subject) classroom?</td>
<td></td>
</tr>
<tr>
<td>Q13. Do you believe student collaboration is important in the classroom? Please explain why you feel that way.</td>
<td></td>
</tr>
<tr>
<td>Q15. How did your experience with remote learning during the spring of 2020 impact your use of G Suite for Education in the classroom today in the gapped hybrid learning environment?</td>
<td></td>
</tr>
<tr>
<td>Q16. Do you use G Suite for Education for student collaboration more now in the gapped hybrid learning environment than you did before due to the restrictions due to COVID-19? If yes, please explain how.</td>
<td></td>
</tr>
<tr>
<td>Q17. What are the benefits of student collaboration in a gapped hybrid model?</td>
<td></td>
</tr>
</tbody>
</table>

I asked the semi-structured interview questions (see Appendix I for the interview questions and protocol) of the eight participants on a Google Meet. I interviewed each teacher privately and individually. I provided directions and explained that the participant could choose to not answer an individual question or decide to end the interview at any time. I obtained consent and assigned each teacher a pseudonym for confidentiality. The interviews lasted approximately 30 minutes each and were recorded as I took notes regarding the interview responses. I transcribed the recorded responses word-for-word using Happy Scribe, an online transcription service.

**Data Analysis**

This study involved the use of both quantitative and qualitative data. I gathered quantitative data via a survey and a review of lesson plans and analyzed the quantitative data produced by the survey using descriptive statistics (means and standard deviations).
I analyzed the quantitative data collected through the lesson plan review through a frequency table. I gathered qualitative data through interviews and the four open-ended responses from the survey. I used inductive analysis to analyze the qualitative data. Table 3.7 shows the alignment of the research questions with the data sources and data analysis methods. The analysis methods are described in detail below.

Table 3.7 Research Questions, Data Sources, and Data Analysis Method

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Data sources</th>
<th>Data analysis methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ1: How do elementary teachers at a school in central New Jersey integrate technology using Google Workspace for Education Fundamentals for student collaboration into their daily lessons in a gapped hybrid learning environment?</td>
<td>Interviews</td>
<td>Inductive analysis</td>
</tr>
<tr>
<td></td>
<td>One month of lesson plans</td>
<td>Descriptive statistics: frequency</td>
</tr>
<tr>
<td>RQ2. How do elementary teachers perceive first and second- order barriers to integrating Google Workspace for Education Fundamentals for the purpose of student collaboration in a gapped hybrid learning environment?</td>
<td>Surveys</td>
<td>Descriptive statistics: mean and standard deviation</td>
</tr>
<tr>
<td></td>
<td>Interviews</td>
<td>Inductive analysis</td>
</tr>
<tr>
<td>RQ3. What are elementary teachers’ perceptions about the integration of Google Workspace for Education Fundamentals for the purpose of student collaboration in their classroom lessons in a gapped hybrid learning environment?</td>
<td>Surveys</td>
<td>Descriptive statistics: mean and standard deviation</td>
</tr>
<tr>
<td></td>
<td>Interviews</td>
<td>Inductive analysis</td>
</tr>
</tbody>
</table>
Quantitative Data Analysis

I ran descriptive statistics (means and standard deviations) for each section of the survey and compared and contrasted the statistics for each section of the survey to present the current situation of technology integration in the school district. Based on the descriptive statistics, I used scores to identify perceived barriers and the perceptions of teachers regarding the integration of technology. I used these results in conjunction with the qualitative data to attain a better understanding of the research questions.

After a review of lesson plans, I organized information from the lesson plans that included the use of technology and Google Workspace for Education Fundamentals. I documented the subject area integrated with technology, the type of technology used, the Google Workspace for Education Fundamentals tools used, and whether the tools were used for the purpose of student collaboration and then tallied and quantified this information. This is reported in a frequency table using the headings of type of technology used, frequency of the use of technology, frequency of collaboration, and whether I was unable to determine whether the tool was used for collaboration. Comparisons from the data were made.

Qualitative Data Analysis

Analyzing data uncovered using qualitative research is a process that requires organization and continual analysis (Creswell, 2014). Inductive analysis consists of reading through textual data, identifying themes in the data, and interpreting the structure and content of themes (Guest, Namey, & Mitchell, 2013). The inductive analysis involved coding and theme development from the interview transcriptions. The
multifaceted pieces of data found through the analysis of the interviews helped ensure the rigor and trustworthiness of the research.

The first step in the analysis process was the transcription of the recorded notes within 2 to 3 hours of completion. I transcribed the recorded interviews word-for-word using the Happy Scribe software. The immediate transcription of the interviews helped to ensure the accuracy of the data.

The second step in the analysis process involved the use of the Delve software program, an online cloud-based program, for coding purposes. I uploaded the transcripts from the responses to the open-ended survey questions and the interviews to the Delve software. I then used this software for coding and creating categories of the codes. I created a codebook in Delve to record the meaning of each code.

I first coded the transcripts using in vivo and descriptive coding. In vivo coding is derived from the language of the participants. Descriptive coding summarizes the primary topic of the excerpt (Saldaña, 2016). I coded the data first and then looked for patterns to create categories (Creswell, 2014). Second round coding involved the use of pattern coding (Saldaña, 2016). This coding process helped to form the themes. The themes were extracted from the data collected. Findings are presented in a table with a breakdown of categories, theme-related components, and assertions (Buss & Zambo, 2014).

Documentation of this process included the use of the codebook and analytical memo writing (Saldaña, 2016). Screenshots of the work completed in Delve and the analytic memos taken are included in the findings section.
Procedures and Timeline

Phase one was the collection of the quantitative and qualitative data using a survey; phase two was completing the interviews and a lesson plan review; and phase three was the analysis of the survey results, interviews, and lesson plan data. Table 3.8 includes details as to the timeline for the procedures of this research study.

Table 3.8 Procedures and Timelines

<table>
<thead>
<tr>
<th>Phase and part</th>
<th>Expectations</th>
<th>Time frame</th>
</tr>
</thead>
</table>
| Phase 1: Survey                       | • Explain study to the teachers  
• Explain confidentiality  
• Gain consent  
• Provide the survey to the teachers in the school  
• Survey completion | Two weeks November 2020                                                     |
| Phase 2: Interview and lesson plan review | • Identify participants from the survey to complete the interviews  
• Contact participants  
• Explain confidentiality  
• Gain consent  
• Complete semi-structured interviews  
• Collect lesson plans  
• Complete transcription of interviews  
• Complete lesson plan review | Four weeks November-December 2020                                           |
| Phase 3, part 1: Analysis of surveys  | • Analysis of survey results | Two weeks January 2021                                             |
| Phase 3, part 2: Analysis of lesson plans | • Analysis of lesson plans | Two weeks January 2021                                             |
| Phase 3, part 2: Analysis of interviews | • Analysis of interviews using inductive analysis | Six weeks January–February 2021                                      |
Phase 1: Survey

The first part of this study began in November 2020. I explained the research study to all the faculty through a Screencastify and email that included a research invitation letter, information on the purpose of the study, the research questions, and the research methods. I also explained measures to ensure confidentiality and included a link to the Google Form survey and consent form. I organized the research results from the Google Form into a Google Sheet. I then reviewed but did not analyze this information.

Phase 2: Interview and Lesson Plan Review

Within the survey questions, teachers were asked to click on a separate Google Form link if they were interested in completing an interview. This separate link allowed for their confidentiality to be maintained within the survey. I contacted via email eight teachers who completed the second Google Form and expressed interest in completing the interview.

Within this email contact, I explained the types of data that would be collected in this next phase of the study. I shared information regarding the interview process. The interview was a 30-minute semi-structured interview to gain additional understanding of teachers’ technology integration using Google Workspace for Education Fundamentals for the purpose of student collaboration within a gapped hybrid learning environment.

In this introductory email, I asked for lesson plans from November 2020 to be submitted electronically. I provided information regarding the purpose of the lesson plans and stated I would review the lesson plans for the integration of technology, noting the subject area integrated with technology, the type of technology used, the frequency of the
technology used, and the frequency with which technology was used for collaboration. A copy of the organizer chart was provided to the participants.

Within the communication, I emphasized the non-evaluative nature of participation and the purpose and research questions for this study. Finally, the email included a schedule of times available to meet. Teachers were asked to contact me regarding their preference of date and time they wished to meet.

Once the interviews were scheduled, I completed all interviews on a recorded Google Meet due to a change because of COVID-19 restrictions/quarantine. At the onset of each interview, I provided information regarding confidentiality and assigned participants a pseudonym to protect their anonymity. I provided participants information regarding their ability to stop the interview at any time and to skip over questions if they preferred not to answer. Because of my role in the school district, again it was emphasized that nothing in the interview was evaluative.

Once the interviews were completed, I transcribed notes and interview recordings word-for-word. I sent a copy of the Google Meet transcription to each participant to confirm that the transcription was accurate and to provide them the ability to add any additional information not sufficiently documented or captured during the transcription.

I then reviewed four lesson plans for each participant from November 2020. I documented information from each lesson plan using the lesson plan organizer (Appendix G) I created in Microsoft Office. Additionally, I made comments regarding the lesson plans. Comments included initial reactions and thoughts from these lesson plans.
Phase 3: Part 1: Analysis of Surveys

Nineteen participants completed the survey using Google Forms. I reviewed the responses in Google Sheets and then organized them into sections based on the questions for each of the identified subscales in the TTQ (Lowther & Ross, 2000), the Technology Integration Survey (Kopcha, 2012), and the Perceptions Towards ICTs in the Teaching-Learning Process Scale (Baş et al., 2016). I imported the data into Microsoft Excel using separate worksheets for each subscale. I analyzed the descriptive statistics using SPSS 27.

I copied the open-ended responses from Microsoft Excel into a Microsoft Word document that was organized based on the open-ended survey questions. There were four open-ended survey transcripts corresponding to the four open-ended questions. I then imported the open-ended response transcripts into the Delve software program. The systematic process of sifting and arranging all the data collected resulted in the ability to reduce a large amount of data into manageable units, which were coded and connected to pieces of data. I used in vivo and descriptive coding (Saldaña, 2016) for the first round of coding and pattern coding for the second round (Saldaña, 2016). I generated categories and themes by finding similarities, differences, and relationships in the data that are reported through quotations and tables within the data section of the study. I provided a final report to the teachers at the elementary school where the study was conducted.

Phase 3: Part 2: Analysis of Lesson Plans

Although there is a lesson plan template used within the school district, the lesson plans included different levels of detail. I compiled the lesson plan organizer for each participant into one Microsoft Excel spreadsheet using the same categories identified on the organizer. From the spreadsheet, I collated the data into a frequency table.
Phase 3: Part 3: Analysis of Interviews

After uploading the interview transcripts to the Delve software, I analyzed them through first round coding through the use of in vivo and descriptive coding (Saldaña, 2016). From this coding and through peer debriefing, I created categories. Second round coding consisted of pattern codes (Saldaña, 2016). After peer debriefing and analysis of the categories, I generated themes by finding similarities, differences, and relationships in the data. Themes are reported through quotations and tables within the data section of the study. A final report was provided to the teachers at the school.

Rigor and Trustworthiness

Trustworthiness of data has been questioned in qualitative research. To successfully build a study that is considered valid and reliable, methods that ensure credibility, transferability, dependability, and confirmability must be used (Shenton, 2004). I used the following strategies to ensure rigor and trustworthiness in this research: (a) triangulation; (b) thick, rich descriptions; (c) member checking; (d) peer debriefing; and (e) an audit trail.

Triangulation

I used triangulation to establish credibility for the research study. Triangulation refers to the process of using multiple methods and data sources to provide an accurate picture of the phenomenon (Mertler, 2017). I collected data from three sources (i.e., surveys, interviews, and lesson plans) and used multiple surveys that have been shown to be valid and reliable to provide triangulation. The semi-structured interviews provided participants the ability to elaborate on their responses. I generated the findings for this
study through the analysis of the surveys, interviews, and lesson plans. These findings are considered credible because of the convergence of many data points (Tracy, 2013).

**Thick, Rich Descriptions**

I used thick, rich descriptions by including quotations from the participants to provide details about the current state of technology integration using Google Workspace for Education Fundamentals, the perceived first- and second-order barriers to technology integration for the purpose of student collaboration, and the teachers’ perceptions about Google Workspace for Education Fundamentals and collaboration. I took these quotations from the participants’ interviews and open-ended responses. Thick, rich descriptions of the phenomenon provide the reader with a clear understanding of the research study and the findings within the study. The use of this method provides both credibility and transferability (Shenton, 2004).

**Member Checking**

The use of member checking provides credibility within a study (Tracy, 2013). Member checking is the practice where the participants review the accuracy of the qualitative findings in the study (Creswell, 2014). First, I provided the interview data by providing the transcripts to the participants for review. After data analysis was conducted, I shared my preliminary findings with the participants on the interpretation of the work. I received three out of eight responses from interview participants regarding member checking.

**Peer Debriefing**

Peer debriefing “is the act of using other professionals who can help you reflect on the research by reviewing and critiquing your processes of data collection, analysis,
and interpretation” (Mertler, 2017, p. 142). For this study, I held multiple meetings with my dissertation chair. Peer debriefing offered an external check to the study. Questions from my dissertation chair enabled me to refine my methods and strengthen my arguments for the research study (Shenton, 2004).

**Audit Trail**

I implemented an audit trail using analytic memos as a journal throughout the study. This provided confirmability to the study and evidence and documentation of the decision-making process. I documented the information in the analysis phase of the research as I moved from code to categories and themes. By documenting this information, I have a written account as to how I completed the analysis in the study (Shenton, 2004).

**Plan for Sharing and Communicating Findings**

Sharing and communicating the findings is an essential part of research. This activity helps to bridge the research and the application of the results in the classroom. Communicating findings lends credibility to the process of conducting the research. Sharing and communicating the findings allows the teachers who participated in the study to have a voice to effect change in the instructional practices and enables others to see the application of the research to classroom practice (Mertler, 2017).

At the end of the study, in May 2021, I shared and communicated these findings in my local context through presentations and an action plan for implementation in the school community. Confidentiality was maintained through this presentation. Specific examples of the data that support my findings did not have teachers’ names attached. This protected the identity of each teacher who was a part of the study.
First, I shared the findings with the participants at the school during a faculty meeting. I included background information, the purpose of the study, the methods used, the results, and the recommendations for educational impact. A question-and-answer session was provided.

Next, information from the study will be shared through a presentation with administrators in the school district during an administrative council meeting July 2021. The recorded presentation will be shared electronically with the teachers at the other two schools in the district through email. Additionally, a brief presentation will take place at the July 2021 Board of Education meeting regarding the study and its findings. Not only will this suffice as a level of communication to the elected officials of the school district, but also to the public.

As the findings are presented and communicated, I will work collaboratively with the Assistant Superintendent of Instruction to use the findings from this action research to create an action plan during the summer of 2021. This action plan will consist of future recommendations that can affect equipment purchases, scheduling needs, and teacher professional development. Upon completion of this action plan, it will be shared with the staff electronically. The action plan will allow the staff to see how the research findings will support changes within the schools. The action plan will also be incorporated into the district’s technology plan. The amended district technology plan will be shared with the Board of Education technology committee, the Board of Education curriculum committee, the teaching staff, and the public.

Upon completion of the research and dissertation, I will present my research at international and state conferences. I have submitted a proposal to the Association for
Educational Communications and Technology (AECT) International 2021 conference.

Some of the additional conferences I will look to present the findings at include the New Jersey Association of School Administrators (NJASA) Techspo Conference held in January 2022. This will allow me to share the results of this action research study within my local context, within a state context, and with an international audience.
CHAPTER 4

ANALYSIS AND FINDINGS

The purpose of this action research was to investigate how elementary teachers used Google Workspace for Education Fundamentals for student collaboration during the COVID-19 pandemic. The goal was to make recommendations for technology integration in Grades 3 through 5 in a school in central New Jersey. I collected both quantitative and qualitative data to answer the following research questions:

1. How do elementary teachers at a school in central New Jersey integrate technology using Google Workspace for Education Fundamentals for student collaboration into their daily lessons in a gapped hybrid learning environment?

2. How do elementary teachers perceive first- and second-order barriers to integrating Google Workspace for Education Fundamentals for the purpose of student collaboration in a gapped hybrid learning environment?

3. What are elementary teachers’ perceptions about the integration of Google Workspace for Education Fundamentals for the purpose of student collaboration in their classroom lessons in a gapped hybrid learning environment?

This chapter presents the analysis and findings of the data collected in the study based on the results of the surveys, interviews, and a review of lesson plans. The chapter includes (a) quantitative results, and (b) qualitative results.
Quantitative Results

I collected quantitative data from two sources: (a) teacher surveys, and (b) lesson plans. This section includes the method of analysis and the findings for each instrument. The findings are presented with descriptive statistics.

Teacher Surveys

Teacher perceptions were measured through anonymous surveys. I modified and merged three published surveys into one survey entitled the Teacher Perception Survey for the teachers to complete. The Teacher Perception Survey included 13 demographic questions, 47 questions answered on a 5-point Likert-type scale, and four open-ended questions. The published surveys I used to create the Teacher Perception Survey were the (a) TTQ (Lowther & Ross, 2000), (b) the Technology Integration Survey (Kopcha, 2012), and (c) the Perceptions Towards ICTs in the Teaching-Learning Process Scale (Baş et al., 2016). I imported the survey data into Microsoft Excel and broke down each survey into subscales. I organized the responses for each subscale into separate Microsoft Excel worksheets and analyzed them for descriptive statistics using SPSS 27.

Demographic questions. Nineteen teachers completed the Teacher Perception Survey. The survey included demographic questions related to age, gender, ethnicity, and years of teaching experience. Additionally, questions regarding technology training, certifications, and technology integration skills were included. Table 4.1 illustrates the technology training and certification information for survey participants. Most of the participants 63.16% (n = 12) had technology integration training. A majority of the teachers (89.47%) indicated they had G Suite for Education training. Participants reported the hours of Google training they had received as follows: two participants
(10.53%) selected none, 13 participants (68.42%) indicated 1 to 6 hours, two participants (10.53%) selected 7 to 12 hours, and two participants (10.53%) selected more than 13 hours. Three participants (15.79%) indicated they held a technology certification and 16 participants (84.21%) indicated they did not have any technology certifications. The three participants who indicated they had technology certifications all listed that they were Google Level 1 and 2 certified. Participants ranked their technology skills on a 5-point Likert-type scale from 1 (novice) to 5 (expert). None of the teachers indicated they were at the novice level, two participants (10.53%) were at a level 2, eight participants (42.10%) were at a level 3, and nine participants (47.37%) were at a level 4. No one rated their level of technology integration abilities at the expert level (level 5).

Table 4.1 *Technology Training and Certification of the Participants*

<table>
<thead>
<tr>
<th>Question</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you received technology integration training?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>12</td>
<td>63.16%</td>
</tr>
<tr>
<td>No</td>
<td>7</td>
<td>36.84%</td>
</tr>
<tr>
<td>Have you received G Suite for Education training?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>17</td>
<td>89.47%</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>10.53%</td>
</tr>
<tr>
<td>How many hours of Google training have you received?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>2</td>
<td>10.53%</td>
</tr>
<tr>
<td>1 to 6 hours</td>
<td>13</td>
<td>68.42%</td>
</tr>
<tr>
<td>7 to 12 hours</td>
<td>2</td>
<td>10.53%</td>
</tr>
<tr>
<td>13 or more hours</td>
<td>2</td>
<td>10.53%</td>
</tr>
<tr>
<td>Do you hold any technology certifications?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
<td>15.79%</td>
</tr>
<tr>
<td>No</td>
<td>16</td>
<td>84.21%</td>
</tr>
<tr>
<td>Do you have any Google certifications?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
How would you rate your technology integration skills?

<table>
<thead>
<tr>
<th>Level</th>
<th>3</th>
<th>15.79%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 2</td>
<td>3</td>
<td>15.79%</td>
</tr>
</tbody>
</table>

| Level 1 | 3 | 15.79% |

(Novice) 1
2
3
4
5

(Expert) 5

<table>
<thead>
<tr>
<th>Question</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>16</td>
<td>84.21%</td>
</tr>
<tr>
<td>Level 1</td>
<td>3</td>
<td>15.79%</td>
</tr>
<tr>
<td>Level 2</td>
<td>3</td>
<td>15.79%</td>
</tr>
</tbody>
</table>

Note. N = 19.

The final three demographic questions asked participants to provide information about the subject and number of students they taught. The mean average was 81.78 students with a standard deviation of 184.75. Two participants reported they taught large numbers of students, including 727 and 450. The other 17 participants reported their average class size was 14.68 students with a standard deviation of 7.22. The participants were asked what subject areas they taught. Two teachers (10.53%) taught math, science, and social studies; one teacher (5.26%) taught Spanish; seven teachers (36.84%) taught general education classes; one teacher (5.26%) taught gifted and talented; two teachers (10.52%) were reading interventionists; one teacher (5.26%) taught English language arts; five teachers (26.31%) taught special education; and one teacher (5.26%) taught art.

**TTQ.** The next section of the survey was questions about technology integration from the TTQ (Lowther & Ross, 2000), a two-part instrument used to collect teachers’ perceptions of computers and technology integration using a 5-point Likert-type scale ranging from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*). Within the TTQ, five subscales are related to five main technology-related areas. Four questions within the survey are
used to create each subscale. The five subscales measure the following: (a) teachers’ perceptions of technology’s influence on student learning and achievement and impact on classroom instruction and learning activities (Teacher Beliefs); (b) teachers’ feelings and perceptions of their capabilities and skills required for technology integration (Teacher Readiness); (c) teachers’ perceptions of administrative, peer, and community support for their technology integration in their classroom instruction (Overall Support); (d) teachers’ perceptions of the adequacy of technical support, availability of resources, and assistance with troubleshooting (Technical Support); and (e) teachers’ perceptions of the frequency of the technology integration in their instruction (Impact on Student Learning).

I calculated Cronbach’s alphas using SPSS 27 as a coefficient of reliability to determine the internal consistency of the questions, which ranged from .528 to .818 as described in Table 4.2. The Cronbach’s alpha acceptable level of reliability is considered to be .70 and higher (Nunnally, 1978). Three out of five sections have Cronbach’s alphas higher than .70 (i.e., Teacher Beliefs, Teacher Readiness, and Technical Support). Two sections have alphas lower than .70, at .636 (Overall Support and Impact on Student Learning).

Table 4.2 *TTQ Survey Questions: Cronbach’s Alphas*

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher Beliefs</td>
<td>.744</td>
</tr>
<tr>
<td>Teacher Readiness</td>
<td>.821</td>
</tr>
<tr>
<td>Overall Support</td>
<td>.636</td>
</tr>
<tr>
<td>Technical Support</td>
<td>.818</td>
</tr>
<tr>
<td>Impact on Student Learning</td>
<td>.528</td>
</tr>
</tbody>
</table>
The descriptive statistics for the subscales were as follows. The mean responses were 3.65 ($SD = 0.93$) for the Teacher Beliefs subscale; 3.59 ($SD = 0.86$) for the Teacher Readiness subscale; 3.46 ($SD = 1.03$) for the Overall Support subscale; 3.48 ($SD = 0.88$) for the Technical Support subscale, indicating a more than neutral perception of the support for technology integration efforts; and 3.76 ($SD = 0.79$) for the Impact on Student Learning subscale, indicating a higher than neutral response and that teachers perceive technology integration efforts for student collaboration as beneficial to student learning. Table 4.3 provides the means and standard deviations for the TTQ broken out by subscale.

Table 4.3 *TTQ Perceptions of Technology Integration*

<table>
<thead>
<tr>
<th>Subscale</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher Beliefs</td>
<td>3.65</td>
<td>0.93</td>
</tr>
<tr>
<td>Teacher Readiness</td>
<td>3.59</td>
<td>0.86</td>
</tr>
<tr>
<td>Overall Support</td>
<td>3.46</td>
<td>1.03</td>
</tr>
<tr>
<td>Technical Support</td>
<td>3.48</td>
<td>0.88</td>
</tr>
<tr>
<td>Impact on Student Learning</td>
<td>3.76</td>
<td>0.79</td>
</tr>
</tbody>
</table>

**Technology Integration Survey.** The Technology Integration Survey (Kopcha, 2012) includes five sections: (a) Vision, (b) Access, (c) Beliefs, (d) Professional Development, and (e) Time. The Access subsection was removed from the Teacher Perception Survey. Each subsection included three questions related to perceived technology integration barriers. Survey items were rated using a standard 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).
I conducted a reliability analysis for these subsections in SPSS 27 using the Cronbach’s alpha coefficients found in Table 4.4. For the Vision subscale, the Cronbach’s alpha level was .713. For the Beliefs subscale, the Cronbach’s alpha was .871. For the Professional Development subscale, the Cronbach’s alpha was .635. For the Time subscale, the Cronbach’s alpha was .939. Cronbach’s alpha measures above 0.7 are considered acceptable and within the acceptable range (Nunnally, 1978). The Professional Development measure is a little lower than the 0.70 acceptable level and the Time measure is the highest and considered in the excellent level (Nunnally, 1978).

Table 4.4 Technology Integration Survey Questions Cronbach’s Alphas

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vision</td>
<td>.713</td>
</tr>
<tr>
<td>Beliefs</td>
<td>.871</td>
</tr>
<tr>
<td>Professional Development</td>
<td>.635</td>
</tr>
<tr>
<td>Time</td>
<td>.939</td>
</tr>
</tbody>
</table>

The mean for the three Vision questions was 4.03 ($SD = 0.86$), indicating the participants agreed with the technology vision statements in the survey. The participants did not perceive this as a significant barrier to integration efforts. The mean for the Beliefs questions was 3.28 ($SD = 1.03$), indicating the participants were neutral regarding their technology beliefs for student learning. The mean for the Professional Development questions was 3.10 ($SD = 1.04$), indicating the participants were neutral regarding the professional development they had received supporting technology integration. The mean for the Time questions was 2.42 ($SD = 1.01$), indicating the participants disagreed with the time statements for technology integration, perceiving it as a barrier to their
technology integration efforts. Table 4.5 illustrates the means and standard deviations for these perceived barriers.

Table 4.5 *Technology Integration Survey Barrier Perceptions*

<table>
<thead>
<tr>
<th>Subscale</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vision</td>
<td>4.03</td>
<td>0.86</td>
</tr>
<tr>
<td>Beliefs</td>
<td>3.28</td>
<td>1.03</td>
</tr>
<tr>
<td>Professional Development</td>
<td>3.10</td>
<td>1.04</td>
</tr>
<tr>
<td>Time</td>
<td>2.42</td>
<td>1.01</td>
</tr>
</tbody>
</table>

**Perceptions Towards ICTs in the Teaching-Learning Process Scale.** This instrument consists of 25 items rated on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*). The survey includes two subscales: Attitudes and Beliefs. This scale was developed for the primary use of measuring teachers’ perceptions toward ICTs in the teaching–learning process.

I conducted a reliability analysis for these subsections in SPSS 27 using the Cronbach alpha coefficients as reported in Table 4.6. For the Attitudes subscale, the Cronbach’s alpha level was .886. For the Beliefs subscale, the Cronbach’s alpha measure was .744. Both sections met a .70 acceptable level. Therefore, all the questions in the subsections met the standard for internal consistency (Nunnally, 1978).

Table 4.6 *Perceptions Towards ICTs in the Teaching-Learning Process Scale Cronbach’s Alphas*

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitudes</td>
<td>.886</td>
</tr>
<tr>
<td>Beliefs</td>
<td>.744</td>
</tr>
</tbody>
</table>
The mean for the Attitudes subsection was 3.85 ($SD = 0.66$). This high neutral and almost agreement score is based on teachers’ attitudes toward integrating technology into their teaching and learning practices. The mean for the Beliefs subsection was 3.89 ($SD = 0.58$). This high neutral and almost agreement score is based on teachers integrating technology into their teaching and learning practices. Table 4.7 illustrates the means and standard deviations for these perceptions and beliefs for technology integration.

Table 4.7 Perceptions Towards ICTs in the Teaching–Learning Process Scale

<table>
<thead>
<tr>
<th>Subscale</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitudes</td>
<td>3.85</td>
<td>0.66</td>
</tr>
<tr>
<td>Beliefs</td>
<td>3.89</td>
<td>0.58</td>
</tr>
</tbody>
</table>

**Lesson Plans**

I collected a month’s worth of lesson plans from November 2020 from eight teachers who completed the survey: one third-grade general education teacher; one fourth-grade general education teacher; two fifth-grade teachers who taught math, science, and social studies; one reading interventionist; one gifted and talented teacher; and two special education teachers teaching fourth grade. Identified by the objectives, a month’s worth of lesson plans equated to 307 lesson plan entries from the eight participants. Duplicate lessons or a continuation of the lessons were not counted a second time. A total of 307 lesson plan entries were as analyzed. Figure 4.1 is an example of one lesson plan entry collected and analyzed for technology integration and collaboration.
Figure 4.1. Sample lesson plan

I reviewed the lesson plans using an organizer, entitled Lesson Plan Checklist, found in Appendix G, to document the use of technology from the lesson plans. The organizer documented each teacher’s plan by noting the following: the subject area with integrated technology, the type of technology integrated, the Google Workspace for Education Fundamentals tool used, whether the integration was used for collaboration, and to describe how the Google Workspace for Education Fundamentals tools were used for collaboration. The categories were selected in order to provide insight as to how
technology was used in the classroom. Figure 4.2 is a sample of the completed organizer.

**LESSON PLAN CHECKLIST**

Teacher Name (Pseudonym): Emily

Plans for the month of: November

<table>
<thead>
<tr>
<th>Subject Area with Integrated Technology</th>
<th>Type of Technology</th>
<th>List the name of the G-Suite Tool? (if applicable)</th>
<th>Used for Collaboration? (Yes or No)</th>
<th>Describe how the G-Suite is used for collaboration?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crime Scene Experts</td>
<td>Quizizz</td>
<td>N/A</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>Crime Scene Experts</td>
<td>Google Slides</td>
<td>Google Slides</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>Crime Scene Experts</td>
<td>Zoom</td>
<td>N/A</td>
<td>Yes</td>
<td>Yes Discussion</td>
</tr>
<tr>
<td>Crime Scene Experts</td>
<td>Google Slides</td>
<td>Google Slides</td>
<td>Yes</td>
<td>Share reflective journal entry with classmates</td>
</tr>
<tr>
<td>Inventive Inventions</td>
<td>Zoom</td>
<td>N/A</td>
<td>Yes</td>
<td>Yes Discussion</td>
</tr>
<tr>
<td>Inventive Inventions</td>
<td>Video</td>
<td>N/A</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>Inventive Inventions</td>
<td>Google Jamboard</td>
<td>Google Jamboard</td>
<td>Yes</td>
<td>Add an idea about the problem to the Google Class Jamboard to share thoughts.</td>
</tr>
</tbody>
</table>

**Figure 4.2. Sample completed lesson plan organizer**

From the organizer, I collated the data into a frequency table that included the type of technology used, the number of times it was used, the number of uses for collaboration, and a column for the uncertain use for collaborative purposes. Table 4.8 indicates the data collected from the lesson plan. During the gapped hybrid learning environment, all eight participants used Google Classroom as the LMS for all subject areas. The participants had the option to use Google Meet or Zoom as their video conferencing tool. According to the lesson plan review, six of the eight participants preferred Zoom to communicate with their students on remote learning during class time. The use of Google Workspace for Education Fundamentals tools appeared 45 times
throughout the 307 lesson plan entries. I counted the frequency of each in the following manner. Google Classroom was only counted once because it was used throughout the day by all participants; therefore, the total count for Google Classroom was eight. Google Meet was counted only once and used by only two participants; therefore, the frequency count was two.

Table 4.8 Lesson Plan Frequency of Technology Integration for November 2020

<table>
<thead>
<tr>
<th>Type of technology</th>
<th>Frequency of times used</th>
<th>Frequency of times used for collaboration</th>
<th>Frequency uncertain if used for collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edpuzzle</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Flocabulary</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total Google Suite</td>
<td>45</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>Google Classroom</td>
<td>8</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Google Document</td>
<td>11</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Google Forms</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Google Jamboard</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Google Meet</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Google Slides</td>
<td>22</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Kahoot</td>
<td>6</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Khan Academy</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Online videos/YouTube</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Personal Math Trainer (Harcourt)</td>
<td>6</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Quizlet</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Quizizz</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sumdog</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Teacher Made</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Xtra Math</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Zoom</td>
<td>6</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>135</td>
<td>43</td>
<td>24</td>
</tr>
</tbody>
</table>
Based on the assessment of frequency following the rules described above, the following were indicated for each of the tools found in Google Workspace for Education Fundamentals. Google Document was used 11 times, with seven of these times for student collaboration. I was uncertain whether a Google Document was used for collaboration in one account based on the lack of detail in the lesson plan. Google Forms was listed once and not used for student collaboration. Google Jamboard was used once, and it was used for student collaboration. Google Slides was noted 22 times and used eight times for student collaboration. I was unable to determine whether Google Slides was used for collaboration based on the lack of detail in the lesson plan on two occurrences. Other educational technology tools were listed, including Edpuzzle, Flocabulary, Kahoot, Khan Academy, online videos/YouTube, Personal Math Trainer (Harcourt), Quizlet, Quizizz, Sumdog, Teacher Made, Xtra Math, and Zoom. As previously mentioned, Zoom was used by six participants for all the communication in the classroom during the gapped hybrid learning environment. Therefore, it was only counted six times.

Based on the data, it appears Google Workspace for Education Fundamentals had the highest frequency of use for collaboration. Zoom was noted to be used within more classrooms as a communication tool than was Google Meet.

**Qualitative Analysis, Findings, and Interpretations**

The qualitative data sources used in this study included four open-ended questions from the surveys and eight interviews. The interviews were semi-structured and conducted in a conversational style. I recorded the interviews on Google Meet and transcribed them verbatim in the participants’ own words through Happy Scribe, a
transcription software. I reviewed the transcriptions for accuracy and shared them with the participants to confirm the accuracy of their statements. I organized both the open-ended responses and the interview transcriptions in Delve software, a web-based qualitative analysis tool, to complete qualitative data coding.

I used inductive analysis with the data, which consisted of reading through textual data and identifying themes in the data (Guest et al., 2013). The result of the inductive analysis was coding and theme development from the interview and open-ended question transcriptions. I used in vivo and descriptive codes during first cycle coding, focusing on inductive coding methods (Mertler, 2017; Saldaña, 2016). In vivo codes are language directly taken from the participants. Descriptive codes help to categorize and summarize the data contents (Saldaña, 2016). Both types of codes aligned with the research questions presented in this study. I coded the open-ended responses first. Table 4.9 outlines the number of codes identified to illustrate the richness of the qualitative data set.

Table 4.9 Summary of Qualitative Data Sources

<table>
<thead>
<tr>
<th>Type of qualitative data sources</th>
<th>Number</th>
<th>Total number of codes applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey open-ended responses</td>
<td>19</td>
<td>72</td>
</tr>
<tr>
<td>One-on-one interview transcripts</td>
<td>8</td>
<td>118</td>
</tr>
<tr>
<td>Totals</td>
<td>27</td>
<td>190</td>
</tr>
</tbody>
</table>

After completing the first cycle coding, I created a codebook in Delve to identify the meaning of each code. The codebook was a way to record the codes, the description of each code, and a brief data example for reference (Saldaña, 2016). I completed audit trail/analytic memo writing in the first cycle of coding (Saldaña, 2016) to document my
analysis process, questions that came up during the first cycle of coding, my thought process, and reflection.

Numerous in vivo and descriptive codes emerged. I organized these codes as subcodes under major codes. Figure 4.3 shows the first round coding and Figure 4.4 shows the in vivo and the descriptive codes in Delve. An example of in vivo codes includes “multitasking nightmare” taken from the comment “multitasking nightmare” and “building the plane as we are flying it” taken from the comment “building the plane as we are flying it.” Descriptive codes include “not enough training” to describe the lack of training perceived by the teachers. These were applied to the comments “feel more training is needed for both teachers and students to use the technology successfully,” “much higher level of training and guidance is needed,” and “it has the potential to be useful, however, we could certainly use more training.” Another example of a descriptive code includes “roomers and zoomers management” to identify the difficulty the teachers were facing managing two different groups of students, those who were in person and those who were at home. Sample responses that were coded under this code include “difficult to keep an eye on both at the same time” and “the management of managing live and in person is extremely difficult.” Figure 4.5 illustrates the sample codes that emerged throughout the analysis in Delve. A full list of codes can be found in Appendix M. Using inductive analysis, categories began to emerge.
Figure 4.3. Sample first round coding in Delve.
Filter snippets by:

<table>
<thead>
<tr>
<th>Codes</th>
<th>Transcripts</th>
</tr>
</thead>
</table>

**Open Ended Survey Question 4.docx**

Collaboration can only flourish and be truly successful when we provide the road for our students to follow. I, myself, am slowly working on different ways to allow for more collaboration as I learn and lay the groundwork for that road.

- working on additional ways for collaboration using G-Suite

**Open Ended Survey Question 4.docx**

not received enough training to feel comfortable in all that I would like to do.

- not enough training

**Open Ended Survey Question 4.docx**

However, not everything can be taught using G-suite, and least not that I am capable of.

- Not everything taught with G-suite

**Open Ended Survey Question 4.docx**

I think that it is serving a function right now. It helps with grading, keeping track of work and interesting lessons

- G-suite functional

*Figure 4.4. Sample in vivo and descriptive coding in Delve.*
• 21st-century skills and Google
• Additional type of technology in the classroom
• Age of the students
• Alter plan on the fly
• Anxiety
• Benefit of co-teachers for collaboration in hybrid setting
• Benefits of technology use for teacher
• Building the plane as we are flying it
• Cannot see students while we are working with them
• Classroom management
• Co-teacher for small group work
• Collaboration in the hybrid setting
• Collaborative assignment
• Engagement and Google
• Fall 2020
• Google and small group
• Google and socialization
• Google Classroom
• Google Docs/Slides
• Google training
• G Suite benefits
• G Suite for collaboration and communication
• Inconsistent Wi-Fi
• Instructional pacing
• Lack of hands-on guidance at home
• Management of multiple devices
• Multi-tasking nightmare
• Not enough time
• Not enough training
• Roomers and Zoomers management
• Shared document for collaboration
• Small group instruction in the hybrid environment
• Spring 2020
• Student focus issues
• Teacher change
• Teacher use of technology
• Teaching and learning
• Technology difficulties
• Technology is inconsistent
• Time
• Training needs
• Zoom and collaboration

Figure 4.5. Sample in vivo and descriptive coding.
Also, first cycle coding used simultaneous coding (Saldaña, 2016). More than one code was applied to the data. Many comments made by the participants were coded among several codes. Figure 4.6 illustrates the use of simultaneous coding in Delve.

<table>
<thead>
<tr>
<th>Transcript and Codes</th>
<th>Participant information</th>
</tr>
</thead>
<tbody>
<tr>
<td>all the features for collaboration amongst Roomers and Zoomers. Technical difficulties such as home wifi not being strong enough for Zoomers, Roomers chromebook running out of charge before the day is over.</td>
<td>Technology problems</td>
</tr>
<tr>
<td>Many students do not focus on the computer and computer work during lessons or for asynchronous work. I think some of the at risk students don't see it as actual learning time if a teacher is not physically present.</td>
<td>Not actual learning time</td>
</tr>
<tr>
<td>consistent wifi and access to technology (both at home and school)2. level of familiarity and comfort with the technology3. amount of time to develop lessons integrating the technology components4. training</td>
<td>Not enough time</td>
</tr>
<tr>
<td>Grouping students becomes an issue</td>
<td>grouping student issue</td>
</tr>
<tr>
<td>Student engagement and inconsistent technological access</td>
<td>engagement</td>
</tr>
<tr>
<td>technology can be problematic2. unsure if Breakout rooms are still ok.</td>
<td>Technology problems</td>
</tr>
</tbody>
</table>

Figure 4.6. Sample of simultaneous coding.

Upon completing the first round of coding for the open-ended survey questions and the interviews, I completed peer debriefing with my dissertation chair. Peer debriefing is used to review the accuracy of the research by asking questions about the qualitative study so the information can apply to others besides only the researcher (Creswell, 2014). During the peer debriefing time, questions were asked about the coded data. Upon reflection and discussion, codes were realigned, and additional categories
began to form. This was necessary to capture much of the discussion regarding the gapped hybrid learning environment in which the teachers were required to teach due to the restrictions of the COVID-19 pandemic. Codes were adjusted to include new in vivo and descriptive codes and then organized into categories. This is reflected in my audit trail/analytic memo document in Figure 4.7. These documents identified the analytic process, my thinking, my reflection, and additional questions necessary to continue the coding process.

From the category student focus issues, there are constructs that need to be divided into categories. Student focus issues are being split into multiple categories.

Figure 4.7. Audit trail/analytic memo for category development after peer debriefing.
For the second cycle of coding, I used pattern coding (Saldaña, 2016) in order to condense the codes into categories. Pattern coding involves identifying an emergent theme and pulling together information into meaningful units of analysis (Saldaña, 2016). I continued to use inductive analysis during the second cycle coding to further group the codes into categories and then into themes (Creswell, 2014; Saldaña, 2016). This analysis was supported by the use of analytic memos as well. The analytic memos documented my thinking and reasoning for my combination of codes to form categories, it captured the reflection in my thinking and the organization of the data.

A few examples of the process included some of the codes related to student focus issues were split into different categories, including student hybrid environment and student engagement with technology. The time code, which became its own category, remained the same. Classroom management encompassed two different constructs that were split into separate category groups of classroom management in hybrid environments, and classroom management instruction using technology. The overall category of instructional items needed to be broken down further into a more specific grouping. This became three separate groups: instructional concerns related to the hybrid environment, differentiation of instruction using technology, and student feedback. Perceptions were also too broad of a category. The category and codes were divided between the challenges of using Google Workspace for Education Fundamentals for collaboration in the hybrid environment based on perceptions and benefits of collaboration in the hybrid environment. Finally, technology problems were joined together but needed to be split into separate categories to identify some of the technology
concerns separately. A list of categories emerged during this process, as identified in Figure 4.8.

<table>
<thead>
<tr>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefit of collaboration for socialization</td>
</tr>
<tr>
<td>Benefit of collaboration for student learning</td>
</tr>
<tr>
<td>Benefits of G Suite for collaboration in the hybrid environment</td>
</tr>
<tr>
<td>Challenges of using G Suite in the hybrid environment based on perceptions</td>
</tr>
<tr>
<td>Chromebooks</td>
</tr>
<tr>
<td>Classroom management hybrid environment</td>
</tr>
<tr>
<td>Classroom management of instruction using technology</td>
</tr>
<tr>
<td>Communication issues with technology</td>
</tr>
<tr>
<td>Differentiation of instruction using technology</td>
</tr>
<tr>
<td>Evolution of teaching from spring 2020 to fall 2020</td>
</tr>
<tr>
<td>Google issues</td>
</tr>
<tr>
<td>Hybrid setting problems</td>
</tr>
<tr>
<td>Instructional concerns related to the hybrid environment</td>
</tr>
<tr>
<td>Lack of student feedback using technology</td>
</tr>
<tr>
<td>Least limiting barriers</td>
</tr>
<tr>
<td>Most limiting barriers</td>
</tr>
<tr>
<td>Other technology used in the classroom</td>
</tr>
<tr>
<td>Pedagogy related to technology integration in the hybrid environment</td>
</tr>
<tr>
<td>Reliability of technology</td>
</tr>
<tr>
<td>Student engagement with technology</td>
</tr>
<tr>
<td>Student hybrid environment</td>
</tr>
<tr>
<td>Student lacking technology skills</td>
</tr>
<tr>
<td>Teacher beliefs of Google</td>
</tr>
<tr>
<td>Teacher beliefs regarding collaboration</td>
</tr>
<tr>
<td>Teacher growth</td>
</tr>
<tr>
<td>Teacher training</td>
</tr>
<tr>
<td>Teaching in the hybrid setting during fall 2020</td>
</tr>
<tr>
<td>Teaching in the spring 2020</td>
</tr>
<tr>
<td>Time</td>
</tr>
<tr>
<td>Use of Google Suite for Education for student learning</td>
</tr>
<tr>
<td>Wi-Fi issues</td>
</tr>
</tbody>
</table>

*Figure 4.8. Categories created after peer debriefing.*

Once the category groups were organized, I completed a second peer debriefing meeting with my dissertation chair to determine which categories overlapped and could be combined into a smaller number of categories and then into themes. I combined the
interrelated categories from the first list (Figure 4.8) into 13 categories. The final
categories are shown in Figure 4.9.

<table>
<thead>
<tr>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of technology including G Suite for Education: Hardware, G Suite for Education, other types of technology</td>
</tr>
<tr>
<td>Benefits of technology integration for socialization and student learning</td>
</tr>
<tr>
<td>Benefits of technology integration: Teacher growth</td>
</tr>
<tr>
<td>Benefit of teachers’ technology use in education</td>
</tr>
<tr>
<td>Barriers to technology integration: Related to hybrid setting/COVID-19</td>
</tr>
<tr>
<td>Barriers to technology integration: Related to the hybrid setting/COVID-19: perception of teacher beliefs regarding collaboration</td>
</tr>
<tr>
<td>Barriers to technology integration: Pedagogy related to technology integration</td>
</tr>
<tr>
<td>Barriers to technology integration: Reliability of technology</td>
</tr>
<tr>
<td>Barriers to technology integration: Student engagement with technology</td>
</tr>
<tr>
<td>Barriers to technology integration: Lack of students’ technology skills</td>
</tr>
<tr>
<td>Barriers to technology integration: Teacher training</td>
</tr>
<tr>
<td>Barriers to technology integration: Time</td>
</tr>
<tr>
<td>Barriers to technology integration: Perceived least limiting barriers</td>
</tr>
</tbody>
</table>

*Figure 4.9. Categories identified after second peer debriefing.*

From these categories, I created three distinct themes: (a) use of technology, including Google Workspace for Education Fundamentals; (b) benefits of technology integration in education; and (c) barriers to technology integration in education. I organized all information related to general technology use in the use of technology theme. All items related to the benefits reported were grouped in the theme of benefits of technology integration in education. Finally, all items related to barriers were grouped in the theme of barriers of technology integration in education. Table 4.10 shows how the categories relate to the themes and to the assertions.
Table 4.10 *Categories to Themes and Assertions*

<table>
<thead>
<tr>
<th>Categories</th>
<th>Themes</th>
<th>Assertions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Use of technology including Google Workspace for Education Fundamentals</td>
<td>Use of technology, including Google Workspace for Education Fundamentals</td>
<td>Teacher participants reported the use of technology in their classroom during the gapped hybrid model.</td>
</tr>
<tr>
<td>• Hardware used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Google Workspace for Education Fundamentals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Other types of technology used in the classroom</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Benefits of technology integration for socialization and student learning</td>
<td>Benefits of technology integration in education</td>
<td>Teacher participants reported benefits to the use of technology during the gapped hybrid model.</td>
</tr>
<tr>
<td>• Benefits of technology integration: Teacher growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Barriers of technology integration: Related to hybrid setting/COVID-19</td>
<td>Barriers to technology integration in education</td>
<td>Teacher participants reported a number of barriers which impacted technology integration for collaboration in the gapped hybrid model.</td>
</tr>
<tr>
<td>• Barriers to technology integration: Related to the hybrid setting/COVID-19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Barriers to technology integration: Pedagogy related to technology integration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Barriers to technology integration: Reliability of technology</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Qualitative Themes and Interpretation

In this section, I describe the findings through the identified themes elicited from the data analysis. Pseudonyms are used throughout the section to protect the identities of the participants. Verbatim quotations were taken from the participants’ responses on the open-ended survey questions or from the word-for-word interview transcriptions. From the responses to the open-ended survey and interview questions, three themes emerged: (a) use of technology, including Google Workspace for Education Fundamentals; (b) benefits of technology integration in education; and (c) barriers to technology integration in education.

Use of technology, including Google Workspace for Education

Fundamentals. Previous research indicated teachers integrate various digital tools in the classroom, including Google Workspace for Education Fundamentals (Apergi, Anagnostopoulou, & Athanasiou, 2015; Thompson, 2015). This theme refers to the types
of technology the teachers used in the classroom based on the answers to the interview questions and from the lesson plan analysis. The categories within this theme were (a) hardware used, (b) Google Workspace for Education Fundamentals, and (c) other types of technology used in the classroom.

**Hardware used.** To facilitate teaching in a gapped hybrid learning environment, the students all had one-to-one access to HP or Dell Chromebooks. All students carried their devices to and from school to have daily access whether they were at school or home. All teacher participants reported using a Promethean Board, a document camera, an HP laptop computer, and a Dell desktop computer. Three teachers noted the use of an additional Chromebook, giving them three devices in total. During the interview, Kelly reported, “I also have another Chromebook that I use to supplement for the Google Meets and for the work with the online things.” When it came to using the devices, Ryan commented, “I feel kind of restricted . . . and you do feel at times plugged into the laptop, whereas you didn’t necessarily feel that before.” Barbara stated she wished she had more hardware to use, as “not having enough computers to do like the breakout rooms . . . we have to keep an eye on them.” The use of the hardware was a critical means to reach all students at school or home in this environment.

**Google Workspace for Education Fundamentals.** All eight teachers interviewed said they used Google Workspace for Education Fundamentals daily. These teachers also reported using Google Classroom as the LMS for all students in the gapped hybrid environment. Jill said, “So we are basically using it [Google Classroom] every day. We will teach a whole group lesson, and then they will go to their Google Classroom with a list of assignments and work on assignments.” Emily elaborated on using Google
Classroom and said, “Then we are also part of Google Classroom where I post resources and instructional videos, assignments, and use it as our main form of communication.” Jill felt Google Classroom was essential in her ability to communicate with the students by stating, “I mean we can’t communicate with them if they are remote if we didn’t have Google Classroom. So it is pretty essential for communication and collaboration.” Ryan commented on the critical nature of using Google Classroom by stating, “There wasn’t really ever a need to use Google. There was limited use of Google Classroom before all this, but now it is driving what we do. It’s essential.”

All teachers reported their use of other Google Workspace for Education Fundamentals products. Each teacher listed Google Documents, Google Slides, and Google Forms as the top used Google products. Two teachers reported the use of Google Meets and one teacher reported the use of Google Jamboard. Although not part of the interview questions, a review of the lesson plans indicated teachers were reliant on Google Workspace for Education Fundamentals. Although the lesson plans did not provide great detail, they referenced using a Google product daily in all subject areas. Additionally, the use of Google Workspace for Education Fundamentals for collaboration was noted in the lesson plans as reported in the quantitative data.

**Other types of technology used in the classroom.** In addition to the use of Google Workspace for Education Fundamentals, the participants elaborated on using other technology tools within a gapped hybrid learning environment. All teachers reported the use of curriculum-related products such as Think Central Math and iReady for English language arts. These products enable students to log on and complete preassigned work based on their individual needs. Ryan elaborated on the importance of these products as a
way to individualize assignments for the students. He stated, “We also use iReady, which teaches students at their level as well as Think Central Math which allows you to assign either an enrichment or remedial math assignment.”

Other types of technology used by the students included various web-based tools. All eight teachers indicated they were using online videos or YouTube videos to provide students with instruction in a video format. The interview responses and lesson plan review showed teachers used the following web-based tools: Edpuzzle, Flocabulary, Kahoot, Khan Academy, Quizlet, Quizizz, Sumdog, Teacher Made, Xtra Math, and Zoom in addition to the Google Workspace for Education Fundamentals products.

Zoom was highlighted during the interviews as being preferred as a teleconferencing platform. Six of the eight teachers interviewed reported the use of Zoom over Google Meet. Julie indicated she was “using Zoom for my meetings because I just think they have better features than Meet right now.” Regarding her preference for Zoom, Chloe stated, “We are using Zoom instead of Google since we use it because this way we can go into breakout rooms. Zoom now has allowed us to help them more and to explain more.” Barbara highlighted how Zoom helped her students collaborate by using breakout rooms: “If they’re in a room or a breakout room and they’re able to collaborate. They get their ideas out there, they become more of a human in the real world.”

In Theme 1, teachers described the use of technology, including Google Workspace for Education Fundamentals, in the classroom. Both students and teachers have one-to-one access to technology. Teachers reported the need to use multiple devices to instruct and monitor students in school and at home. The teachers indicated the use of other hardware within the classroom environment. Google Workspace for Education
Fundamentals and other technology tools are critical to implementing the instruction in a gapped hybrid learning environment. The teachers stressed the importance of using Google Classroom as an LMS to organize assignments and other resources. Videoconference software, with a preference for Zoom, was also noted as a way to provide students with instruction and synchronous learning opportunities.

**Benefits of technology integration in education.** Previous studies highlighted the pedagogical benefits of technology integration and student collaboration (Dawson, 2012; Harper & Milman, 2016; Louis, 2012; Thompson, 2015). During the pandemic, teachers mentioned the benefits of technology integration with collaboration in their classrooms for (a) socialization and student learning, and (b) teacher growth.

**Socialization and student learning.** One of the main benefits the teachers found was for students to socialize during the pandemic through technology. Though students were in different settings, some at home and some in school, students could talk to one another and share their thoughts regardless of their location. Question 4 of the open-ended survey questions was: What are your perceptions regarding the integration of G Suite for Education for the purpose of student collaboration? Jenny stated, “I think G Suite for Education offers fantastic opportunities for student collaboration in meaningful learning in this environment when it is orchestrated properly.” Liz reported, “Students can collaborate from school-home. They have access to share documents and can work together.” Brenda responded, “I feel that integrating technology is an important life skill for my students. My students have grown more computer literate and they have shown so much growth in what they can do independently online.” Jill commented, “I think just collaborating with others, and bouncing ideas of one another and learning from each
other is big and for social skills.” Emily noted the lack of contact with peers during a pandemic. She stated, “As we know, students that are remote learners may have very little contact with their peers.” Barbara indicated, “I think that it’s more important for students to collaborate. They need to be able to express themselves. Number one, they have to be able to talk about things verbally.” She continued and added, “Students are longing for that dialogue with other students.” Jill’s use of morning meetings for both students attending in person and students at home provided students additional opportunities to talk to each other during the pandemic. Jill said, “I think that especially during this pandemic, it’s helped the kids be able to collaborate in small groups and even in the whole group during morning meetings. They get to socialize a little bit through that.” Kelly stated, “They [students] also get the benefits of the social-emotional learning where they feel as if they are a part of a group.” Ryan referenced the benefits of students talking to each other when they are in the hybrid model. He reported, “I specifically think in this hybrid model where they’re not seeing each other. I think the biggest benefit [of collaboration] is the socialization that they’re really missing out on.” In these answers, the teachers referenced collaboration to support students’ social-emotional needs, not only their academic needs. Collaboration was beneficial for students to be able to talk to each other about a variety of items.

Students also benefited from collaboration for learning opportunities. During the interviews, three teachers gave examples of collaborative assignments provided to students. These assignments were across grade levels and subject areas. Emily, who taught cross-content with a focus on STEM-related projects in her gifted and talented class, indicated, “I have used Google Docs where students have contributed their
thoughts or hypotheses on the same Google Doc. We’ve used it with Jamboard for students to share their ideas.” Barbara indicated she wanted to use collaborative projects in her fifth-grade social studies class, stating, “I want them [students] to start collaborating in their groups and coming up with something to teach the class. So I’m going to figure out the use of G Suite in the hybrid environment.” Bob reported on his use of Google Tools to help foster collaboration in his fourth-grade math class. He stated, “It allows them [students] to work on the same document. If one person is at home and one person in school they can see the same document, they can provide input on the same work.” Although only three teachers indicated they were working on projects to foster student collaboration, Chloe provided her belief of the benefit of collaboration for her third-grade students. Still, she had been unable to implement it yet with her students. She reported, “I am not doing probably as much as I could . . . the students are not working in a live document together as we have in the past. We are just not there yet.”

In this novel environment that emerged as a result of the pandemic, teachers referenced the benefits of integrating technology to collaborate. There was a benefit to students’ social needs by allowing additional opportunities for students to talk to one another. Additionally, students worked on projects to share their knowledge and learn from each other, allowing the work to be more student-centered.

**Teacher growth.** In the spring of 2020 when schools were closed and all students placed on remote instruction, teachers were responsible for asynchronously posting assignments with limited interaction with their students. During the interviews, teachers highlighted how in the spring of 2020 they could introduce themselves to products in
Google Workspace for Education Fundamentals. This was reported in both the open-ended survey questions and in the interviews.

Question 4 on the survey was: What are your perceptions regarding the integration of the G Suite for Education for purpose of student collaboration in a gapped hybrid learning environment? One teacher indicated a positive growth perception. Ann Marie stated,

I have positive perceptions of the potential opportunities regarding the integration of the G Suite for Education for the purpose of student collaboration in a gapped hybrid learning environment. I am already amazed at what my fellow teachers have been able to accomplish in such a short amount of time. I am also aware and appreciative of Google’s efforts to keep ahead of the curve and provide updates to their offerings as various needs are discovered throughout the hybrid learning environment that most educators find themselves in. Collaboration can only flourish and be truly successful when we provide the road for our students to follow. I, myself, am slowly working on different ways to allow for more collaboration as I learn and lay the groundwork for that road.

Although this perception was shared by only one person in the survey responses, it was further explained during the interviews. Kelly commented, “I would say the spring gave me an opportunity to introduce myself to some of those things.” Ryan indicated he felt “the spring did give me an opportunity to become familiar with Google Classroom and creating assignments for that purpose and any other programs that we use.” Julie added,

I think in the spring, it was like a totally different animal. I don’t think we were using everything that we had at the time just because we didn’t know what we
were doing, and we had enough time in those couple of months to kind of evaluate what we needed to do to improve.

Bob stated, “Luckily, we were able to do it last year as we got familiar from March to June.”

During the interviews, all participants noted how their instruction and knowledge changed through this evolution in fall 2020. During the fall of 2020, teachers were required to teach lessons synchronously. Students, regardless of their setting, were receiving live instruction from their teachers. Ryan stated, “The Google Meet has been a whole new thing. The live instruction has really changed things.” Julie stated, “Now that we are meeting every day and doing like classwork and making everything digital, it is working a lot better. And they’re learning more than they were in the spring.” Chloe remarked, “Now we are teaching more and doing more than only posting assignments.”

Teacher growth was continually highlighted in the participants’ comments. Bob reported,

It [Google] allowed me to collaborate with my coworkers just to gain a better understanding and build on or just build on my knowledge for next [this] year.

Because no thought we were going to be here by this time last year. But guess what? We are still here.

Kelly demonstrated appreciation for the time she had during the summer to focus on learning more. She stated,

It was good because after the spring we had the summer. We had the months over the summer to really focus, and that was the time we talked about earlier to explore some of those things . . . We had the opportunity to talk to teachers from other districts. We had time to see what they were saying on social media. And I,
I can speak for myself, but I think I can also speak for a lot of the people that I work with.

This evolution required teachers to build on skills gained and establish their knowledge through various resources with limited instructional coaching and minimal formalized professional development. Learning how to teach with technology as the primary emphasis made teachers look at how they delivered instruction and what they needed individually to get better. Jill’s quote from the interview is important to use as a general belief statement. She stated, “I’ve learned a lot, and I think it has made me a better teacher.”

Theme 2, the benefits of technology integration, conveyed how participants described the benefits of technology integration in the gapped hybrid learning environment. Although there was difficulty in creating a new way that teachers were required to instruct, the participants could see the benefits for the students in terms of socialization and learning. The teachers saw benefits for themselves through their professional growth.

**Barriers to technology integration.** Previous research has revealed a variety of barriers impede successful technology integration in the classroom. This list of factors has included the school setting, equipment usage, training needs, time concerns, and planning (Ertmer, 1999; Hew & Brush, 2007; Hsu, 2010; Pittman & Gaines, 2015; Tondeur et al., 2017). These have been identified as first-order barriers (Ertmer, 1999). Studies have also indicated teacher beliefs and attitudes, identified as second-order barriers (Ertmer, 1999), are a critical factor in successful technology integration (Ertmer, 1999, 2005; Ertmer & Ottenbreit-Leftwich, 2010; Hsu, 2016; Inan & Lowther, 2010). In
In this study, participants indicated several barriers that affected technology integration for student collaboration: (a) the hybrid setting and COVID-19/teachers’ beliefs regarding collaboration related to the hybrid setting, (b) pedagogy related to technology integration, (c) reliability of technology, (d) student engagement with technology, (e) lack of students’ technology skills, (f) teacher training, (g) time, and (h) a perceived least limiting barrier.

The hybrid setting and COVID-19. One category of the barriers to technology integration related primarily to the current gapped hybrid setting implemented in response to the restrictions of COVID-19. During the fall of 2020, students were assigned to cohort groups to reduce the number of students present in the classroom. When one cohort was present in the classroom, the other students were at home connecting to live instruction through Google Meet or Zoom. Teachers found it difficult to implement collaborative work in this environment. During the interview, Chloe indicated, “No, I did not use a lot of the collaborative tools during remote learning. Our students completed an animal research project together. They did everything together, from brainstorming to the presentation together. We have not done that yet.” Students did work independently on using technology whether they were at home or in school. Chloe stated, “We used the same story in different Google Slides, but then they were writing a friendly letter to Mr. Macy persuading him to design their balloon design for his parade in their writing notebook.”

Management of this type of environment was difficult. In the interviews and open-ended questions, participants identified the management of “roomers and zoomers” as difficult. Question 3 of the open-ended survey was: Why is the (answer to the previous
question) the number one barrier to student collaboration in a gapped hybrid learning environment? Some comments from the participants related to this thought were as follows: “It is difficult to keep an eye on both at the same time” (Denise), “There are inherent difficulties of supervising two groups simultaneously” (Carolyn), “The management of managing live and in-person is extremely difficult” (Donna), and “A multi-tasking nightmare” (Jenny). During the interview, Barbara indicated the lack of additional computers prevented her from managing all the breakout groups. She stated, “Like maybe if I have six groups or five groups, I need four other computers, and I don’t have that available.”

Teachers shared a few strategies to facilitate the management of students at home and in school. In-person learners helped the teachers manage the at-home learners as well. This was a strategy reported to facilitate discussion among both groups. In the interview, Emily indicated,

Through collaboration, it’s been nice for the students get to hear and understand and learn from their peers, as well as take some leadership roles. I can have the students that are in person with me take a leadership role in guiding the students that are remote in activities. I can control better the in-class environment and then kind of have the students that are there with their peers.

Another strategy shared to help with management related to the hybrid setting was using a co-teacher. Jill stated, “I have a co-teacher who can take groups of students and allow them to talk to each other and help each other.”

A subcategory of perceptions of teacher beliefs regarding collaboration was also noted. Collaboration was seen as a benefit to the students; however, teachers had
difficulty implementing collaboration in this environment. Question 4 of the open-ended questions was: What are your perceptions regarding the integration of G Suite for Education for student collaboration in a gapped hybrid learning environment? In response, the teachers indicated, “I think collaboration will be very challenging in the hybrid environment. . . . The idea of having to do this gives me, the teacher, a lot of anxiety” (Nicole), “I have not found a way for students to work collaboratively with G-suite [referring to at home and in school learners]” (Tina), “Positive and negative. . . . It is very helpful in collaboration; however, there needs to be restrictions” (Anna), and,

Collaboration can only flourish and truly be successful when we provide the road for our students to follow. I, myself, am slowly working on different ways to allow for more collaboration as I learn and lay the groundwork for that road.

(Barbara)

In the interviews, the teachers indicated collaboration is important but stated they were having issues with how to have students collaborate in this environment. Chloe indicated, “I am not doing probably as much as I could.” Ryan stated, “It is huge for students to be able to learn. I think that is the biggest challenge with the hybrid setting.” Kelly also felt collaboration was important, as she stated, “It goes back to unifying the class, I mean, it’s important to keep the elements, the very basic elements of what a classroom is.” Although the teachers recognized the importance of collaboration, they reported difficulty in its actual implementation.

Pedagogy related to technology integration. In the gapped hybrid learning environment, the teacher participants reported difficulty with instruction specific to this pedagogical implementation in this setting. Teachers had issues with differentiation,
instructional pieces, and communication. Teachers reported difficulty with their pacing and the lack of hands-on guidance at home for the remote students. Excerpts to illustrate this finding were as follows: “The number one barrier in multiple disabilities classroom is the lack of hands-on guidance at home. . . . I must move at a slower pace to make sure no one is behind” (Brittany), and “The pace of directions, instruction, and completion of assignments has to be slower since G Suite is a new tool to the students, and the reliance on technology is so great” (Brenda).

Question 1 in the open-ended survey was: What do you perceive as the barriers to integrate G Suite for Education for student collaboration in a gapped-hybrid learning environment? To this question, Ellen responded that “grouping students becomes an issue” and Liz stated “the barriers to integrated G Suite for Education are providing feedback to students.”

During the interviews, the teacher participants indicated difficulty with instructional pieces as well. They reported difficulties with instructional pacing, grouping students, and facilitating small group instruction. Ryan indicated the ideal nature of using technology for small group instruction by stating, “Ideally, technology allows students to be placed into small groups effectively for small group instruction. And ideally, we are able to personalize the structure that’s actually being delivered and the assignments that are being delivered for each student’s needs.” Jill’s interview response speaks to the pacing issues teachers have in the classroom due to the hybrid environment. Jill reported the following in terms of how guided reading was being organized in the classroom:

Well, you know, normally on a regular day, on a regular education day in the classroom, when everybody is in the classroom, I can go to guided reading groups
during a period. And now, what I am finding is I only get to one [guided reading] group. That is because to get everybody in the small group, to get everybody’s computer working, to get everybody’s volume working, it’s kinda limited me from completing things the way I usually do . . . If I’m teaching vocabulary, it now takes me 2 days to teach vocabulary as opposed to me teaching the vocabulary in 1 day. So I’m noticing things are taking me longer because of the issues with the technology.

**Reliability of technology.** Reliability of technology was another barrier to technology integration. Teachers reported multiple technology-related problems, including Wi-Fi issues, Chromebook charging problems, and glitchy and freezing connections when using Google Meet and Zoom. This unreliable technology affected the teachers’ ability to integrate technology in general as well as for collaboration. This was a prevalent issue in both the open-ended question and interview responses. In the open-ended section, participants were asked: What do you perceive as the barriers to integrate G Suite for Education for the purpose of student collaboration in a gapped-hybrid learning environment? Nine of the 19 participants identified technology problems as a perceived barrier. Excerpts from the participants that support this claim include “inconsistent technological access” (Beverly) and “There are times when we are online that the students drop off or the screen freezes” (Brenda).

Question 3 yielded information regarding technology inconsistencies as a barrier; Linda stated, “The delays in conversations across settings due to the technology issues.” In the interviews, this was a theme from all eight of the participants. Everyone mentioned something regarding the inconsistency of technology or the problems they were seeing
with the technology. Kelly stated, “You can’t always anticipate walking into school one day and finding out that servers are down, or the Wi-Fi is down.” In response to the interview question, “Have there been situations when you were unable to, or it was difficult to implement technology or use G Suite for Education in the classroom? Please describe the reasons for the difficulty and how you overcame them,” Chloe stated, “Most of the issues are Wi-Fi related.” Bob, in response to the same question, stated,

I think the only difficulty would be if, like, the broad bandwidth wasn’t big enough or the students at home experienced the power outage, or their Wi-Fi and Internet wasn’t working properly . . . And because if it is a technology issue or it’s like a Wi-Fi issue, there is nothing you can really do except restart our computer and hope for the best that it comes back on.

The reliability of technology was a barrier the teachers mentioned frequently in both the survey and the interview responses.

**Student engagement with technology.** Previous research provided a positive view of student engagement with technology (Harper & Milman, 2016; Harris et al., 2016). With students at home and in school, teachers must teach to both groups of students throughout the day. To unify the class, the students attending in person also join the Zoom meeting and the lesson is delivered through the computer. The teachers reported students were not engaged in the lesson and activity through technology. In the open-ended questions, three participants indicated engagement with the technology was lacking. The following are excerpts of the participants’ comments: “Many students do not focus on the computer and the computer work during the lessons or for asynchronous work . . . students don’t see it as actual learning time if a teacher is not physically
present” (Tina), “Keeping the students engaged and self-motivated in a hybrid environment” (Ryan), and “Keeping students engaged and on-task in both settings at the same time” (Ellen). The participants indicated this was an area of concern when attempting to integrate technology effectively.

The age of the students was noted as a concern in the open-ended responses by three participants. This was added to the engagement section to capture age as a feature needed for engagement in a virtual environment. It was shared by the participants who taught third-grade students in the school that “younger students lack the maturity to sustain a completely computer-driven teaching mode” (Tina), and “These students are not old enough/capable enough to be able to discuss what they need to do in a chat and then work. . . . They need to be able to verbally discuss the project as they work” (Chloe).

During the interviews, five of the eight participants reported concerns with engagement. Julie indicated, “They’re off task, but you know when that will happen, the technology is used inappropriately, which I guess would be off-task stuff as well.” Chloe reported, “The students easily get off-topic. It is harder for me to nip this in the bud.”

Lack of engagement may be described as off-topic behavior and seen as students who do not engage in the learning, discussion, and collaboration using the technology. This was referenced in Emily’s comment that “I think there is a lot more opportunity for students to elect not to collaborate and kind of check out, so to speak.” Barbara added to the engagement piece by focusing on attendance as a lack of engagement. She indicated, “A barrier in a hybrid environment that I have seen is that not all the students are coming to class daily. I mean, now it is better, but in the beginning of the year, it was a little bit of a challenge.”
Although not referenced in the discussion, attendance has been an area of concern within the school all year.

**Lack of students’ technology skills.** Students’ technology skills were discussed in both the open-ended survey questions and the interviews as a barrier to technology integration. Teachers reported a lack of technology skills on the part of students as a barrier to being able to integrate technology successfully. In the open-ended survey, participants mentioned the lack of foundational technology skills, the lack of typing skills, and the lack of understanding of using Google and the computer. Some teacher responses regarding student skills as a concern during the gapped hybrid environment were as follows: “Students do not have a great [technology] foundation. Because they have a hard time navigating through new programs, they have a harder time collaborating” (Liz), “Students lack typing skills” (Bob), and “My perception is teaching students how to function with the technology so they can fully engage with the material during the actual lesson” (Sonia). The lack of student skills impeded the teachers from carrying out lessons as they were spending additional time teaching the students how to use the technology.

In the interviews, three of the eight participants discussed students’ technology skills. The participants identified a need for instruction in Google, user error concerns, and typing as pitfalls for students. Chloe added,

Most of the time, we can use Google, but we have to instruct and teach the students how to use it. For example, they did not know how to use textboxes, especially at the beginning of this year. Still, to complete an assignment, we had to organize Google tools in Google Classroom.
Emily recanted the use of Jamboard and noted that although she provided the students with directions, the students’ work went off course:

So, I left instructions, and then I had set up the Jamboard with the prompt, some illustrations, and directions. And because Jamboard is totally like once you give someone access to edit, you know, third graders were just deleting my instructions. So. That. That became problematic, and I needed to rein it in in part. I mean, dealing directly with some students individually and giving them specific directions of what the expectation was. Monitoring that and it just became a lot of juggling on my end because I would take something off that was not following the directions and but to do that before the kids put in, putting it back on and trying to get it at the same time.

Bob indicated a need for students to have better typing skills so they could complete their work:

Some students aren’t very good typers. There are some people that are crazy fast, adult level, and then there are some that are still on a hunt and peck for which makes something that they could get right in a minute now 4- or 5-minutes time because they are looking for the letters.

The lack of technical skills on the part of the students impeded teachers’ integration efforts. They needed to teach the curriculum, but they also needed to address the lack of understanding of using the technology to deliver the instruction.

*Teacher training.* Another barrier to technology integration noted was teacher training. This was discussed in both the open-ended survey responses and in the interviews. Teachers felt they were not prepared to integrate technology for student
collaboration and did not feel prepared to teach in the gapped hybrid learning environment. During the survey, the perceived barrier of training was mentioned by five different participants. I have included three examples of this: “Insufficient training for staff and students how to approach student collaboration between the roomers and the zoomers” (Melissa), “Without proper training of staff, we cannot model what this student-to-student collaboration should look like” (Denise), and “I feel much more comfortable with Google Classroom this year than I ever have, however, I feel there is much more to learn” (Brenda).

During the interviews, a question was asked directly of the participants regarding training. This was incorporated in the interview questions because, in the literature, training has been highlighted as the main barrier to technology integration (Dawson, 2012; Ertmer, 1999; Harper & Milman, 2016; Hsu, 2016; Kopcha, 2012). The question was: How well do you think the district prepared you and the students for the integration of the Chromebooks and G Suite for Education for the purpose of collaboration? All eight participants answered the question in the interviews. Training was noted as something all eight teachers needed. Julie stated,

I don’t feel we were really prepared for this. We did a lot of stuff on our own. This was also kind of like an emergency situation. So how are you going to get any type of professional development last second in the middle of a pandemic?

Kelly added to this sentiment by saying, “That’s a loaded question, too, because, in an ideal world, there would definitely have been more time to prepare. But we were kind of thrown into it. I think the district did the best that they could.” Barbara stated, “So I
would say that they trained us, but that was like 2 years ago. We need some updating now because there have been changes.”

Training was highlighted as the most limiting barrier by two of the eight participants in the interviews. Jill indicated she was uncertain as to how to use the technology as the most limiting barrier. Jill summarized her reason as, “If teachers aren’t trained in certain areas of G Suite, they will have major difficulty completing what is expected of them.” Kelly indicated, “The other barriers could be possibly overcome, or an alternative can be found, but without some type of understanding of technology, it cannot be implemented.” Training continued to be highlighted as an area in which the teachers wanted more specifically related to the Google platform and teaching in a hybrid environment.

*Time.* In previous research, the lack of time was listed as a barrier to integrating technology (Ertmer, 1999; Ertmer & Ottenbreit-Leftwich, 2010; Ertmer et al., 2012; Hew & Brush, 2007; Hsu, 2016; Pittman & Gaines, 2015; Tondeur et al., 2017). In this research, time was an area of concern for the participants as reported in both the open-ended question and interview responses. In the responses to the open-ended survey questions, six participants mentioned time as a barrier. This encompassed both time to prepare the lesson and the lack of time to implement the lessons with technology. The participants stated the following: “Introducing G Suite to the students in a new educational environment takes up even more time” (AnnMarie), “Lack of time. Time is always an issue in the world of education” (Denise), “The time-consuming, chaotic nature of this teaching environment is a barrier to effective planning and lesson
implementation” (Linda), and “Time to develop lesson integrating the technology components” (Ryan). Time was a prevalent barrier reported by the participants.

In the interview responses, three of the eight participants mentioned time as the most limiting barrier in their responses. One participant reported time was an issue, but did not rank it as the most limiting barrier. Emily, who selected time as the most limiting barrier, explained,

The time to plan lessons is almost exclusively outside of the school day. During my prep/lunchtime in school, other tasks, such as communicating with parents, students, and other teachers and setting up/cleaning materials for the lessons that day, consume nearly all of the available time. So when I spend time planning lessons, the incorporation of technology is always a consideration. It just depends on how much time I have to consider all the options and put them in play.

Chloe selected time as the most limiting barrier as well. She stated, “Time I have to spend on my own time is a lot. I cannot do a lot of things during the school day. It takes a lot of time to prep all of the documents.” Julie ranked time as the most limiting barrier and explained it as, “Teachers never have enough time, especially now. Converting lessons to fit the digital platform is very time-consuming. It’s also a trial-and-error process sometimes.” Ryan, who did not rank time as the most limiting barrier, stated during the interview that, “Almost all content has to be modified for this hybrid setting. However, the time to do so can still be a challenge.” As indicated in previous studies, time was a prevalent category as a barrier to implementing and integrating technology in the gapped hybrid environment.
**Perceived least limiting barrier.** During the interviews, the eight participants were asked to rank what they believed was the least limiting barrier to technology integration. The results were not consistent among the group. However, each teacher interviewed provided a rationale for their decision that provided additional insight.

Both Barbara and Bob selected “unsure of how to use the technology” as the least limiting barrier. Barbara explained her thinking by stating, “I am confident in using G Suite and technology in my classroom.” Bob elaborated on his selection and replied, “Due to my experience and knowledge of technology, I am able to implement Google Suite for the purpose of student collaboration to ensure the academic success of our students.”

Emily indicated “the need to have enough grades for the report card” as the least limiting barrier. Emily, a teacher of the supplemental class, explained her thinking as, “In my particular position, I do not have some of the grading/assessing constraints that other teachers experience. These things do not impact my implementation of technology at all.”

Both Jill and Ryan agreed with the least limiting barrier and selected “the content does not lend itself to collaboration and the use of technology.” Their explanations were somewhat similar as they focused on the content. Jill stated,

I have realized that you can always teach things using technology and collaborate on various content . . . In fact, I find the longer I am teaching online, the more I find online. I have found resources to help in planning lessons.

Ryan explained his ranking as, “I find that almost all content has been able to be modified for this hybrid setting; however, the time it takes to do so can still be a challenge.”
Julie’s selection focused on content as well. She indicated “technology makes the content more difficult” as the least limiting barrier for technology integration. Julie’s belief in this barrier was identified through her explanation. She stated, “Technology may be a challenge to use sometimes, but it definitely enhances teaching. Technology already has enhanced our profession.”

Chloe’s selection highlighted her beliefs about content. She selected “my beliefs for teaching the content” as the least limiting barrier to technology integration. Her explanation for this selection was as follows: “The Google Suite products have made providing instruction both whole group and individual easier. On the whole, my students are using Google Slides, Forms, Docs, etc., daily. However, they are completing these individually.”

Kelly selected “students do not work well together on task” as the least limiting barrier to her technology integration needs. This may have to do with her level of experience as compared to the other participants. Kelly stated in her explanation, “In my 18 years of teaching, I already have some experience in classroom management that would allow me to redirect students’ behavior or work habits to find ways for them to be successful together.”

Although the selected least limiting barriers were not necessarily consistent, half of the interviewed teachers focused on the construct surrounding content as the least limiting barrier. Two of the eight teachers focused on using technology based on their knowledge level. One teacher focused on grades as the least limiting barrier and the other on student behavior.
Theme 3, barriers to technology integration, included a variety of categories: (a) the hybrid setting/COVID-19/teachers’ beliefs regarding collaboration, (b) pedagogy related to technology integration, (c) reliability of technology, (d) student engagement with technology, (e) lack of students’ technology skills, (f) teacher training, (g) time, and (h) least limiting barriers. These categories were further explained by the participants in both the open-ended survey questions and in the interviews. Barriers impeded the progress of technology integration. Previous research supported the existing barriers of the school setting, reliability of technology, teacher training, and time (Ertmer, 1999; Hew & Brush, 2007; Hsu, 2010; Pittman & Gaines, 2015; Tondeur et al., 2017). Ways to improve pedagogy have been studied through different technology and teaching models (Glassett & Schrum, 2009; Hilton, 2016; Mishra & Koehler, 2006; Storz & Hoffman, 2013; Urbina & Polly, 2017). There has been limited research on the impacts of a gapped hybrid learning environment due to the COVID-19 pandemic. Some of the barriers reported in the current study were directly related to modifications made to the school schedule, environment, instruction, and technology use due to the pandemic.

Chapter Summary

In this action research study, I used both quantitative and qualitative data to develop a complete understanding of the answers to the research questions (Creswell & Plano Clark, 2011). Three prevalent themes emerged from the open-ended questions on the survey and the interview questions. The first theme related to the use of technology, including Google Workspace for Education Fundamentals. Participants elaborated on the technology used in the classroom for both general and collaborative purposes. The second theme provided insight into the benefits of technology integration found during
the gapped hybrid environment. Benefits identified included socialization, student learning, and teacher growth. The third and final theme uncovered the barriers of successful technology integration. Barriers related to the hybrid setting/COVID-19, teacher beliefs regarding collaboration, pedagogy related to technology integration, reliability of technology, student engagement with technology, lack of students’ technology skills, teacher training, time, and a perceived least limiting barrier. The analysis of these themes contributed to the goal of this study by clarifying teachers’ use of Google Workspace for Education Fundamentals for the purpose of collaboration.
CHAPTER 5
DISCUSSION, RECOMMENDATIONS, IMPLICATIONS, AND
LIMITATIONS

The purpose of this action research was to investigate how teachers used Google Workspace for Education Fundamentals for student collaboration during the COVID-19 pandemic. The goal was to make recommendations for technology integration in Grades 3 through 5 in a school in central New Jersey. This chapter presents the findings and how they relate to the research questions and the literature. In addition, the chapter includes the recommendations, implications, and limitations of the study.

Discussion

To answer the research questions directing this study, I combined quantitative and qualitative data and reviewed them in tandem with the literature and previous studies addressing technology integration, the barriers to technology integration, and collaboration. This discussion section is divided into three sections according to each research question:

1. How do elementary teachers at a school in central New Jersey integrate technology using Google Workspace for Education Fundamentals for student collaboration into their daily lessons in a gapped hybrid learning environment?
2. How do elementary teachers perceive first- and second-order barriers to integrating Google Workspace for Education Fundamentals for the purpose of student collaboration in a gapped hybrid learning environment?

3. What are elementary teachers’ perceptions about the integration of Google Workspace for Education Fundamentals for the purpose of student collaboration in their classroom lessons in a gapped hybrid learning environment?

**Research Question 1: How do elementary teachers at a school in central New Jersey integrate technology using Google Workspace for Education Fundamentals for student collaboration into their daily lessons in a gapped hybrid learning environment?**

Students live in a world where technology is integrated into every aspect of their lives. In schools across the country, the expectation to use technology exists based on recommendations made by international organizations, Departments of Education, and the teaching standards with which curricula are aligned. These guidelines contain a focus on the application of technology skills within different subject areas and the need for students to develop 21st-century skills (Council of Chief State School Officers, 2010; ISTE, 2016; New Jersey Department of Education, 2014; P21, 2018; U.S. Department of Education, Office of Educational Technology, 2017). Numerous studies have been completed on technology integration in the K–12 classroom and have shown integrating technology into classroom instruction is a slow and complicated process that is influenced by many factors (Ertmer, 1999; Hew & Brush, 2007; Hsu, 2010).
Educators in many school districts have used various Web 2.0 tools, including Google Workspace for Education Fundamentals, to teach students content and technology skills. Google Workspace for Education Fundamentals is a cloud-based solution that is free for use by those within educational institutions. Google products enable multiple users to contribute, edit, and interact together in one document, presentation, spreadsheet, or note-taking tool at one time. Each of the Google tools can be used in the classroom to accomplish a different set of objectives. As of the year 2020, approximately 120 million school accounts had been created using Google (Google, 2020).

During the COVID-19 pandemic, K–12 teachers needed to find alternative ways to instruct students using technology. This unplanned and unprecedented change forced educators to use technology daily to reach learners with the restrictions of in-person learning. Web 2.0 tools became critical for students to use as a way to receive instruction, complete and organize work, and submit completed work and summative assessments. The use of Google Workspace for Education Fundamentals provided students and teachers tools for all aspects of technology instruction. A variety of case studies completed by Google (2021) provided examples of educators in K–12 schools using Google to address overall school operations, writing needs, feedback, engagement, videoconferencing, assessment, and improving digital skills and learning outcomes.

Google Workspace for Education Fundamentals gives teachers the ability to spend more time personalizing learning so students can learn 21st-century skills. Google products have built-in collaborative features to enable students to work together even if they are not present in the same space (Google, 2021). Collaboration is important for
students to learn to bring multiple perspectives and ideas together. When two or more students explain a concept, all students benefit (Nussbaum et al., 2009). However, few studies exist on how to use Google and student collaboration in the K–12 setting.

**Usage of technology tools with and without collaboration.** Data collection for this study took place in November 2020. Because of the pandemic, the school was required to operate using a gapped hybrid learning model. This model allowed some students to be present in school while some worked remotely at home. Teachers connected to remote students via conferencing software, Google Meet or Zoom, throughout the school day. A review of 307 lesson plan entries from November 2020 from eight teachers showed they used technology daily and in every class period. However, this was not exclusive to Google Workspace for Education Fundamentals. Teachers used curriculum-based instructional technology programs and other online platforms such as EdPuzzle, Flocabulary, Kahoot, Quizlet, and Teacher Made to support student learning. It was reported in the lesson plans that the teachers used these tools for collaboration. A total of 135 entries were noted, with only 45 entries relating to products found in Google Workspace for Education Fundamentals. Forty-three of these entries noted collaborative uses, with 17 of these being Google tools. Of the 135 entries, it was unclear within 24 entries whether the tools were used in a collaborative nature by the students.

During the interviews, teachers reported the continued use of various hardware and software tools during their teaching. Teachers used multiple devices to conduct their lessons. All eight teachers reported using Google Workspace for Education Fundamentals daily and using Google Classroom as the LMS for their students. During the interviews,
teachers reported the main collaborative use of Google tools was for communication purposes. Students benefited from the ability to talk to one another in terms of socialization and student learning purposes.

However, it was also noted that Zoom was primarily used as the teleconferencing tool. The teachers interviewed commented on their preference for Zoom. These comments included Julie’s statement that she was “using Zoom for my meetings because I just think they have better features than Meet right now.” Chloe stated, “We are using Zoom instead of Google since we use it because this way we can go into breakout rooms. Zoom now has allowed us to help them more and to explain more.” Barbara highlighted how Zoom helped her students collaborate by using breakout rooms, stating, “If they’re in a room or a breakout room and they’re able to collaborate. They get their ideas out there, they become more of a human in the real world.”

During the interviews, the teachers talked about the benefits of collaboration. However, only three of the eight teachers interviewed provided examples of a collaborative project using Google Workspace for Education Fundamentals. Bob stated, “It allows them [students] to work on the same document. If one person is at home and one person in school they can see the same document, they can provide input on the same work.” Emily indicated, “I have used Google Docs where students have contributed their thoughts or hypotheses on the same Google Doc. We’ve used it with Jamboard for students to share their ideas.” Chloe stated, “I am not doing probably as much as I could . . . the students are not working in a live document together as we have in the past. We are just not there yet.”
In this study, different ways were identified to use Google to support student learning both with and without collaboration. It was indicated that teachers asked students to collaborate using Google tools and used other online Web 2.0 tools to provide students with learning opportunities.

During the COVID-19 pandemic, teachers in classrooms across the nation provided instruction in a variety of ways. Teachers used technology to manage online assessments (89%), provided live instruction over teleconferencing platforms (84%), facilitated online polling or quizzes (72%), and created online lesson (56%). The proportion of teachers whose daily hours of synchronous remote instruction resembled a conventional school day was 42% (Arnett, 2021). In this study, teachers mirrored the use of classroom instruction with technology enhanced opportunities both with and without collaboration.

Existing research supports the use of Google for collaborative learning opportunities. Iftakhar (2016) reported the use of Google by university teachers for collaborative learning. Students used Google Classroom to submit assignments and project work. University students agreed that Google Classroom was effective and easy to use. However, technology-related issues, such as password problems, and slow connection speeds acted as a barrier to its regular use. Google Docs provided opportunities for collaborative writing opportunities live (synchronous) or at different points of time (asynchronous). The web-based nature of Google Docs enables students to access work in different settings (Alkhataba, Abdul-Hamid, & Bashir, 2018).

This study provides a unique contribution to the literature in different ways. Elementary schools have functioned primarily with traditional in-person learning. This
study was conducted with students in various settings. There are very few research studies with a focus on the use of Google for collaboration in elementary schools. Many of the articles surrounding the use of Web 2.0 tools in elementary classroom are less research-based and relate more to practitioners providing ideas for using tools in the classroom (Mahaffey, Kinard, & Daughrity, 2020).

**Research Question 2: How do elementary teachers perceive first- and second-order barriers to integrate Google Workspace for Education Fundamentals for the purpose of student collaboration in a gapped hybrid learning environment?**

Previous research has indicated there are a variety of barriers that impede successful technology integration in the classroom. First-order barriers include the school setting, equipment usage, training needs, time concerns, and planning (Ertmer, 1999; Hew & Brush, 2007; Hsu, 2010; Pittman & Gaines, 2015; Tondeur et al., 2017). Second-order barriers include teacher beliefs and attitudes (Ertmer, 1999). The elimination of both types of barriers has been deemed critical in successful technology integration (Ertmer 1999, 2005; Ertmer & Ottenbreit-Leftwich, 2010; Hsu, 2016; Inan & Lowther, 2010). In this study, teachers perceived many barriers to integrating Google Workspace for Education Fundamentals to collaborate in a gapped hybrid learning environment. Through the surveys and interview responses, teachers indicated the most prevalent barriers were (a) teacher training and (b) time. Additional barriers noted included (c) pedagogy related to technology integration, (d) reliability of technology, (e) student engagement, (f) lack of students’ technology skills, and (g) the hybrid setting.

**Teacher training.** The survey responses were neutral on the need for teacher training ($M = 3.10, SD = 1.04$). However, uncovered by the qualitative sources, teachers
did not feel they had enough training to facilitate technology to collaborate in a gapped hybrid environment. Five out of the 19 teachers commented in their open-ended responses regarding the lack of training they had received. Two examples of these responses included: “Insufficient training for staff and students how to approach student collaboration between the roomers and the zoomers” (Melissa) and “Without proper staff training, we cannot model what this student-to-student collaboration should look like” (Denise).

During the interviews, all eight participants highlighted training as a piece that was missing. Kelly added to this sentiment by saying, “That’s a loaded question, too, because, in an ideal world, there would definitely have been more time to prepare. But we were kind of thrown into it. I think the district did the best that they could.” Barbara stated, “So I would say that they trained us, but that was like 2 years ago. We need some updating now because there have been changes.” Two of the eight participants interviewed ranked training as the most limiting barrier. Jill and Kelly indicated other barriers could be overcome, but they could not implement technology without a level of understanding.

The findings in this study corroborate the findings of previous studies that showed training to be a limiting barrier to successful technology integration. Ertmer (1999) identified teacher training as a significant first-order barrier. Recommendations included that training be conducted in a variety of ways to eliminate this blockade, including on-site courses, workshops, specialized workshops, and summer intensive courses. Technology training should focus on both pedagogical and technological needs. Hsu (2016) noted training was a significant barrier to successful technology integration. Louis
(2012) indicated four out of six teacher participants referenced district training to learn about technology and indicated a desire for future trainings. Professional development activities are an important component to consider when creating opportunities for successful technology integration (Swain & Pearson, 2002; Thompson, 2015).

**Time.** In this research, teachers identified time as another barrier to successful technology integration. This was indicated in the surveys and elaborated in the interview responses. On the survey, time was the only variable with a level of disagreement ($M = 2.42, SD = 1.01$) to the questions asked. In the open-ended responses, time was noted in six out of 19 responses. Sample responses identified from the participants included the following: “Introducing G Suite to the students in a new educational environment takes up even more time” (AnnMarie) and “Lack of time. Time is always an issue in the world of education” (Denise).

In the interview responses, three of the eight participants mentioned time as the most limiting barrier to successful technology integration for the purpose of collaboration. Time was a barrier primarily in the area of planning. The following quote, provided by Chloe, echoed the repeated sentiments of the teachers who were interviewed: “Time I have to spend on my own time is a lot. I cannot do a lot of things during the school day. It takes a lot of time to prep all of the documents.”

The existing research also supports that a lack of time is a barrier to integrating technology successfully (Ertmer, 1999; Ertmer & Ottenbreit-Leftwich, 2010; Ertmer et al., 2012; Hew & Brush, 2007; Hsu, 2016; Pittman & Gaines, 2015; Tondeur et al., 2017). Hew and Brush (2007) found time to be a significant barrier to successful technology integration. Three strategies were identified as successful ways to provide
more time, including changes to the building schedule, providing longer blocks of classroom time, and opening up school time for teachers to familiarize themselves with technology and for teachers to collaborate to create technology-integrated lesson plans and materials. Additional recommendations included allowing teachers time to play with technology and giving teachers time to work with knowledgeable peers and to have access to suitable models.

**Pedagogy related to technology integration.** While instructing in this model, teachers reported difficulty with instruction specific to pedagogy. Teachers found issues with differentiation, instructional pieces, maintaining communication with students, and providing feedback. Teachers reported the need to provide hands-on guidance to students and issues with curriculum pacing. This was elucidated by responses to the open-ended survey responses and interviews conducted with the eight participants.

Information taken from the open-ended responses uncovered a continued difficulty in trying to teach while integrating technology. The following are excerpts that support this finding: “The number one barrier in multiple disabilities classroom is the lack of hands-on guidance at home. I must move at a slower pace to make sure no one is behind” (Brittany) and “The pace of directions, instruction, and completion of assignments has to be slower since G Suite is a new tool to the students, and the reliance on technology is so great” (Brenda).

Ellen responded to Question 1 in the open-ended survey, which was, “What do you perceive as the barriers to integrate G Suite for Education for student collaboration in a gapped-hybrid learning environment” that “grouping students becomes an issue.” Liz
noted, “The barriers to integrated G Suite for Education are providing feedback to students.”

These sentiments were clarified in the interview responses. All eight participants commented on the difficulty of instructional pacing, grouping students, and facilitating small group instruction. Jill’s interview response speaks to the pacing issues teachers have in the classroom due to the hybrid environment. The following is Jill’s report of how guided reading is being organized in the classroom:

Well, you know, normally on a regular day, on a regular education day in the classroom, when everybody is in the classroom, I can go to guided reading groups during a period. And now, what I am finding is I only get to one [guided reading] group. That is because to get everybody in the small group, to get everybody’s computer working, to get everybody’s volume working, it’s kinda limited me from completing things the way I usually do . . . If I’m teaching vocabulary, it now takes me two days to teach vocabulary as opposed to me teaching the vocabulary in one day. So I’m noticing things are taking me longer because of the issues with the technology.

Two frameworks are used to integrate technology. The TPACK framework (Mishra & Koehler, 2006) and the SAMR framework (Puente, 2013) provide research-based strategies to ways to successfully integrate technology. During the interviews, none of the teachers spoke to using a specific model that helped facilitate successful instruction. Additionally, no research was found specifically related to an elementary synchronous classroom environment in a gapped hybrid model. It is uncertain
what additional research studies would reveal regarding the success of these models in an alternative school setting.

Research conducted with adult (i.e., college age) learners supports that there are pedagogical challenges in a hybrid environment from the teacher’s perspective (Raes et al., 2020). Teachers need to carefully reflect on instructional designs and pedagogical strategies to maximize learning and students’ experience in a hybrid environment with face-to-face and remote learners (Bower, Dalgarno, Kennedy, Lee, & Kenney, 2015). According to research, active learning strategies (Bower et al., 2015) and the Here or There (HOT) instructional strategies (Zydney et al., 2019) are ways to overcome some pedagogical difficulties.

**Reliability of technology.** Throughout the responses to the open-ended section of the survey and the interview questions, the reliability of technology was discussed as a barrier to successful technology integration for student collaboration. Teachers reported multiple technology-related problems, including Wi-Fi issues, charging problems, and glitchy and freezing connections when using teleconferencing software. Nine of the 19 participants identified technology problems as a perceived barrier on the open-ended survey. Several excerpts from the participants support this claim: “Connectivity issues. Another barrier is the reliability of the network” (Denise), “There are times when we are online that the students drop off or the screen freezes” (Brenda), “Insufficient bandwidth/Wi-Fi makes conversations between students difficult (glitchy, freezing, sound like robots)” (Melissa), and “Inconsistent Wi-Fi and technology because it is truly the foundation that would allow any collaboration to be successful” (AnnMarie).
In the interview responses, the reliability of technology was noted from all eight participants. Everyone mentioned the inconsistency of technology and the problems they encountered. One example was provided by Jill: “The problem with it is technology is inconsistent. Some days it works, and some days it doesn’t.” This barrier was mentioned in all the responses.

Previously conducted research emphasized the need to have reliable technology and specific setups to conduct synchronous learning for students in a face-to-face environment and at home. Technical quality is the highest contributor to instructional quality because the delivery is reliant on technology resources (Grant & Cheon, 2007). Research conducted on the barriers to successful technology integration corroborates this evidence. Technology equipment and support have been shown to be key components of successful technology integration (Ertmer, 1999; Ertmer et al., 2012).

**Student engagement.** The teachers were required to teach using synchronous instruction throughout the school day with students at home and in school. According to the responses provided through the surveys and the interviews, teachers reported the students were not engaged in the lessons and activities provided. On the open-ended questions, three participants indicated a lack of engagement in this environment. The following are excerpts from the participants’ comments related to problems with student engagement, indicating some may be based on the student’s age level: “Younger students lack the maturity to sustain a completely computer-driven teaching mode” (Tina) and “These students are not old enough/capable enough to be able to discuss what they need to do in a chat and then work. They need to be able to verbally discuss the project as they work” (Chloe).
During the interviews, five of the eight participants commented regarding engagement. One example of this can be seen in Ryan’s response regarding off-topic behavior: “While it is really good that they [students] enjoy having socialization, it can be difficult to redirect and get focused on the task at hand.”

Research conducted in the area of technology integration and student engagement provided a positive view of student engagement when technology was integrated into the classroom lessons (Harper & Milman, 2016; Harris et al., 2016). However, when further researching student engagement in the hybrid environment with remote and face-to-face learners, student engagement was noted as an issue in previous studies. Huang et al. (2017) reported remote students felt excluded from the class because they were physically separated from the school. This especially occurred when students encountered technical difficulties and did not have support from someone immediately. Weitze (2015) indicated remote students learned less, were more passive, and behaved as they would when watching TV. This primarily resulted from less active engagement required by the students due to teachers providing more lecture-based instruction.

**Lack of students’ technology skills.** Teachers indicated the lack of technology skills the students possessed was a barrier to being able to integrate technology successfully. In the open-ended survey questions, participants mentioned the lack of foundational technology skills, the lack of typing skills, and the lack of understanding of using Google and the computer. As an example, Liz said, “Students do not have a great [technology] foundation. Because they have a hard time navigating through new programs, they have a harder time collaborating.”
The lack of student skills impedes the ability of teachers to carry out lessons as they need to spend additional time teaching students how to use the technology. In addition to a lack of skills, students’ age was a concern brought up by a participant in their open-ended response. Sarah stated, “I don’t know if the technology is working with the younger students.” In the interviews, students’ technology skills were discussed by three of the eight teacher participants. Bob indicated a need for students to have better typing skills so they could complete their work as follows:

Some students aren’t very good typers. There are some people that are crazy fast, adult level, and then there are some that are still on a hunt and peck for which makes something that they could get right in a minute now 4- or 5-minutes time because they are looking for the letters.

Emily recanted the use of Jamboard and noted that though she provided students with directions, the students’ work went off course:

So, I left instructions, and then I had set up the Jamboard with the prompt, some illustrations, and directions. And because Jamboard is totally like once you give someone access to edit, you know, third graders were just deleting my instructions. So. That. That became problematic, and I needed to rein it in in part. I mean, dealing directly with some students individually and giving them specific directions of what the expectation was. Monitoring that and it just became a lot of juggling on my end because I would take something off that was not following the directions and but to do that before the kids put in, putting it back on and trying to get it at the same time.
Most of the existing research on first- and second-order barriers contained a focus on teachers’ use of technology (Ertmer, 2005; Ertmer & Ottenbreit-Leftwich, 2010; Hew & Brush, 2007). However, Hsu (2016) reported the lack of computer skills on the part of students was a barrier reported by teachers regarding successful technology integration. Teaching students how to use the computer tools took time away from instruction in the curriculum-related topics for elementary students. This aligns with the findings in this current research study.

**Hybrid setting.** In this research, the hybrid setting was another barrier to successful technology integration. Because of the unique circumstances in which this study was conducted, the research does not yet provide additional clarification of the barriers related to the COVID-19 pandemic. In this study, the scheduling model was identified as a barrier to successful teaching and technology integration. The environment and scheduling options selected made it difficult to manage the instruction of in-person learners and learners at home. The comments from the participants are excerpts related to this thought. It was stated, “It is difficult to keep an eye on both at the same time” (Denise), “The management of managing live and in-person is extremely difficult” (Donna), and “A multi-tasking nightmare” (Jenny).

A few strategies were shared to help facilitate the management of students at home and in school. These strategies included using the in-person students as partners for the at-home students. This was indicated by Emily during the interview:

Through collaboration, it’s been nice for the students to get to hear and understand and learn from their peers, as well as take some leadership roles. I can have the students that are in person with me take a leadership role in guiding the
students that are remote in activities. I can control better in the class environment and then kind of have the students that are there with their peers.

Another strategy that was shared related to the hybrid setting was using a co-teacher. Jill reflected on this by stating, “I have a co-teacher who can take groups of students and allow them to talk to each other and help each other.”

The gapped hybrid model was being used specifically in response to the need for increased social distancing and smaller classroom sizes. The pros and cons identified related to the hybrid model are significant planning and coordination. A pro of this model is that students feel a sense of community. A con is that teachers will be stretched throughout the week to prepare a lesson to deliver for in-person and virtual students (Hooker, 2020). Some of the teachers’ responses reflected the sense of not meeting the needs of all the students through this scheduling model.

There is limited research on the use of synchronous instruction in the elementary environment. Research conducted on synchronous instruction provided information from the college level as a viable option for teachers and students, yet the research is still minimal. Models need to be developed to provide the best instruction in this environment (Grant & Cheon, 2007; Raes et al., 2020).

In this study, teachers perceived many barriers to integrating Google Workspace for Education Fundamentals to collaborate in a gapped hybrid learning environment. Teacher responses identified the following barriers: teacher training, time, pedagogy related to technology integration, reliability of technology, student engagement, lack of students’ technology skills, and the hybrid model. These identified barriers supported
those found within the previous research on technology integration or remote and face-to-face learning in the school environment.

**Research Question 3: What are elementary teachers’ perceptions about the integration of Google Workspace for Education Fundamentals for the purpose of student collaboration in their classroom lessons in a gapped hybrid learning environment?**

Results of this study revealed the participants’ perceptions about the integration of Google Workspace for Education Fundamentals to collaborate in their classroom lessons. Previous researchers identified teachers’ perceptions as a second-order barrier to technology integration (Ertmer, 1999, 2005) and the amount of technology integration in a teacher’s classroom (Inan & Lowther, 2010; Thompson, 2015). In this study, I reviewed both quantitative and qualitative data to get a comprehensive picture of teachers’ perceptions of technology integration for the purpose of student collaboration. Teachers’ perceptions were ascertained from the survey and interview questions. Overall, teachers held positive perceptions regarding the use of technology in the classroom to collaborate within a gapped hybrid model. The participants identified positive perceptions of technology integration based on (a) socialization and student learning, and (b) teacher growth.

The results from the TTQ indicated the teachers held more than neutral perceptions (Lowther & Ross, 2000) regarding beliefs about technology integration ($M = 3.65; SD = 0.93$), readiness for technology integration ($M = 3.59; SD = 0.86$), the overall support they received for technology integration ($M = 3.46; SD = 1.03$), the technical support they received for technology integration ($M = 3.48; SD = 0.88$), and the impact...
on student learning ($M = 3.76; SD = 0.79$). The highest perception was found to be the impact on student learning. On the Technology Integration Survey (Kopcha, 2012), results showed the teachers held positive perceptions regarding the technology vision ($M = 4.03; SD = 0.56$). The participants held a neutral perception of their beliefs about technology integration ($M = 3.28; SD = 1.03$) and their beliefs regarding student learning ($M = 3.28; SD = 1.03$). Professional development perceptions ($M = 3.10; SD = 1.04$) were neutral in training on technology integration for collaboration and there was a negative perception of having enough time ($M = 2.42; SD = 1.01$) to integrate technology with collaboration in the gapped hybrid environment successfully. Teachers’ attitudes ($M = 3.85; SD = 0.66$) and beliefs ($M = 3.89; SD = 0.58$) were higher than neutral when measured by the Perceptions Towards ICTs in the Teaching-Learning Process Scale (Baş et al., 2016). Based on the survey data obtained through the TTQ (Lowther & Ross, 2000), the Technology Integration Survey (Kopcha, 2012), and the survey questions from the Perceptions Towards ICTs in the Teaching-Learning Process Scale (Baş et al., 2016), overall, teachers had positive perceptions regarding the use of the technology for the purpose of collaboration in the gapped hybrid learning environment. In this case, perceptions would not be viewed as a barrier to integrating technology, except for perceptions of the amount of time available and the time it takes to integrate technology.

Added to the Likert surveys were open-ended questions for the 19 participants to complete. Question 4 on the survey was: What are your perceptions regarding the integration of G Suite for Education for the purpose of student collaboration? Comments provided additional insight into the barriers teachers face, such as time, difficulties related to instructional pedagogy, technology problems, and student engagement. These
responses were already identified in the second question responses. However, participants indicated a positive perception of how technology could support student socialization and learning and teacher growth.

**Socialization and student learning.** One of the main perceptions teachers indicated technology enabled students to socialize during the pandemic. Though students were in different settings, some at home and some in school, students could talk to one another and share their thoughts regardless of their location. In the open-ended section of the survey, in response to Question 4, Jenny stated, “I think G Suite for Education offers fantastic opportunities for student collaboration in meaningful learning in this environment when it is orchestrated properly.” Liz stated, “Students can collaborate from school and home. They have access to share documents and can work together.” Brenda responded, “I feel that integrating technology is an important life skill for my students. My students have grown more computer literate, and they have shown so much growth in what they can do independently online.” This aligns with teachers’ beliefs about the benefits of student learning found in the survey questions. Overall, the teachers perceived that students could benefit from using technology to collaborate in this gapped hybrid learning environment.

During the interviews, this sentiment was clarified. The perceptions teachers held were positively related to collaboration for socialization and student learning. Four teachers mentioned perceived benefits for the students during the fall of 2020. Barbara indicated, “I think that it’s more important for students to collaborate. They need to be able to express themselves. Number one, they have to be able to talk about things verbally. Students are longing for that dialogue with other students.” Ryan referenced the
benefits of students talking to each other when they are in the hybrid model. He stated, “I specifically think in this hybrid model where they’re not seeing each other. I think the biggest benefit [of collaboration] is the socialization that they’re really missing out on.” In these answers, the teachers referenced collaboration to support students’ social-emotional needs, not only their academic needs. Collaboration was beneficial for students to be able to talk to each other about a variety of items. According to previously conducted research, teachers hold positive perceptions of technology integration affecting students’ learning (Ertmer, 2005; Ertmer & Ottenbreit-Leftwich, 2010; Ruddell, 2017; Thompson, 2015).

**Teacher growth.** Teachers perceived growth in their own abilities to integrate technology for the purpose of student collaboration. One teacher provided a positive perception regarding teacher growth. Ann Marie stated, “I am already amazed at what my fellow teachers have been able to accomplish in such a short amount of time.” During the interviews, all eight participants spoke about their growth from the onset of the pandemic to the fall of 2020 related to technology integration. Comments included Jill’s statement that “I’ve learned a lot, and I think it has made me a better teacher.” Although professional development was a barrier for many, participants reflected and perceived their abilities to grow as teachers without specific professional development.

To support technology integration in the classroom, research has demonstrated the need to conduct professional development for teachers (Ertmer, 1999; Harper & Milman, 2016; Hew & Brush, 2007; Kopcha, 2012; Reinhart, Thomas, & Toriskie, 2011; Swain & Pearson, 2002) that is designed according to pedagogical beliefs and perceptions (Ertmer, 2005; Ertmer & Ottenbreit-Leftwich, 2010; Hsu, 2010; Pittman & Gaines, 2015;
Thompson, 2015). Because of the COVID-19 pandemic, teachers were provided with minimal professional development but took it upon themselves to find fixes that would work in this novel environment. This does not support the research conducted on professional development. A previous study found that teachers who attended intensive training felt more prepared and successful integrating technology when compared to teachers who did not receive intensive training (Coleman, Gibson, Cotton, Howell-Moroney, & Stringer, 2016). However, teachers can find increased confidence through successful learning experiences, such as through PLCs or by supporting and helping one another implement appropriate classroom technology (Ertmer, 2005; Ertmer & Ottenbreit-Leftwich, 2010). As reported in this study, teachers worked together to support one another to implement technology-dependent lessons. This corroborated the findings from previous studies.

**Recommendations for District and School**

During 2020 and 2021, technology has become a requirement for teachers to use to provide instruction to students in the gapped hybrid model. The use of technology is fully embedded daily in schools. This research enabled me to develop recommendations to implement within the district and school.

As a result of this study, I propose implementing different initiatives to eliminate some barriers to technology integration and support more collaborative practices, such as (a) implementing targeted professional development, (b) providing time for teachers to work together, (c) providing a bank of successful plans and resources to eliminate the additional time needed to plan and prepare, (d) outlining a more cohesive student instructional plan for the use of Google Workspace for Education Fundamentals, and (e)
improving the reliability of the network and technology hardware. This can be done in conjunction with a building-level planning committee, the building principal, and the school district’s Assistant Superintendent. The results of this study will be shared with all school members and will be reviewed again with the planning committee, so they are aware of the findings to use for planning purposes. Although I have outlined some additional practices, ideas from other stakeholders will be accepted. By removing the first-order barriers identified through this study, technology for student collaboration will be integrated more seamlessly through this elementary school.

**Implementation of targeted professional development.** Through this study, teacher training was an identified barrier to successful technology integration for the purpose of student collaboration. To support technology integration in the classroom, research has demonstrated the need to conduct professional development for teachers (Ertmer, 1999; Harper & Milman, 2016; Hew & Brush, 2007; Kopcha, 2012; Reinhart et al., 2011; Swain & Pearson, 2002) that is designed according to pedagogical beliefs and perceptions (Ertmer, 2005; Ertmer & Ottenbreit-Leftwich, 2010; Hsu, 2010; Pittman & Gaines, 2015; Thompson, 2015). Based on this study, teachers need support in learning ways to integrate technology into their existing pedagogy. The professional development goals are to provide training to the teaching staff on the Google Workspace for Education Fundamentals tools and a targeted pedagogical and technology model.

**Implementation of targeted pedagogical support.** Professional development should emphasize an instructional and technology-integrated model that ties together pedagogy and technology. Using the TPACK model demonstrates a relationship between technology, content, and pedagogy, and the purposeful planning to blend these three
components of lesson design is the key (Hilton, 2016; Koehler & Mishra, 2006). Additionally, the technology coach should model and co-teach using TPACK (Lowther, et al., 2008).

**Time.** In this study, time was identified as a significant barrier. As recognized in previous studies (Ertmer, 1999; Ertmer & Ottenbreit-Leftwich, 2010; Ertmer et al., 2012; Hew & Brush, 2007; Hsu, 2016; Pittman & Gaines, 2015; Tondeur et al., 2017), time is a considerable barrier to overcome. To provide teachers with additional time, the following is recommended. Teachers should be encouraged to use the building PLC time to plan lessons collaboratively with their colleagues. This will afford teachers 12 additional hours a year in monthly intervals to focus on a specific area of need. This is a recommendation found in previous studies as a way for teachers to gain confidence and skills (Ertmer & Ottenbreit-Leftwich, 2010). When crafting the yearly faculty meeting schedule, a monthly faculty meeting will be provided specifically for planning purposes. This will provide an additional 10 hours a year for teachers. Although time is scarce in a school, finding 22 additional hours will be helpful for teachers. During monthly administrative council meetings, a discussion will transpire with building leadership about other opportunities within the upcoming month to afford additional time to teachers for planning.

**Bank of lesson plans.** One benefit of this school year is that teachers have created many lesson plans that include technology. These lesson plans will be shared among the teachers in the following manner. Within the school, curriculum captains have been identified as grade-level leaders. Teachers will be instructed to provide a copy of the lesson plans and related activities to the curriculum captains to link to the curriculum
dashboard. Lesson plans will be reviewed by the technology coach and Assistant Superintendent of Instruction for alignment. These lessons and resources will then be available to all staff members. This will allow teachers to identify the standards taught and then find multiple technology-integrated lesson plans in one location. Sharing lesson plans will also add time to the teachers’ schedules.

**Student instructional plan.** Starting in kindergarten, the progression of the use of Google Workspace for Education Fundamentals should be addressed. Student skills will be explicitly identified by grade level. Although a majority of the research on technology integration barriers is based on teachers’ needs, there is evidence that students’ use of technology has benefits in terms of student achievement and motivation (Harper & Milman, 2016; Lowther et al., 2008; Suhr et al., 2010).

A recommendation for monitoring student learning is to use a checklist of student understanding. Google skills should be reviewed through the technology classes and added to the technology curriculum. Both technology teachers and classroom teachers will be expected to instruct students in the Google Workspace for Education Fundamentals during class time. An end-of-trimester assessment will be created and provided to students to assess their skills through technology classes. This assessment will be used as part of the teacher evaluation system for technology teachers and identified in their yearly student growth objectives required by the State of New Jersey.

**Improve the reliability of the network and technology hardware.** Already planned for summer 2021 is an upgrade of the network. Because technical quality contributes to instructional quality (Grant & Cheon, 2007), working technology is a critical piece. To focus on technology support, a barrier identified for technology
integration (Inan & Lowther, 2010), resources will be allocated to ensure the technology is working successfully. The network administrator will be tasked with assessing the connectivity of the network and the devices throughout the 2021–2022 school year. A technology support staff member (part of the technology department) will be permanently based in each school building to address teacher and student issues quickly. A log of these technical issues will be kept and assessed monthly. Data from this log on reoccurring problems will be collected and reviewed monthly by the network administrator. A report of problems and solutions will be provided to the building principal to review problems and fixes to support the uninterrupted use of technology by the teachers and students.

Implications

By completing this action research, I identified implications that should be considered for me personally as well for future research. The implications are outlined in the following sections: (a) personal implications and (b) implications for further research.

Personal Implications

Through this action research, I gained insight into my personal role in the field of education. One benefit of action research is that it encourages an understanding of what is occurring in the local context (Buss & Zambo, 2014). As a district leader, it is critical for me to understand what is occurring in the school district. Immersing myself in this study and working closely with teachers in the district provided me with an understanding of what is happening in the school. This research put me in an insider position in collaboration with other insiders (Herr & Anderson, 2005). This positionality contributes
to the “knowledge base, improved and critiqued practice, and professional/organization transformation” (Herr & Anderson, 2005, p. 31).

The use of the convergent parallel mixed methods design (Creswell, 2014) allowed me to collect quantitative and qualitative data simultaneously. The benefit of this design was that I was able to merge the results and understand the relationship of the data collected (Creswell & Plano Clark, 2011). Equal emphasis was provided to comprehensively address the problem statement and research questions for the study. The pragmatic paradigm that guided this research will allow me to take action from the outcomes.

Some of the findings in this study confirmed my thoughts of what was occurring in the local context. At the onset of this study, I believed I would identify the difficulty of using technology based on the reliability of its use, time, and teacher training as barriers to successful technology integration for student collaboration. I also expected that teachers would have concerns when it came to pedagogy and teaching with technology.

The finding I did not expect was that all teachers would be using Google Workspace for Education Fundamentals consistently, and daily at that. However, I believe this use was accelerated because of the setting conditions and the pandemic. All teachers had to rely on these tools to deliver lessons in all subject areas because they were teaching students both at home and in school. Finding a platform all students could use regardless of location was a requirement during the pandemic.

Additionally, I did not expect the lack of student technology skills and student engagement with technology to be significant barriers. I believed students were using Google Workspace for Education Fundamentals on a more regular basis and would have
a higher level of understanding of how to use these tools successfully. Also, previous studies indicated student engagement would increase when using technology (Harper & Milman, 2016; Wachira & Keengwe, 2011). I was surprised to find this was a barrier reported by the teachers through the survey responses and the interviews.

Additional insight gained through this study related to the positive perceptions teachers held about integrating technology for collaboration. An unanticipated benefit highlighted that though students were in different settings, they were still able to interact and socialize with each other. Technology allowed students to work together, talk to one another, and connect with their classmates. A second unexpected benefit during the study was the finding regarding teacher growth. I did not expect the teachers to highlight their growth. With the lack of professional development, I expected the interviewed teachers to emphasize their lack of preparedness and not share their thoughts regarding their growth through the pandemic.

This study and the insight gained enabled me to understand better the needs of the school, teachers, and students. A plan can be created to support the teachers and students to remove these barriers successfully.

Implications for Further Research

The findings of this study have several implications for further action research. These include an (a) evaluation of interventions to eliminate first-order barriers, (b) teacher beliefs and perceptions of the use of Google Workspace for Education Fundamentals in a non-pandemic year, (c) measurement of student engagement, (d) measurement of student achievement, (e) measurement of student skills, and (f) Google Workspace for Education Fundamentals and the student point of view.
**Evaluation of interventions to eliminate first-order barriers.** It has been suggested that the removal of first-order barriers will provide more opportunities for technology integration to happen in the classroom (Ertmer, 1999; Hew & Brush, 2007; Lowther et al., 2008; Wachira & Keengwe, 2011; Young, 2012). Future research could be conducted to determine whether the action plan to remove first-order barriers results in more technology integration and whether teachers still identify the first-order barriers to technology integration. This would be the next step of this action research study. Teachers in this study would share their experiences through surveys and interviews primarily on the barriers identified in this study and whether the implemented recommendations impacted technology integration. Therefore, it would be beneficial for future research to be conducted to explore these topics further and continue with the action research cycle (Mertler, 2017).

**Teacher beliefs and perceptions of the use of Google Workspace for Education Fundamentals in a non-pandemic year.** Research has indicated beliefs and perceptions are key to technology integration once first-order barriers are removed (Ertmer, 1999, 2005; Hermans, Tondeur, van Braak, & Valcke, 2008; Hew & Brush, 2007; Liu, 2011; Pittman & Gaines, 2015; Tondeur et al., 2017; Wachira & Keengwe, 2011). Although this study related to teachers’ beliefs and perceptions, it would be interesting to replicate this study in a non-pandemic year. While this study was being conducted, additional variables may have influenced the teachers’ beliefs because of the required reliance on technology to meet the needs of students in different settings. The study could be replicated when students are on a traditional school schedule with all
students present. Findings from a future study could be compared to those of this study to determine the impact of the pandemic on beliefs and perceptions.

**Measurement of student engagement.** Research has provided a positive view of student engagement when using technology (Cifuentes et al., 2011; Dawson, 2012; Harper & Milman, 2016; Louis, 2012; McKnight et al., 2016). In this study, student engagement was found to be a barrier to technology integration. In a future study, student engagement could be the variable that is measured when implementing a collaborative unit. This could be completed through an intervention study where students who completed a collaborative unit are measured compared to students who completed a traditional unit. Engagement could be measured through an observation protocol and the results compared to one another.

**Measurement of student achievement.** An increase in student achievement has been identified in previous studies when working collaboratively and using technology (Daniel, 2012; Hilton, 2016; Lowther et al., 2008; Storz & Hoffman, 2013). In this study, student achievement was not addressed. Future studies can primarily look at student achievement concerning collaboration and technology integration. This study could be conducted as an intervention study, where one group receives instruction using a collaborative technology-based unit and the other a traditional unit. Both activities would need to be aligned to the same standards, and student achievement could be measured based on pre- and posttests.

**Measurement of student skills.** In this study, student skills were an identified barrier. Because the ability to use technology correctly is an important 21st-century skill (New Jersey Department of Education, 2014), it must be explicitly taught as are skills in...
other content areas. To graduate students who can harness the power of technology, students must use the technology correctly. Measurement of student technology skills can be completed through a pretest–posttest study or a longitudinal study where a review of technology skills is completed with the same participants over several years to record the students’ technology abilities.

**Google Workspace for Education Fundamentals and student point of view.** In a future study, the student perspective can be addressed when using Google Workspace for Education Fundamentals and collaborative projects. A qualitative study can be completed based on students’ opinions of Google Workspace for Education Fundamentals when being assigned collaborative tasks.

**Limitations**

As with other research studies, this study has several limitations that should be noted. The limitations are described in two categories: (a) methodological limitations and (b) limitations of findings.

**Methodological Limitations**

There are methodological limitations with action research. First, action research results are not generalizable to a larger population, as action research is specific to the participants, setting, and situation (Mertler, 2017). The participants in this study were a non-random purposeful sample, which limits the ability to generalize the results to a larger group. The participants were volunteers who met the requirements outlined in the research study. Second, the sample size was relatively small. This included 19 teachers responding to the survey and eight teachers from the original 19 volunteering to complete
a semi-structured interview. This small sample size may have affected the outcome and caused the inability to generalize results.

A third limitation is that I am the Superintendent of Schools. Although I believe I have good relationships and rapport with the teachers, their answers may have been skewed because of the position I hold in the school district. This may have been especially true during the interviews as three of the eight interviewees were non-tenured teachers. They may have felt compelled to participate or to provide a certain type of response.

A fourth limitation of the methodology of this study is the brevity and timing of this study. I reviewed only 1 month of lesson plans. A review of more than 4 weeks of lesson plans may have resulted in additional information regarding the use of Google Workspace for Education Fundamentals for student collaboration. During this year, I could not observe the teachers’ practice due to restrictions and limitations surrounding COVID-19. Observation using a specific protocol may have created a stronger methodology with more points for triangulation. Also, teachers only had a few months to establish practices when the data for this study were collected. If the data had been collected later in the school year, teachers may have reported different results in their collaborative activities, barriers, beliefs, and perceptions.

**Limitations of Findings**

Certain elements regarding the findings also limited this study. The limitations of the findings identified include (a) self-reporting by the teachers during the interviews and the survey, (b) lesson plan collection, (c) the removal of the observation protocol, and (d) low Cronbach’s alpha scores.
The data collected from the semi-structured interviews were self-reported. As noted previously, the teachers may have been hesitant in sharing information as I am the Superintendent of Schools in the school district where the data were collected. I attempted to eliminate this potential bias by protecting the participants’ anonymity through pseudonyms and reinforcing the non-evaluative nature of the discussion that transpired during the interviews. Additionally, teacher survey results had no identifying features except grade level and subject taught. However, some teachers hold positions that only one person holds because of the school’s staffing structure. Therefore, identifying the subject area taught may not have protected their anonymity.

The collection of lesson plans was also a limitation. Although there is a lesson plan template and teachers must identify certain lesson design components in the lesson plans, including objectives, standards, materials, methods, and assessment, some teachers provide greater detail in their lesson plans. It was difficult to identify how teachers were using Google Workspace for Education Fundamentals based on the lack of information shared within some lesson plans.

I originally designed the study to include observations using a protocol. This was removed from the study because of the restrictions in space due to social distancing and staff’s hesitancy to allow an observer in their classrooms. An observation of a participant teaching one of the identified lessons may have provided additional clarity and findings.

The use of the Cronbach’s alpha statistic provides a measure of reliability. This statistical test was performed to determine whether multiple questions within the surveys were reliable. Acceptable Cronbach’s alpha values are considered to be .70 and higher (Nunnally, 1978). Within this study, three of the subscales had alphas lower than .70. On
the given teacher survey, the TTQ survey section, the Overall Support subscale had a Cronbach alpha of .636 and the Impact on Student Learning Subscale had a Cronbach alpha score of .528. On the survey, the Technology Integration Survey section, the Professional Development subscale, had a Cronbach alpha of .635. With the lower Cronbach alpha scores, these subscales may have had problems with internal consistency, therefore rendering them not accurate.

**Closing Thoughts**

Because today’s students are surrounded by technology, the meaningful use of technology in the classroom seems essential for student learning. As educators, we must continually find ways to leverage technology in our classrooms to prepare students for success in the 21st century. However, the removal of barriers that hamper the use of technology is paramount for successful use. Teachers will have a more successful experience using technology in their classrooms if teachers are provided additional time for planning and instruction, professional development, and research-based methodology for technology integration; increased focus is placed on improving students’ technology skills; and the network’s reliability is improved. Additionally, as reported in this study, capitalizing on the successful use of Google Workspace for Education Fundamentals for socialization and student learning opportunities is a place from which teachers can build. The teachers should explicitly recognize their personal technology growth as they have used technology for alternative ways to instruct and meet students’ needs. Combining all these factors is a complex task but doing so is essential for continued growth on part of both students and teachers.
REFERENCES


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https://doi.org/10.1080/09500693.2017.1327733

https://doi.org/10.2190/EC.39.2.a


https://doi.org/10.1016/j.compedu.2010.12.001


Ruddell, N. (2017). *The lived experiences of leading edge certified elementary school teachers who use instructional technology to foster critical thinking, collaboration, creativity, and communication in their classroom: A
phenomenological study (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses database. (10268943)


APPENDIX A

TEACHER TECHNOLOGY QUESTIONNAIRE

Teacher Technology Questionnaire (TTQ)

Lowther & Ross (2000)

First Name: __________________
Last Name: __________________
Age? ______________
Gender? Male  Female
Ethnicity?_____________
(For example, African-American, Asian Pacific Islander, Caucasian, Hispanic

How many different students did you teach each week: _________

What is your average class size? ____________

Directions: Select the response that most accurately describes you level of agreement with the following statements

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Most of our school computers are kept in good working condition.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>I can readily obtain answers to technology related questions.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>The use of computers has increased the level of students interaction and/or collaboration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Parents and community members support our school’s emphasis on technology.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Neutral</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>---</td>
<td>------------------</td>
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<td>---------</td>
<td>-------</td>
<td>----------------</td>
</tr>
<tr>
<td>5.</td>
<td>I know how to meaningfully integrate technology into lessons.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>My students have adequate access to up-to-date technology resources.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Materials (e.g. software, printer supplies) for classroom use of computers are readily accessible.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>The integration of technology has positively impacted student learning and achievement.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>I am able to align technology use with my district’s standards-based curriculum.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Most of my students can capably use computers at an age appropriately level.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>I have received adequate training to incorporate technology into my instruction.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>My computer skills are adequate to conduct classes that have students using technology.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Teachers receive adequate administrative support to integrate technology into classroom practices.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>My teaching is more student-centered when technology is integrated into the lesson.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Our school has a well-developed technology plan that guides all technology integration efforts.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

184
<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.</td>
<td>I routinely integrate the use of technology in my instruction.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Teachers in this school are general supportive of technology integration efforts.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Technology integration efforts have changed classroom learning activities in a very positive way.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>The use of technology has improved the quality of student work.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>My teaching is more interactive when technology is integrated in the lesson.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

21. Please rate your level of computer ability
   - Very Good
   - Good
   - Moderate
   - Poor
   - No ability

22. Do you own a home computer
   - Yes
   - No

23. How many computers (laptop or desktop) are available for students use in your classroom?
   - __________

24. How many mobile computing devices (e.g. tablets, Chromebooks, iPad, iPod touches) are available for students use in your classroom?
   - ______________

25. Do you have a wireless cellphone or smartphone
   - Yes
   - No

26. Can your wireless device access data services, such as browsing the Internet?
   - Yes
   - No
   - N/A

27. Do you own one or more mobile device (e.g. tablet, iPad, Nook, Kindle, Galaxy tablet) other than a cellphone or smartphone?
   - Yes
   - No
   - N/A

28. How many mobile devices other than a cellphone or smartphone do you own (if applicable)?
APPENDIX B

TTQ ORIGINAL QUESTION, CHANGES MADE, AND ALIGNMENT TO RESEARCH QUESTIONS

<p>| TTQ Original Questions, Changes Made and Alignment to Research Question |
|---|---|---|
| <strong>TTQ question</strong> | <strong>Question to be Added, Deleted, or Kept the same</strong> | <strong>Research question alignment</strong> |
| 1. Most of school computers are kept in good working condition. | Same | Question 2 |
| 2. I can readily obtain answers to technology related questions | Same | Question 2 |
| 3. The use of computers has increased the level of student interaction/collaboration | The use of <em>G Suite for Education</em> has increased the level of student interaction/collaboration | Question 2 |
| 4. Parents and community members support our school’s emphasis on technology | Same | Question 2 |
| 5. I know how to meaningfully integrate technology into lessons | I know how to meaningfully integrate technology into lessons using <em>G Suite for Education</em>. | Question 2 |</p>
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Question 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. My students have adequate access to up to date technology resources</td>
<td>Same</td>
<td>Question 2</td>
</tr>
<tr>
<td>7. Materials (e.g. software, printer supplies) for classroom use of computers is readily accessible</td>
<td>Same</td>
<td>Question 2</td>
</tr>
<tr>
<td>8. The integration of technology has positively impacted student learning and achievement</td>
<td>The integration of G Suite for Education has positively impacted student learning and achievement</td>
<td>Question 2</td>
</tr>
<tr>
<td>9. I am able to align technology use to my district’s standards-based curriculum</td>
<td>I am able to align the use of G Suite for Education to my district’s standards-based curriculum.</td>
<td>Question 2</td>
</tr>
<tr>
<td>10. Most of the students can capably use computers at an age-appropriate level.</td>
<td>Same</td>
<td>Question 2</td>
</tr>
<tr>
<td>11. I have received adequate training to incorporate technology into my instruction</td>
<td>I have received adequate training to incorporate G Suite for Education, specifically for collaboration, into my instruction</td>
<td>Question 2</td>
</tr>
<tr>
<td>12. My computer skills are adequate to conduct classes that have students using technology.</td>
<td>My computer skills using the collaborative tools on G Suite for Education are adequate to conduct classes that have students using technology.</td>
<td>Question 2</td>
</tr>
<tr>
<td>13. Teachers receive adequate administrative support to integrate technology into classroom practice</td>
<td>Same</td>
<td>Question 2</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>14. My teaching is more student centered when technology is integrated into classroom practices</td>
<td>My teaching is more student centered with the use of <em>G Suite for technology</em>, integrated into classroom practices.</td>
<td>Question 2 and 3</td>
</tr>
<tr>
<td>15. Our school has a well-developed technology plan that guides all technology integration efforts</td>
<td>Same</td>
<td>Question 2</td>
</tr>
<tr>
<td>16. I routinely integrate the use of technology into my instruction.</td>
<td>I routinely integrate the use of technology, *especially *G Suite for <em>Education for the purpose of collaboration</em>, into my instruction</td>
<td>Question 2 and 3</td>
</tr>
<tr>
<td>17. Teachers in this school are generally supportive of technology integration efforts</td>
<td>Teachers in this school are generally supportive of technology integration efforts, <em>especially for the use of G Suite for Education for the purpose of student collaboration</em></td>
<td>Question 2</td>
</tr>
<tr>
<td>18. Technology integration efforts have changed classroom learning activities in a positive way.</td>
<td><em>Using G Suite for Education has changed classroom learning activities in a positive way.</em></td>
<td>Question 2 and 3</td>
</tr>
<tr>
<td>Question</td>
<td>Action</td>
<td>Notes</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>-------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>19. The use of technology has improved the quality of student work</td>
<td>Same</td>
<td>Question 2</td>
</tr>
<tr>
<td>20. My teaching is more interactive when technology is integrated into the lesson.</td>
<td>Same</td>
<td>Question 2 and 3</td>
</tr>
<tr>
<td>21. Please rate your level of computer ability (Very good, good, moderate, poor, no ability)</td>
<td>Deleted--duplicate demographic question</td>
<td>Not needed</td>
</tr>
<tr>
<td>22. Do you own a home computer (Yes/No)</td>
<td>Delete</td>
<td>Not needed</td>
</tr>
</tbody>
</table>
# APPENDIX C

## TECHNOLOGY INTEGRATION SURVEY

Technology Integration Survey  
(Kopcha, 2012)

<table>
<thead>
<tr>
<th>Vision</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I was expected to use technology to support content objectives.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. There was a strong administrative backing for using technology.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. The demands/goals placed on me for using technology were reasonable.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Access</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The technology available, was, for the most part, useful in teaching.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. I received help fixing technology problems in a timely manner.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. The technology available for the most part, reliable.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Beliefs</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I believe using computers with students increases their learning.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. It is easy to design learning activities that incorporate computers.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I believe that technology makes my job as a teacher easier.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Professional Development**

<table>
<thead>
<tr>
<th>1. The training I received could be easily applied in my classroom.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. I felt adequately trained on the skills needed to use technology.</td>
</tr>
<tr>
<td>3. I had enough opportunity to share technology lessons with other teachers</td>
</tr>
</tbody>
</table>

**Time**

<table>
<thead>
<tr>
<th>1. Integrating technology took less time than I thought it would.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. I was given time to learn to integrate technology into my lessons.</td>
</tr>
<tr>
<td>3. I had enough time to plan and prepare lessons that use technology.</td>
</tr>
</tbody>
</table>
APPENDIX D

TECHNOLOGY INTEGRATION SURVEY ORIGINAL QUESTIONS, CHANGES MADE, AND ALIGNMENT TO THE RESEARCH QUESTIONS

**Items from the Technology Integration Survey (Kopcha, 2012)**

Original Survey: 5-point Likert Scale: Strongly Disagree=0, Disagree=1, Neutral=2, Agree=3, Strongly Agree=4

*This will be changed to align with the other surveys. Strongly Disagree= 1, Disagree=2, Neutral=3, Agree=4, Strongly Agree=5

<table>
<thead>
<tr>
<th>Technology Integration Survey Question</th>
<th>Question to be added, deleted, or kept the same</th>
<th>Research question alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subscale Vision: I was expected to use technology support content objectives.</td>
<td>I was expected to use technology, <em>especially G Suite for Education</em>, to support content objectives.</td>
<td>Question 2</td>
</tr>
<tr>
<td>Subscale: Vision: There was a strong administrative backing to use technology</td>
<td>There was a strong administrative backing to use technology, <em>especially G Suite for Education</em>.</td>
<td>Question 2</td>
</tr>
<tr>
<td>Subscale: Vision: The demands/goals placed on me for using technology were reasonable</td>
<td>The demands/goals placed on me for using technology, <em>especially G Suite for Education</em> were reasonable</td>
<td>Question 2</td>
</tr>
<tr>
<td>Subscale: Access: The technology available was, for the most part, useful for teaching</td>
<td>Delete (Repeated from TTQ)</td>
<td>Question 2</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>-----------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Subscale: Access: I received help fixing technology problems in a timely manner.</td>
<td>Delete (Repeated from TTQ, Question)</td>
<td>Question 2</td>
</tr>
<tr>
<td>Subscale: Access: The technology available was, for the most part, reliable.</td>
<td>Delete (Repeated from TTQ, Question)</td>
<td>Question 2</td>
</tr>
<tr>
<td>Subscale: Beliefs: I believe using computers with students increases their learning.</td>
<td>I believe using <em>G Suite for Education</em> with students increases their <em>ability to collaborate with each other</em>.</td>
<td>Question 2</td>
</tr>
<tr>
<td>Subscale: Beliefs: It is easy to design learning activities that incorporate computers.</td>
<td>It is easy to design <em>collaborative</em> learning activities that incorporate <em>G Suite for Education</em>.</td>
<td>Question 2</td>
</tr>
<tr>
<td>Subscale: Beliefs: I believe that technology makes my job as a teacher easier.</td>
<td>I believe that using the <em>collaborative tools in G Suite for Education</em> with my students makes my job as a teacher easier.</td>
<td>Question 2</td>
</tr>
<tr>
<td>Subscale: Professional Development: The training I received could be easily applied in my classroom</td>
<td>The training I received on <em>G Suite for Education</em> could be easily applied in my classroom.</td>
<td>Question 2</td>
</tr>
<tr>
<td>Subscale: Professional Development: I felt adequately trained on the skills needed to use technology.</td>
<td>I felt adequately trained on the skills needed to use <em>G Suite for Education for the purpose of student collaboration</em>.</td>
<td>Question 2</td>
</tr>
<tr>
<td>Subscale: Professional Development</td>
<td>Same</td>
<td>Question 2</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td>I had enough opportunity to share technology lessons with other teachers</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subscale: Time: Integrating Technology took less time than I thought it would.</th>
<th>Integrating G Suite for Education for the purpose of collaboration took less time than I thought it would.</th>
<th>Question 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>I was given enough time to learn how to integrate G Suite for Education for the purpose of collaboration into my lessons.</td>
<td>I was given enough time to plan and prepare lessons that use G Suite for Education for the purpose of collaboration.</td>
<td>Question 2</td>
</tr>
<tr>
<td>I had enough time to plan and prepare lessons that use technology.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subscale: Time: I was given enough time to integrate technology into my lessons.</th>
<th>I was given enough time to plan and prepare lessons that use G Suite for Education for the purpose of collaboration.</th>
<th>Question 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subscale: Time: I had enough time to plan and prepare lessons that use technology.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX E

PERCEPTIONS TOWARDS ICTS IN THE TEACHING-LEARNING PROCESS SCALE

Perceptions towards ICTs in Teaching-Learning Process Scale
Baş, Kubiatko, & Sunbul, 2016

<table>
<thead>
<tr>
<th>Items</th>
<th>Factors/Items</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attitude (ATT)</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>The use of ICTs in teaching-learning process is important.</td>
</tr>
<tr>
<td>2</td>
<td>The use of the ICTs makes teaching-learning process more interesting.</td>
</tr>
<tr>
<td>3</td>
<td>The use of ICTs in teaching-learning process is valuable.</td>
</tr>
<tr>
<td>4</td>
<td>The use of ICTs in teaching-learning process makes students more motivated.</td>
</tr>
<tr>
<td>5</td>
<td>The use of ICTs in teaching-learning process makes communication more functional.</td>
</tr>
<tr>
<td>6</td>
<td>The use of ICTs in teaching-learning process makes curriculum more functional.</td>
</tr>
<tr>
<td>7</td>
<td>Studying with teaching-learning process more enjoyable.</td>
</tr>
<tr>
<td>8</td>
<td>I reinforce my colleagues to use ICTs in teaching-learning process.</td>
</tr>
<tr>
<td>9</td>
<td>I consider the use of ICTs a suitable tool for teaching-learning process.</td>
</tr>
<tr>
<td>10</td>
<td>I am eager to participate in in-service training seminars about the use of ICTs.</td>
</tr>
<tr>
<td><strong>Usage (US)</strong></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>The use of ICTs in teaching-learning process makes save energy.</td>
</tr>
<tr>
<td>12</td>
<td>The use of ICTs in teaching-learning process makes save time.</td>
</tr>
<tr>
<td>13</td>
<td>I try to use ICTs in teaching-learning process in the classroom.</td>
</tr>
<tr>
<td>14</td>
<td>I give priority to use ICTs more than textbooks in teaching-learning process.</td>
</tr>
<tr>
<td>15</td>
<td>The use of ICTS helps me organise teaching-learning process better.</td>
</tr>
<tr>
<td>16</td>
<td>The use of ICTs helps me integrate the curriculum and teaching-learning process.</td>
</tr>
<tr>
<td>17</td>
<td>I reinforce my students to use ICTs in teaching-learning process.</td>
</tr>
<tr>
<td>18</td>
<td>The use of ICTs assist me design teaching-learning process in the classroom.</td>
</tr>
<tr>
<td></td>
<td>Statement</td>
</tr>
<tr>
<td>---</td>
<td>-----------</td>
</tr>
<tr>
<td>19</td>
<td>I try to use educational software through the use of ICTs in teaching-learning process.</td>
</tr>
<tr>
<td>20</td>
<td>I am satisfied with using ICTs in teaching-learning process in the classroom.</td>
</tr>
<tr>
<td>Belief (BEL)</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>I believe that ICTs enhance students’ learning in teaching-learning process.</td>
</tr>
<tr>
<td>22</td>
<td>ICTS present students life-like applications in teaching-learning process.</td>
</tr>
<tr>
<td>23</td>
<td>I consider ICTs as valuable tools in students’ learning in the classroom</td>
</tr>
<tr>
<td>24</td>
<td>I believe ICTs as powerful tools in students’ learning in the classroom</td>
</tr>
<tr>
<td>25</td>
<td>I think all students should use ICTs in teaching-learning process in their classrooms.</td>
</tr>
</tbody>
</table>

Note: All the items in the scale were grouped under the factors and then numbered accordingly. The scale is designed in 5-point Likert type (Totally Disagree=1; Disagree=2; Uncertain=3; Agree=4; Totally Agree=5). All the items in the scale are positive. Thus there is no item in the scale that is coded reversibly.
APPENDIX F

PERCEPTIONS TOWARDS ICTS IN THE TEACHING-LEARNING PROCESS SCALE ORIGINAL QUESTIONS, CHANGES MADE, AND ALIGNMENT TO RESEARCH QUESTIONS

<table>
<thead>
<tr>
<th>Perception Towards ICTs in the Teaching–Learning Process Scale Question</th>
<th>Question to be added, deleted, or kept the same</th>
<th>Research question alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Subscale: Attitude: The use of ICTs in teaching-learning process is important.</td>
<td>The use of ICTs in the teaching and learning process is important.</td>
<td>Question 2</td>
</tr>
<tr>
<td>2. Subscale: Attitude: The use of ICTs makes the teaching-learning process more interesting.</td>
<td>Same</td>
<td>Question 2</td>
</tr>
<tr>
<td>3. Subscale: Attitude: The use of ICTs in teaching and learning process is valuable.</td>
<td>The use of ICTs in the teaching and learning process is valuable</td>
<td>Question 2</td>
</tr>
<tr>
<td>4. Subscale: Attitude: The use of ICTs in teaching-learning process makes students more motivated.</td>
<td>The use of ICTs in the teaching-learning process makes students more motivated.</td>
<td>Question 2</td>
</tr>
<tr>
<td>5. Subscale: Attitude: The use of ICTs in teaching-learning process makes communication more functional.</td>
<td>The use of ICTs in the teaching-learning process makes communication more functional.</td>
<td>Question 2</td>
</tr>
<tr>
<td></td>
<td>Subscale: Attitude: The use of ICTs in teaching-learning process makes curriculum more functional.</td>
<td>The use of ICTs in the teaching-learning process makes curriculum more functional.</td>
</tr>
<tr>
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<tr>
<td>7.</td>
<td>Subscale: Attitude: Studying with teaching-learning process more enjoyable.</td>
<td>Studying with technology makes the teaching-learning process more enjoyable.</td>
</tr>
<tr>
<td>8.</td>
<td>Subscale: Attitude: I reinforce my colleagues to use ICTs in teaching-learning process.</td>
<td>I encourage my colleagues to use ICTs in the teaching-learning process.</td>
</tr>
<tr>
<td>9.</td>
<td>Subscale: Attitude: I consider the use of ICTs as a suitable tool for teaching-learning process.</td>
<td>I consider the use of ICTs as a suitable tool for the teaching-learning process.</td>
</tr>
<tr>
<td>10.</td>
<td>Subscale: Attitude: I am eager to participate in in-service training seminars about the use of ICTs</td>
<td>Same</td>
</tr>
<tr>
<td>12.</td>
<td>Subscale: Usage: The use of ICTs in teaching-learning process makes save time</td>
<td>Delete</td>
</tr>
<tr>
<td>14.</td>
<td>Subscale: Usage: I give priority to use ICTs more</td>
<td>Delete</td>
</tr>
<tr>
<td>Subscale</td>
<td>Usage</td>
<td>Delete</td>
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<tr>
<td>15.</td>
<td>The use of ICTs helps me organise teaching-learning process better.</td>
<td>Delete</td>
</tr>
<tr>
<td>16.</td>
<td>The use of ICTs helps me integrate the curriculum and teaching-learning process.</td>
<td>Delete</td>
</tr>
<tr>
<td>17.</td>
<td>I reinforce my students to use ICTs in teaching-learning process.</td>
<td>Delete</td>
</tr>
<tr>
<td>18.</td>
<td>The use of ICTs assists me design teaching-learning process in the classroom.</td>
<td>Delete</td>
</tr>
<tr>
<td>19.</td>
<td>I try to use educational software through the use of ICTs in teaching-learning process.</td>
<td>Delete</td>
</tr>
<tr>
<td>20.</td>
<td>I am satisfied with using ICTs in teaching-learning process in the classroom.</td>
<td>Delete</td>
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<tr>
<td>21.</td>
<td>I believe that ICTs enhance students’ learning in teaching-learning process.</td>
<td>I believe that G Suite for Education enhance students’ learning in the teaching-learning process.</td>
</tr>
<tr>
<td>22.</td>
<td>ICTs present students life-like</td>
<td>I believe that G Suite for Education present students</td>
</tr>
<tr>
<td>Question</td>
<td>Subscale: Beliefs</td>
<td>Comment</td>
</tr>
<tr>
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</tr>
<tr>
<td>23.</td>
<td>I consider ICTs as valuable tools in students’ learning in the classroom.</td>
<td>I consider <em>G Suite for Education</em> as valuable tools in students’ learning in the classroom.</td>
</tr>
<tr>
<td></td>
<td>I believe <em>G Suite for Education</em> is a powerful tools helping students’ to collaborate on work.</td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>I think all students should use ICTs in teaching-learning process in their classrooms.</td>
<td>I think all students should use <em>G Suite for Education</em> in teaching-learning process in their classrooms.</td>
</tr>
</tbody>
</table>

APPENDIX G

LESSON PLAN CHECKLIST

Teacher Name (Pseudonym): ____________________________________

Plans for the month of _________________________________________

<table>
<thead>
<tr>
<th>Subject Area with Integrated Technology</th>
<th>Type of Technology</th>
<th>List the name of the G—Suite Tool? (if applicable)</th>
<th>Used for Collaboration? (Yes or No)</th>
<th>Describe how the G Suite is used for collaboration?</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

Comments:
APPENDIX H

TEACHER PERCEPTION SURVEY

First page of survey:

Thank you for agreeing to complete the survey entitled Teacher Perception Survey. Please complete each answer as honestly as possible. This survey is part of the dissertation research study entitled: Factors to Integrate Technology for Student Collaboration in the Elementary School: An Action Research Study. The survey should take approximately 15 minutes to complete.

As stated in the invitation letter, if you feel uncomfortable answering any of the questions, you do not need to answer. You may skip that question. Nothing in this study will be used for evaluative purposes. Your participation is confidential. Your identity will not be revealed. Your name is collected only should you need to be included as part of the interview, observation, and lesson plan portion of the study.

To continue on to complete the survey, please click here.

Name: _______________________________ Gender: ____________

Ethnicity: __White (Non-Hispanic) ___ White (Hispanic) ____African American ____Other

Years of teaching experience: _______________

Have you had technology integration training ___Yes ____No

Have you had Google training: ____Yes _____No

How many hours of Google training have you had: ___none ___ 1 to 6 ____7-12 ____more than 13 hours

Do you hold any technology certifications? _______Yes _______No

List any technology certifications you have ______________

How would you rate your skills integrating technology in your classroom on a scale from 1 to 5 with 1 being novice and 5 being expert: ___1 ___2 ___3 ___4 ___5

How many students do you teach ?_______________
What is your average class size? ___________________

Please complete the remaining questions of the survey.

Section 2:

Survey Questions Adapted from the Teacher Technology Questionnaire (Lowther & Ross, 2000)

**Directions:** Please answer each question based on the 5-point Likert Scale. The Likert Scale is as follows: Strongly Disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly Agree=5. These questions are applicable to the current gapped hybrid learning environment that we have been in since September 2020

1. Most of the school computers are kept in good working condition
   - 1=Strongly Disagree
   - 2= Disagree
   - 3=Neutral
   - 4= Agree
   - 5=Strongly Agree

2. I can readily obtain answers to technology related questions.
   - 1=Strongly Disagree
   - 2= Disagree
   - 3=Neutral
   - 4= Agree
   - 5=Strongly Agree
3. The use of *G Suite for Education* has increased the level of student interaction/collaboration.

   - 1=Strongly Disagree
   - 2= Disagree
   - 3=Neutral
   - 4= Agree
   - 5=Strongly Agree

4. Parents and community members support our school’s emphasis on technology.

   - 1=Strongly Disagree
   - 2= Disagree
   - 3=Neutral
   - 4= Agree
   - 5=Strongly Agree

5. I know how to meaningfully integrate technology into lessons.

   - 1=Strongly Disagree
   - 2= Disagree
   - 3=Neutral
   - 4= Agree
   - 5=Strongly Agree
6. My students have adequate access to up to date technology resources.

   ○ 1=Strongly Disagree
   ○ 2= Disagree
   ○ 3=Neutral
   ○ 4= Agree
   ○ 5=Strongly Agree

7. Materials (e.g. software, printer supplies) for classroom use of computers is readily accessible.

   ○ 1=Strongly Disagree
   ○ 2= Disagree
   ○ 3=Neutral
   ○ 4= Agree
   ○ 5=Strongly Agree

8. The integration of G Suite for Education has positively impacted student learning and achievement.

   ○ 1=Strongly Disagree
   ○ 2= Disagree
   ○ 3=Neutral
   ○ 4= Agree
   ○ 5=Strongly Agree
9. I am able to align the use of *G Suite for Education* to the district’s standards-based curriculum.
   
   - 1=Strongly Disagree
   - 2= Disagree
   - 3=Neutral
   - 4= Agree
   - 5=Strongly Agree

10. Most of the students can capably use computers.

   - 1=Strongly Disagree
   - 2= Disagree
   - 3=Neutral
   - 4= Agree
   - 5=Strongly Agree

11. I have received adequate training to incorporate *G Suite for Education, specifically for collaboration*, into my instruction

   - 1=Strongly Disagree
   - 2= Disagree
   - 3=Neutral
   - 4= Agree
   - 5=Strongly Agree
12. My computer skills using the collaborative tools on G Suite for Education are adequate to conduct classes that have students using technology.

- 1=Strongly Disagree
- 2= Disagree
- 3=Neutral
- 4= Agree
- 5=Strongly Agree

13. Teachers receive adequate administrative support to integrate technology into classroom practice.

- 1=Strongly Disagree
- 2= Disagree
- 3=Neutral
- 4= Agree
- 5=Strongly Agree

14. My teaching is more student centered with the use of G Suite for technology, integrated into classroom practices.

- 1=Strongly Disagree
- 2= Disagree
- 3=Neutral
- 4= Agree
- 5=Strongly Agree
15. Our school has a well-developed technology plan that guides all technology integration efforts.

○ 1=Strongly Disagree

○ 2= Disagree

○ 3=Neutral

○ 4= Agree

○ 5=Strongly Agree

16. I routinely integrate the use of technology, especially G Suite for Education for the purpose of collaboration, into my instruction.

○ 1=Strongly Disagree

○ 2= Disagree

○ 3=Neutral

○ 4= Agree

○ 5=Strongly Agree
17. Teachers in this school are generally supportive of technology integration efforts, especially for the use of G Suite for Education for the purpose of student collaboration.

   ○ 1=Strongly Disagree
   ○ 2= Disagree
   ○ 3=Neutral
   ○ 4= Agree
   ○ 5=Strongly Agree

18. Using G Suite for Education has changed classroom learning activities in a positive way.

   ○ 1=Strongly Disagree
   ○ 2= Disagree
   ○ 3=Neutral
   ○ 4= Agree
   ○ 5=Strongly Agree

19. The use of technology has improved the quality of student work.

   ○ 1=Strongly Disagree
   ○ 2= Disagree
   ○ 3=Neutral
   ○ 4= Agree
   ○ 5=Strongly Agree
20. My teaching is more interactive when technology is integrated into the lesson.

   □ 1=Strongly Disagree

   □ 2= Disagree

   □ 3=Neutral

   □ 4= Agree

   □ 5=Strongly Agree

Section 3:

Survey Questions Adapted from the Technology Integration Survey (Kopcha, 2012).

Directions: Please answer each question based on the 5-point Likert Scale. The Likert Scale is as follows: Strongly Disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly Agree=5. These questions are applicable to the current gapped hybrid learning environment that we have been in since September 2020

21. I was expected to use technology, especially G Suite for Education, to support content objectives.

   □ 1=Strongly Disagree

   □ 2= Disagree

   □ 3=Neutral

   □ 4= Agree

   □ 5=Strongly Agree
22. There was a strong administrative backing to use technology, especially *G Suite for Education*.

   ○ 1 = Strongly Disagree
   ○ 2 = Disagree
   ○ 3 = Neutral
   ○ 4 = Agree
   ○ 5 = Strongly Agree

23. The demands/goals placed on me for using technology, especially *G Suite for Education* were reasonable.

   ○ 1 = Strongly Disagree
   ○ 2 = Disagree
   ○ 3 = Neutral
   ○ 4 = Agree
   ○ 5 = Strongly Agree

24. I believe using *G Suite for Education with students* increases their ability to collaborate with each other.

   ○ 1 = Strongly Disagree
   ○ 2 = Disagree
   ○ 3 = Neutral
   ○ 4 = Agree
   ○ 5 = Strongly Agree
25. It is easy to design *collaborative* learning activities that incorporate *G Suite for Education*.

1=Strongly Disagree

2= Disagree

3=Neutral

4= Agree

5=Strongly Agree

26. I believe that using the *collaborative tools in G Suite for Education with my students* makes my job as a teacher easier.

1=Strongly Disagree

2= Disagree

3=Neutral

4= Agree

5=Strongly Agree

27. The training I received on *G Suite for Education* could be easily applied in my classroom.

1=Strongly Disagree

2= Disagree

3=Neutral

4= Agree

5=Strongly Agree
28. I felt adequately trained on the skills needed to use *G Suite for Education for the purpose of student collaboration*.

   ○ 1 = Strongly Disagree

   ○ 2 = Disagree

   ○ 3 = Neutral

   ○ 4 = Agree

   ○ 5 = Strongly Agree

29. I had enough opportunity to share technology lessons with other teachers.

   ○ 1 = Strongly Disagree

   ○ 2 = Disagree

   ○ 3 = Neutral

   ○ 4 = Agree

   ○ 5 = Strongly Agree

30. *Integrating G Suite for Education for the purpose of collaboration* took less time than I thought it would.

   ○ 1 = Strongly Disagree

   ○ 2 = Disagree

   ○ 3 = Neutral

   ○ 4 = Agree

   ○ 5 = Strongly Agree
31. I was given enough time to learn how to integrate G Suite for Education for the purpose of collaboration into my lessons.

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Neutral
- 4 = Agree
- 5 = Strongly Agree

32. I had enough time to plan and prepare lessons that use G Suite for Education for the purpose of collaboration.

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Neutral
- 4 = Agree
- 5 = Strongly Agree

Section 4:

Survey Questions Adapted from the Perceptions Towards ICTs in the Teaching-Learning Process Scale (Baş, Kubiatko, & Sunbul, 2016).

Directions: Please answer each question based on the 5-point Likert Scale. The Likert Scale is as follows: Strongly Disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly Agree=5. These questions are applicable to the current gapped hybrid learning environment that we have been in since September 2020.

Key: Information Communication Technology (ICTs)
33. The use of ICTs in *the* teaching *and* learning process is important.

- 1=Strongly Disagree
- 2= Disagree
- 3=Neutral
- 4= Agree
- 5=Strongly Agree

34. The use of ICTs makes the teaching-learning process more interesting.

- 1=Strongly Disagree
- 2= Disagree
- 3=Neutral
- 4= Agree
- 5=Strongly Agree

35. The use of ICTs in *the* teaching and learning process is valuable.

- 1=Strongly Disagree
- 2= Disagree
- 3=Neutral
- 4= Agree
- 5=Strongly Agree
36. The use of ICTs in *the* teaching-learning process makes students more motivated.

   1=Strongly Disagree

   2= Disagree

   3=Neutral

   4= Agree

   5=Strongly Agree

37. The use of ICTs in *the* teaching-learning process makes communication more functional.

   1=Strongly Disagree

   2= Disagree

   3=Neutral

   4= Agree

   5=Strongly Agree

38. The use of ICTs in *the* teaching-learning process makes curriculum more functional.

   1=Strongly Disagree

   2= Disagree

   3=Neutral

   4= Agree

   5=Strongly Agree
39. Studying with *technology makes the* teaching-learning process more enjoyable.

- 1=Strongly Disagree
- 2= Disagree
- 3=Neutral
- 4= Agree
- 5=Strongly Agree

40. I *encourage* my colleagues to use ICTs in *the* teaching-learning process.

- 1=Strongly Disagree
- 2= Disagree
- 3=Neutral
- 4= Agree
- 5=Strongly Agree

41. I consider the use of ICTs as a suitable tool for *the* teaching-learning process.

- 1=Strongly Disagree
- 2= Disagree
- 3=Neutral
- 4= Agree
- 5=Strongly Agree
42. I am eager to participate in in-service training seminars about the use of ICTs.

1=Strongly Disagree

2= Disagree

3=Neutral

4= Agree

5=Strongly Agree

43. I believe that *G Suite for Education* enhance students’ learning in *the* teaching-learning process.

1=Strongly Disagree

2= Disagree

3=Neutral

4= Agree

5=Strongly Agree

44. *I believe that G Suite for Education* present students life-like applications in *the* teaching-learning process.

1=Strongly Disagree

2= Disagree

3=Neutral

4= Agree

5=Strongly Agree
45. I consider *G Suite for Education* as valuable tools in students’ learning in the classroom.

○ 1=Strongly Disagree

○ 2= Disagree

○ 3=Neutral

○ 4= Agree

○ 5=Strongly Agree

46. I believe *G Suite for Education* is a powerful tools helping students’ to collaborate on work.

○ 1=Strongly Disagree

○ 2= Disagree

○ 3=Neutral

○ 4= Agree

○ 5=Strongly Agree

47. I think all students should use *G Suite for Education* in teaching-learning process in their classrooms.

○ 1=Strongly Disagree

○ 2= Disagree

○ 3=Neutral

○ 4= Agree

○ 5=Strongly Agree
Section 4: Open-Ended Questions: Please answer the open-ended questions to help me gain an additional understanding of how G Suite for Education supports student collaboration.

1. What do you perceive as the barriers to integrate G Suite for Education for the purpose of student collaboration in a gapped-hybrid learning environment? (Roomers and Zoomers). List all that apply.
2. What do you perceive as the number one barrier to student collaboration using G Suite for Education during this gapped hybrid learning environment?
3. Why is the (answer to the previous question) the number one barrier to student collaboration in a gapped hybrid learning environment?
4. What are your perceptions regarding the integration of G Suite for Education for purpose of student collaboration in a gapped hybrid learning environment?
5. Thank you for your participation in completing this survey. If you are interested in participating in an additional survey, please click the link below and complete the attached form to include identifying information. The identifying information will not be tied back to your survey.
https://forms.gle/vJswitMmyRmPRz7J6
APPENDIX I

INTERVIEW QUESTIONS AND PROTOCOL

Hello, thank you for taking the time to speak with me today. As you are aware, I am conducting research for my doctoral dissertation regarding technology integration for the purpose of student collaboration in a gapped hybrid learning environment. The purpose of this action research is to investigate how elementary teachers used Google Workspace for Education Fundamentals for student collaboration during the COVID-19 pandemic. The goal was to make recommendations for technology integration in Grades 3 through 5 in a school in central New Jersey.

During this interview, I am looking at how and to what extent you use G Suite for Education for student collaboration, the perceived barriers that affect your ability to integrate technology for the purpose of student collaboration and your beliefs about the integration of G Suite for Education for the purpose of student collaboration.

Please answer each question as honestly. Your answers will remain confidential as you will be assigned a pseudonym in my data collection and in the reporting. This is to protect your identity and answers. Also, please know that nothing in this interview is used for evaluative purposes. Your answers, connected to you, will not be shared with anyone else. They will be part of the research report with your pseudonym. Do you understand how you will be protected in this study? (wait for answer). I will be taking notes on my interview sheet as we are conducting this interview. These are my notes only to help me with the research. Also, I am going to audio record the answers that you provide. The
answers are recorded only for accuracy’s sake. The recordings will be saved on a secure server through the University of South Carolina. They will be deleted off my phone after saving it to the server. Do I have your permission to turn on the recorder now? (wait for answer). Start the recorder (using iPhone voice recording).

Do I have your consent to continue with the research questions? (Wait for answer)

Thank you again for agreeing to participate in my study. If, at any time during this interview, you do not want to continue to complete the interview, please ask me to stop the interview. You do not need to answer anything further.

We are with ______ (state pseudonym) today. It is (provide date and time), and we are located at the ______ School. ________ (a pseudonym) has agreed to answer questions regarding his/her technology integration practices using G Suite for Education in the classroom for the purpose of student collaboration. We are currently using a gapped hybrid model for instruction based on the restrictions due the COVID-19 Pandemic.

a. What grade and subject do you teach?

b. How long have you been teaching?

c. How long have you been teaching this grade and subject?

d. What technology do you use in your (grade/subject) classroom?

e. Please explain how you use the different forms of technology to teach your (grade/subject) students in the gapped hybrid learning environment.

f. What Google Suite for Education tools do your students use regularly in a gapped hybrid learning environment?
g. (Ertmer) How frequently are you able to implement Google Suite for Education for student use in your own classroom? Can you provide an example or two of how your students used this technology tool?

h. (Storz and Hoffman) Do you think that Google Suite for Education impacts student learning? Explain your thinking?

i. (Storz and Hoffman) Has the use of Google Suite for Education affected the way that you teach in a gapped hybrid learning environment? Explain?

j. (Ertmer) Ideally, how should technology, including Google Suite for Education be used in the (insert grade/subject) classroom?

k. (Ertmer) Have there been situations when you were unable to, or it was difficult to implement technology or Google Suite for Education in the classroom? Please describe the reasons for the difficulty and how you overcame them.
   a. If the teacher explains only one variable, ask is there another situation that you could describe?
   b. If the teacher provides limited ways to overcome the difficulty, ask for more expansion.

l. (Storz and Hoffman) How well do you think the district prepared you and the students for the integration of Chromebooks and G Suite for Education for the purpose of collaboration?

m. Do you believe student collaboration is important in the classroom? Please explain why you feel that way.

n. Do you use G Suite for student collaboration in your classroom in the gapped hybrid learning environment?
a. Specifically in what subject areas, and for what purpose, what tools they use?

b. What benefits do you see to student learning when adding a collaborative piece to your lessons?

o. How did your experience with remote learning during the spring of 2020 impact your use of G Suite for Education in the classroom today in the gapped hybrid learning environment?

p. Do you use G Suite for Education for student collaboration more now in the gapped hybrid learning environment than you did before due to the restrictions due to COVID-19? If yes, please explain how.

q. What are the benefits of student collaboration in a gapped hybrid model?

r. What are the pitfalls of student collaboration in a gapped hybrid model?

s. Please rank the barriers in using technology in your classroom for the purpose of student collaboration while using a gapped hybrid model due to the COVID-19 restrictions. Please rank one being the most limiting barrier to 13 the least of a barrier. (At this point provide the teacher with the Google Doc listing all the barriers for them to rank):

   a. Time to implement,

   b. student behavior,

   c. classroom assessments to be conducted,

   d. unsure of how to use the technology,

   e. unsure of how to design the lesson,

   f. students do not work together well on a task,
g. the need to have enough grades for the report card,

h. technology not working correctly,

i. Time to plan lessons,

j. Technology makes teaching the content more difficult,

k. My beliefs for teaching the content,

l. The content does not lend itself to collaboration and the use of technology,

m. Administrative beliefs of the use of technology.

Do you have any questions about these barriers or need clarification on what they mean?

t. Why did you find the __________ barrier to be most limiting on your use of technology for the purpose of student collaboration?

u. Why did you find the __________ barrier to be least limiting on your use of technology for the purpose of student collaboration?

v. Do you have any questions?

Thank you for your participation in this study. Your answers are valuable to understand the current ways that teachers in this school integrate technology, barriers to technology integration, and your perceptions relating to the use of technology in a gapped hybrid learning environment. Once your answers are transcribed, I will share the interview responses with you. You will be able to provide me with any feedback on the answers and confirm that your answers are accurate.
APPENDIX J

BOARD APPROVAL TO CONDUCT STUDY

17. ADMINISTRATIVE/CERTIFIED STAFF
   a. Approved Lisa Goldey, Superintendent, to conduct dissertation research regarding technology integration at the School during Fall 2020. (Attachment “B”)

   Moved by Ms. Watson, seconded by Ms. Jennings
   Abstain: Mr. Livingood, Mr. Lomangino
   Vote: All in favor. Motion carried
APPENDIX K

INSTITUTIONAL REVIEW BOARD APPROVAL LETTER

UNIVERSITY OF SOUTH CAROLINA

OFFICE OF RESEARCH COMPLIANCE

INSTITUTIONAL REVIEW BOARD FOR HUMAN RESEARCH
EXEMPT AMENDMENT APPROVAL LETTER

Lisa Goldey

Re: Am27_Pro00100586

Dear Mrs. Lisa Goldey:

This is to certify that the Amendment requested on 10/31/2020 for research study Factors to Integrate Technology for Student Collaboration in the Elementary School: An Action Research Study was reviewed and approved by the University of South Carolina Institutional Review Board (USC IRB) on 11/9/2020.

The requested revision does not change the current Exempt status; therefore, further IRB oversight is not required unless additional changes are required. Because changes could result in a reclassification of the study, you must inform the IRB of any changes in procedures involving humans.

All research related records, including informed Consent document(s), if applicable, are to be retained for at least three (3) years after termination of the study.

The Office of Research Compliance is an administrative office that supports the University of South Carolina Institutional Review Board (USC IRB). If you have questions, contact Lisa Johnson at lisaj@mailbox.sc.edu or (803) 777-5670.

Sincerely,

Lisa M. Johnson
ORC Assistant Director and IRB Manager
APPENDIX L

INVITATION LETTER FOR EXEMPT RESEARCH

Dear Teachers,

My name is Lisa Goldey I am a doctoral candidate in the Curriculum and Instruction: Emphasis in Educational Technology program in the College of Education at the University of South Carolina. I am conducting a research study as part of the requirements of my degree and I would like to invite you to participate.

The purpose of this action research is to investigate how elementary teachers use G Suite for Education for student collaboration during the COVID-19 pandemic in a gapped hybrid learning environment. The goal is to make recommendations for technology integration in Grades 3 through 5 in a school in central New Jersey.

If you decide to participate, you will be asked to complete a survey in the first phase of the research. You may be asked to complete an interview in the second phase of the research, if you volunteer to participate. The questions within the survey and the interview are based on technology integration using G Suite, the perception of barriers to integrate G Suite for Education for the purpose of collaboration, and your perceptions about the integration of G Suite for Education for the purpose of student collaboration. If you participate in the second phase of the research you will be asked to have a month of your lesson plans reviewed. The setting of this research is all within the gapped hybrid model (A/B student cohorts attending in person school two days a week, and remotely three days a week).

The survey should take approximately fifteen minutes to complete. If you are selected for the second phase, the interview will take place at a mutually agreed upon time and place and should last about 20 minutes. The interview will be audiotaped so that I can accurately transcribe what is discussed. The recording will only be reviewed by me and will be destroyed upon completion of the study.

For the lesson plan review, you will submit a month’s worth of plans. Nothing in this study will be used for evaluative purposes.

Participation is confidential. Study information will be kept on a secure server at the University of South Carolina. The results of the study may be published or presented at professional meetings, but your identity will not be revealed. In the report a pseudonym will be used to keep your identity confidential.
I will be happy to answer any questions you have about the study. You may contact me at 732-547-0198 or at lisagoldey@gmail.com or Dr. Arslan-Ari, my faculty advisor, at arslanai@mailbox.sc.edu.

Thank you for your consideration. If you would like to participate, please complete the survey at the link provided. Upon completion of the survey, you will have the option to add your name to a google form to participate in the second phase. This will also keep your answers confidential. When you are done, please submit the survey. Thank you for agreeing to participate in my study.

With kind regards,

Lisa Goldey

Lisagoldey@gmail.com
APPENDIX M

CONSENT FORM

CONSENT TO BE A RESEARCH SUBJECT

UNIVERSITY OF SOUTH CAROLINA

CONSENT TO BE A RESEARCH SUBJECT

Factors to Integrate Technology for Student Collaboration in the Elementary School:

An Action Research Study

KEY INFORMATION ABOUT THIS RESEARCH STUDY:

You are invited to volunteer for a research study conducted by Lisa R. Goldey. I am a doctoral candidate in the Curriculum and Instruction program at the University of South Carolina. The University of South Carolina, Department of Educational Practice and Innovation, is sponsoring this research study. The purpose of this study is to investigate how teachers use Google Suite for Education (G Suite for Education) for student collaboration during the COVID-19 pandemic to make recommendations for technology integration. You are being asked to participate in this study because you are teacher in the _______ School, currently teaching during the COVID-19 Pandemic. This study is being done at _______ School and will involve approximately 25 volunteers.

The following is a short summary of this study to help you decide whether to be a part of this study. More detailed information is listed later in this form.

This study will focus on three overarching research questions. The first question will answer how do elementary teachers at a school in central New Jersey integrate technology using G Suite for Education for student collaboration into their daily lessons in a gapped hybrid learning environment? The second question will explore how elementary teachers perceive first and second-order barriers to integrate G Suite for the Education for the purpose of student collaboration in a gapped hybrid learning environment. The third question will address elementary teachers’ perceptions about the integration of G Suite for Education for the purpose of student collaboration in their classroom lessons in a gapped hybrid learning environment.

The study will use the convergent parallel mixed methods design (Creswell, 2014). Data will be collected from 20-25 participants on a survey regarding technology integration and G Suite for Education, first and second-order barriers, and teachers’ perceptions on
the use of G Suite for Education for the purpose of student collaboration. The survey data will be analyzed through quantitative analysis using descriptive statistics. Additional data will be collected from eight participants who completed the survey. A review of a month of lesson plans will be used as quantitative data showing the frequency of use of technology and the use of G Suite for Education for the purpose of collaboration. Qualitative data will be collected through interview questions. This data will be analyzed through inductive analysis. The results of both types of data will be informally compared to see if they have yielded similar results.

This survey should take approximately 15 minutes to complete. Your name is not included on this study. Some demographic information will be collected for research purposes but should not tie back to you directly.

There are no risks in completing the survey. You will have the opportunity to complete the survey at a convenient time during the collection window. The benefit of this study will help us to uncover barriers to technology integration to create a technology action plan for the district.

PROCEDURES:

If you agree to participate in this study, you will do the following:


2. Have an opportunity to participate in the second phase of the research study which includes an interview and a review of lesson plans looking specifically at the integration of technology for the purpose of student collaboration.

DURATION:
Participation in the study involves a 15-minute survey and the potential to complete a 30 minute interview should you wish to participate further.

BENEFITS:
As a teacher in the _____ School District, at the _____ School, this study may benefit you directly as we move forward in making decisions about technology integration.

COSTS:
There will be no costs to you for participating in this study.

PAYMENT TO PARTICIPANTS:
You will not be paid for participating in this study.

PARTICIPATION:
Participation in this study is voluntary. You are free not to participate, or to stop participating at any time, for any reason without negative consequences. Your participation, non-participation, and/or withdrawal will not affect you.
CONFIDENTIALITY OF RECORDS:
Information obtained about you during this research study will remain confidential. Study information will be securely stored on password-protected cloud server at the University of South Carolina. Results of this research study may be published or presented at seminars; however, the report(s) or presentation(s) will not include your name or other identifying information about you.

VOLUNTARY PARTICIPATION:
Participation in this research study is voluntary. You are free not to participate, or to stop participating at any time, for any reason without negative consequences. In the event that you do withdraw from this study, the information you have already provided will be kept in a confidential manner.

I have been given a chance to ask questions about this research study. These questions have been answered to my satisfaction. If I have any more questions about my participation in this study, or a study related injury, I am to contact Lisa Goldey at 732-____-____ or email lisagoldey@gmail.com.

Concerns about your rights as a research subject are to be directed to, Lisa Johnson, Assistant Director, Office of Research Compliance, University of South Carolina, 1600 Hampton Street, Suite 414D, Columbia, SC 29208, phone: (803) 777-6670 or email: LisaJ@mailbox.sc.edu.

I agree to participate in this study. I have been given a copy of this form for my own records.

If you wish to proceed, please check the box below.

☐ I agree to participate in this study.
APPENDIX N

ALL IN VIVO AND DESCRIPTIVE FIRST ROUND CODES AND SUBCODES

<table>
<thead>
<tr>
<th>First Round Codes</th>
<th>In Vivo and Descriptive Subcodes</th>
</tr>
</thead>
</table>
| Benefit of collaboration for socialization | • Google and socialization  
• Zoom and collaboration  
• Zoom/Google Hangout to talk to each other |
| Benefit of collaboration for student learning | • 21st-century skills and Google collaboration and math  
• collaboration and balance of student work |
| Challenges of using G Suite for collaboration in the hybrid environment based on perceptions | • Collaborative assignment  
• Collaboration requires communication  
• Difficulty with communication |
| Classroom management | • Anxiety  
• Lack of hands-on guidance at home  
• Management  
• Management of multiple devices  
• Multi-tasking nightmare  
• On task  
• Single teacher classroom  
• Social distance  
• Restrictions needed with collaboration  
• Work completion |
| Evolution of teaching from spring 2020 to fall 2020 | • Spring 2020 into fall 2020 is an evolution  
• Google Use Frequency  
• Google use in Hybrid environment |
| Google use in hybrid | • Cannot see students while we are working with them  
• Classroom management  
• Collaboration in hybrid setting  
• Collaboration problem in hybrid |
<p>| Hybrid setting problems |</p>
<table>
<thead>
<tr>
<th>Instructional items</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Do not know our students as well in hybrid</td>
</tr>
<tr>
<td>• Pitfalls of collaboration</td>
</tr>
<tr>
<td>• Preparation for Hybrid</td>
</tr>
<tr>
<td>• Restriction of hybrid environment</td>
</tr>
<tr>
<td>• Roomers and zoomers management</td>
</tr>
<tr>
<td>• Rules due to pandemic</td>
</tr>
<tr>
<td>• Social distancing</td>
</tr>
<tr>
<td>• Teacher need more technology</td>
</tr>
<tr>
<td>• Two devices to demonstrate</td>
</tr>
<tr>
<td>• Unable to monitor student computer</td>
</tr>
<tr>
<td>• Academic Deficits</td>
</tr>
<tr>
<td>• Grouping student issue</td>
</tr>
<tr>
<td>• G Suite allow present lesson and check for understanding</td>
</tr>
<tr>
<td>• Lack of verbal communication</td>
</tr>
<tr>
<td>• Not everything taught with G Suite</td>
</tr>
<tr>
<td>• One student should not carry the group</td>
</tr>
<tr>
<td>• Pacing issues because need to move slower</td>
</tr>
<tr>
<td>• Require repetition to feel comfortable</td>
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<tr>
<td>• Special education needs</td>
</tr>
<tr>
<td>• Student feedback</td>
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<tr>
<td>• Teacher guidance</td>
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<tr>
<td>• Visual Reference Needed</td>
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<thead>
<tr>
<th>Lack of student feedback using technology</th>
<th>Least limiting barrier</th>
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<tbody>
<tr>
<td>• Not everything taught with G Suite</td>
<td>• Access not a problem</td>
</tr>
<tr>
<td>• Student Feedback</td>
<td>• Beliefs least limiting barrier</td>
</tr>
<tr>
<td></td>
<td>• Content does not lend itself to collaboration least limiting barrier</td>
</tr>
<tr>
<td></td>
<td>• Content not lining up with technology least limiting</td>
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<tr>
<td></td>
<td>• Need enough grades for the report card least limiting</td>
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<td></td>
<td>• Students do not work well together least limiting</td>
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<td></td>
<td>• Subject matter</td>
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<td></td>
<td>• Technology makes teaching the content more difficult least limiting barrier</td>
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<td></td>
<td>• Unsure how to use the technology least limiting barrier</td>
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<table>
<thead>
<tr>
<th>Most Limiting Barrier</th>
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<tbody>
<tr>
<td>• Time</td>
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<tr>
<td>• Technology not working correctly</td>
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</tbody>
</table>
Other technology used in the classroom

- Training needs
- Additional type of technology in the classroom
- Other technology to meet the levels
- Technology students use
- Zoom

Pedagogy related to technology integration in a hybrid environment

- Benefit of co-teacher for collaboration in hybrid setting
- Benefits of technology uses for teachers
- Co-teacher for small group work
- Google Slide as visual in a hybrid setting
- Immediate Feedback
- Individual assignment and Google
- Instructional pacing
- Life is easier with Google
- Parent leading lesson
- Positive impact of Google
- Small group instruction in the hybrid environment
- Students need technology
- Students show teachers how to use technology
- Teacher use of Google
- Teacher use of technology
- Teaching and learning
- Technology for small groups
- Use of breakout rooms
- Use of collaboration
- Collaboration challenging in hybrid environment
- Google Docs/Slides
- G Suite benefits
- G Suite for collaboration and communication
- G Suite functional
- G Suite good for student collaboration
- G Suite important
- G Suite necessary
- G Suite potential
- Shared documents for collaboration
- Working on additional ways for collaboration using G Suite

Perceptions of using G Suite for collaboration
<table>
<thead>
<tr>
<th>Student focus issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Accountability for students at home</td>
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<tr>
<td>• Age of students</td>
</tr>
<tr>
<td>• Don’t know if technology is working with younger children</td>
</tr>
<tr>
<td>• Engagement</td>
</tr>
<tr>
<td>• Engagement and collaboration</td>
</tr>
<tr>
<td>• Engagement and Google</td>
</tr>
<tr>
<td>• Home learning environment problems</td>
</tr>
<tr>
<td>• Lack of face-to-face time</td>
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<tr>
<td>• Not actual learning time</td>
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<tr>
<td>• One-to-one</td>
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<tr>
<td>• Student focus issues</td>
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<tr>
<td>• Students fooling around</td>
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<tr>
<td>• Students can check out</td>
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<tr>
<td>• Students easily get off topic</td>
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<tr>
<td>• Student motivation in hybrid environment</td>
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<tr>
<td>• Students not showing up</td>
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<tr>
<td>Student hybrid environment</td>
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<tr>
<td>• G Suite does not replace the need for face to face</td>
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<tr>
<td>• Parents unable to participate</td>
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<tr>
<td>• Unease of speaking with peers</td>
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<tr>
<td>Student lacking technology skills</td>
</tr>
<tr>
<td>• Computer literacy for students</td>
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<tr>
<td>• Guide student through new technology feature</td>
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<tr>
<td>• Lack of students foundational skills for technology</td>
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<tr>
<td>• Lack of typing skills</td>
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<tr>
<td>• Student instruction needed on Google</td>
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<tr>
<td>• Student knowledge of Google</td>
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<tr>
<td>• Student learning deficits</td>
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<tr>
<td>• Students how to use computer</td>
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<tr>
<td>• Students how to use Google</td>
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<tr>
<td>• Typing as a pitfall for students</td>
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<tr>
<td>• User error for pitfalls</td>
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<tr>
<td>Teacher beliefs of Google</td>
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<tr>
<td>• Negative impact of Google</td>
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<tr>
<td>• Students are digital learners</td>
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<tr>
<td>Teacher beliefs regarding collaboration</td>
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<tr>
<td>• Belief of student collaboration</td>
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<td>• Belief vs. actual implementation collaboration</td>
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<tr>
<td>• Google beliefs</td>
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<tr>
<td>Teacher Growth</td>
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<tr>
<td>• Alter plan on the fly</td>
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<tr>
<td>• G Suite and teacher effectiveness</td>
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<td>• Teacher change</td>
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<td>Teacher Training</td>
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<td>---------------------------------------------------------------------------------</td>
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<tr>
<td>• Teacher problem solving in hybrid environment</td>
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<tr>
<td>• Technology has enhanced our profession</td>
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<tr>
<td>• Building the plane as we are flying it</td>
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<tr>
<td>• Google Training</td>
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<tr>
<td>• Not enough training</td>
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<td>• Teacher learning about Google</td>
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<td>• Teacher located resources</td>
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<tr>
<td>• Teacher support</td>
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<tr>
<td>• Teachers helping teachers with technology</td>
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<tr>
<td>• Training</td>
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<tr>
<td>• Training most limiting barrier</td>
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<tr>
<td>• Trial-and-error process takes more time</td>
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<tr>
<td>• Up for the challenge and made it work</td>
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<tr>
<td>• Use of social media for own professional development</td>
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<tr>
<td>• We did a lot on our own</td>
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<tr>
<td>• Yet to figure out how students to work collaboratively on Google</td>
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<td>• YouTube for PD for teachers</td>
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<thead>
<tr>
<th>Teaching in Spring 2020</th>
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<td>• Spring 2020</td>
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<tr>
<th>Teaching in the Hybrid Setting during Fall 2020</th>
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<tr>
<td>• Fall 2020</td>
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<tr>
<th>Technology Problems</th>
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<tbody>
<tr>
<td>• Chromebook running out of charge</td>
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<tr>
<td>• Google freezing</td>
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<td>• Hardware</td>
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<td>• Inconsistent Wi-Fi</td>
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<tr>
<td>• Technical difficulties</td>
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<td>• Technology is inconsistent</td>
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<td>• Technology not working correctly limiting barrier</td>
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<td>• Technology problems</td>
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<tr>
<td>• Wi-Fi</td>
<td>Wi-Fi Issues</td>
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<tr>
<th>Time</th>
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<td>• Not enough time</td>
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<td>• Time</td>
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<tr>
<td>• Time most limiting barrier</td>
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<table>
<thead>
<tr>
<th>Use of Google Suite for Education for Student Learning</th>
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<tbody>
<tr>
<td>• Frequency of Google Suite for Education</td>
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<tr>
<td>• Gmail proficiency</td>
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<tr>
<td>• Google and collaboration</td>
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<td>• Google and creativity</td>
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</tbody>
</table>
- Google and learning
- Google and small group
- Google Classroom
- Google Classroom personalized assignments
- Google Docs
- Google Forms
- Google Meet small group
- Google Slides for assignments
- Google use
- Reading and Google