Exploring Educational Technology in the Classroom: An Analysis of Middle School Teachers' Technological Knowledge, Integration and Pedagogical Approaches

by

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DISSERTATION ABSTRACT

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Title: Exploring Educational Technology in the Classroom: An Analysis of Middle School Teachers' Technological Knowledge, Integration and Pedagogical Approaches

The rapid expansion of educational technology following the COVID-19 pandemic has left many school districts seeking to understand how digital tools are being utilized in classrooms to support student learning. This qualitative study investigates middle school teachers' experiences with technology integration in a post-pandemic context. Using survey data from thirty-one teachers across various content areas and levels of experience, the study explores three guiding questions: (1) How do teachers integrate technological skills, pedagogical knowledge, and reflective practices into instruction? (2) What educational technologies are utilized, and how do teachers make selections? (3) What are teachers' professional development needs related to designing engaging, technology-enhanced lessons?

Findings revealed that technology is most frequently used to support student engagement, differentiation, and access for diverse learners. Participants emphasized the benefits of student choice, multimodal demonstrations of learning, and self-paced instruction facilitated by digital tools. However, barriers such as limited time for mastering new technologies, inconsistent training, funding constraints, and concerns about student distraction and overreliance on technology persist.

Teachers expressed a strong need for professional development that is continuous, differentiated by experience level, focused on instructional integration, and inclusive of emerging tools like artificial intelligence. Implications for practice include redefining teacher proficiency to emphasize pedagogical intentionality, improving communication about available digital resources, and creating sustainable funding models for technology upgrades.

The study concludes that effective technology integration requires more than device availability; it demands intentional instructional design, collaborative professional learning structures, and district policies that prioritize both equitable access and high-quality pedagogy. Preparing teachers to integrate technology thoughtfully is essential to ensure that all students, regardless of background or learning needs, are equipped with the skills necessary to thrive in an increasingly digital world.

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DEDICATION

This work is dedicated to my mom, whose unwavering belief in education and lifelong learning shaped my educational journey. I wish you could be here to celebrate with me. To my amazing husband, my eternal cheerleader and thought partner, I could not have done any of this without you. To Chloie, your patience during my academic pursuits means the world to me. I hope that I have shown you that with hard work and perseverance anything is possible.

Table of Contents

LIST OF FIGURES

Figure Page

LIST OF TABLES

CHAPTER I

INTRODUCTION

During the COVID-19 pandemic, middle schools rapidly transitioned to online learning to ensure continued student access to instruction. To facilitate this shift, school districts made significant investments in educational technology, particularly by purchasing devices to provide every student with access to digital learning. Now that schools have returned to in-person instruction, an important question arises: How is this technology being utilized in the middle school classroom, and to what extent, if any, does it support student learning?

It can be beneficial to school districts to investigate whether these digital tools are being integrated into daily instruction or if they have been relegated to occasional use. Districts need to determine how teachers are leveraging technology to personalize learning for a variety of learners, provide real-time feedback, and foster collaboration, or determine if these devices are primarily being used for standardized assessments and occasional student research. Additionally, district and teachers need to examine how teachers perceive the effectiveness of educational technology in supporting academic achievement and engagement for all students. Understanding how technology is currently being used will also help inform future decisions regarding professional development, infrastructure investments, and instructional strategies that maximize student success.

This study will address the central question of what are middle school teachers' experiences using educational technology in the classroom?

Research Sub-questions:

1. How do middle school teachers describe their level of proficiency using technology when teaching?
2. What kinds of educational technology is being used in middle school classrooms and how do teachers select the technology they use?
3. In what areas do middle school teachers perceive a need for more professional development as it relates to designing engaging lessons which include the use of technology?

Positionality

My own positionality informs my choice of topic and commitment to this research. As a building principal, who is always attempting to make funding stretch the furthest, it is important to know how technology is being used to support students. Technology, computers, chargers and repair to student Chromebooks account for a large portion of my school budget annually. If we are spending a lot of money for this technology, I would like to know that it is being used frequently, being used to foster student engagement, to support struggling students and to support students to be critical thinkers and consumers of information.

CHAPTER II

LITERATURE SYNTHESIS

During the COVID-19 Pandemic, schools were forced to quickly switch to an online learning format to support continued student learning. School districts invested large sums of money to purchase enough computers for each learner. Now that schools have returned to inperson instruction, I wonder how technology is being used in instruction to support student learning. It is important to investigate how and if educational technology is continuing to be used in instruction.

Research has demonstrated the benefits of instruction, such as technology-enhanced learning, that supports student engagement. These benefits include higher grades, higher reported levels of student satisfaction, reduced dropout rates, and increased levels of student persistence (Kearney & Maakrun, 2020). The topic of student engagement continues to be a well-researched topic that examines how teachers can improve their instructional practices to increase positive student outcomes. Bigatel and Edel-Malizia (2018) discuss how it is necessary to look at two facets of student engagement; what teachers do to engage students and what students do during instruction. Both pieces must be examined and considered when teachers are designing engaging lessons, when teachers are incorporating technology into instruction and when educational leaders are selecting professional development opportunities for teachers.

During the COVID-19 pandemic, teachers and students were forced to quickly pivot to a completely new way of teaching and learning. To facilitate teaching and learning in an online environment, schools purchased devices and computers for students to use. Both teachers and students had varying levels of experience with technology that

ranged from very little to highly proficient (Dolighan & Owen, 2021). There was very little time to provide teachers with professional development opportunities to support designing pedagogically appropriate lessons for an online format (Dolighan & Owen, 2021). In the online environment, students exhibited a wide range of behaviors that indicated a lack of engagement such as students with cameras off, limited participation in face-to-face instruction opportunities, and lack of work completion.

While life and school are beginning to slowly return to normal after the COVID-19 pandemic, many schools continue to utilize the technology and devices that were purchased to support students during online learning. The technology includes web conferencing, educational software, blogs, social networking, learning management systems (LMS) and digital games. (Schindler, Burkholder, Morad & Marsh, 2017). This will require teachers and school districts to deeply consider how to facilitate student learning and engagement when students are using technology. As new technology applications and programs appear every day, it will be increasingly important that teachers and school districts put more intentional thought into the areas of student needs, teacher professional development, and the selection of technology so that educational technology in classrooms will support student learning and engagement.

Defining Educational Technology versus Using Technology

According to Reiser (2001), educational technology was defined as "The field of instructional design and technology encompasses the analysis of learning and performance problems, and the design, development, implementation, evaluation and management of instructional and non-instructional processes and resources intended to improve learning and performance in a variety of settings, particularly educational institutions and the workplace." Later studies have developed the concept of *technology*

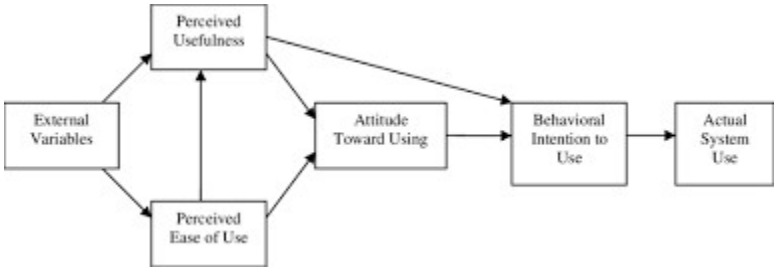
integration to describe how teachers weave the use of technology into their lesson designs and do not view the use of technology as being separate from lesson planning. Teaching effectively with educational technology goes beyond the idea of simply using technology to enrich the learning for students and supporting the acquisition of content knowledge (Hamutoglu & Basarmak, 2020).

Theoretical Frameworks for Educational Technology

Several theoretical frameworks have been developed to describe the processes involved in defining educational technology. While it is helpful to define educational technology, it does no good for students if teachers do not use the technology. As shown in Figure 1, the Technology Acceptance Model (TAM) was developed by Davis (1986) and explained that there are several key factors that influence a person's computer usage. These factors are perceived usefulness and perceived ease of use, and users' attitudes, intentions and actual computer usage (Davis, Baggozzi & Warshaw, 1989).

Figure 1

Technology Acceptance Model



The Technology Pedagogy and Content Knowledge (TPACK) theoretical model, developed by Koehler and Mishra (2005), attempts to explain even more clearly how necessary it is for teachers to be proficient in their content areas, their understanding of how to teach and also in their ability to teach with technology. TPCK can be defined as

"... the basis of good teaching with technology and requires an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones" (Mishra & Koehler, 2006).

Potential Barriers for Teaching Using Technology

There are two levels of barriers to integrating technology-primary and secondary. Primary barriers are internal barriers such as factors related to resources; lack of equipment, lack of training or professional development, time, lack of technical support (Hamutoglu & Basarmak, 2020). Secondary barriers are harder to identify because they may be less tangible things like; teachers' perceptions of their proficiency with technology, the culture of the building or district and attitudes and beliefs about using technology.

Both the TAM and TPACK models take into consideration how teachers view the barriers that may be impeding their use of educational technology applications in the classroom. If schools and districts are not considering what teachers view as barriers to implementing more technology into their lesson planning, then student engagement may suffer.

Defining Student Engagement

Schindler, Burkholder, Morad and Marsh (2017) describe student engagement as "Student engagement is a broad and complex phenomenon for which there are many definitions grounded in psychological, social, and/or cultural perspectives". This

statement demonstrates one of the challenges with studying student engagement. There is not one universally agreed upon definition. Without a clear definition it is more challenging to identify when students are engaged in classrooms and whether the lessons taught are structured to facilitate student engagement.

There are indicators that have been identified which educators can use to determine if students are engaged during instruction (Bond & Bedenlier, 2019). The indicators are divided into three categories of engagement-cognitive, behavioral, and affective. Cognitive Engagement involves a student's ability to use strategies that will assist them to think deeply, practice selfregulation and enhance their learning (Bond and Bedenlier, 2019; Quin, Hemphill & Heerde, 2017). Some examples of cognitive engagement indicators include students setting learning goals, using critical thinking strategies while working on tasks, maintaining focus and concentration, and the ability to both teach and learn from peers (Bond & Bedenlier, 2019). Affective Engagement involves a student's feelings about the learning environment which affects their ability to interact in a positive way, and show interest to others such as peers, and teachers (Bond and Bedenlier, 2019). Affective engagement can also be referred to as Emotional Engagement (Quin, Hemphill & Heerde, 2017). Examples of affective engagement indicators include student attitude about school and learning, the sense of belonging to the school/classroom, positively values learning and school, and positive interactions with peers and teachers (Bond & Bedenlier, 2019). Behavioral Engagement relates to how a student acts and participates in a positive way in their school environment which includes the academic, social, and extracurricular activities (Bond and Bedenlier, 2019; Quin, Hemphill & Heerde, 2017). Student attendance, homework completion, level of effort, willingness to attempt work, and student conduct are indicators of behavioral student engagement (Bond & Bedenlier,

2019). Classroom instruction must be designed to include instructional strategies which address each area of student engagement (Bond & Bedenlier, 2019).

Relationship between Motivation and Student Engagement

In some research the term motivation is used interchangeably with engagement. Alley (2019) argues that although motivation impacts student engagement it is a separate construct. Motivation can be thought of as *why* a student does or does not do a task, while engagement is *what* they are doing or not doing the actual task. Research on motivation describes how students are motivated by factors in their environment. Two common theories that describe how students are motivated are the Self-Determination Theory (SDT) and the Stage-fit Environment Theory (Alley, 2019; Eccles, Midgley, Wigfield, Buchanan, Reuman, Flanagan, and Mac Iver, 1993). Both theories focus on what conditions are required for a student to be motivated to learn and engage. The Stage-Fit Environment Theory (Eccles, et al., 1993) explains how the environment in which a student is placed must be developmentally appropriate and provide a way to meet their developmental needs for students to be motivated to learn. The concept is that teachers craft the learning environment to provide students with challenges to facilitate growth and learning while still providing students with individual scaffolding to support academic growth. This is accomplished by both establishing positive relationships with students and designing instruction that is appropriately challenging (Alley, 2019). If the environment, for whatever reason, does not meet the developmental needs of the student then they will not be motivated, will not be engaged, and will have limited academic growth (Eccles, et al., 1993).

The Self-Determination Theory states that all people possess inherent tendencies that allow them to show personal growth (Alley, 2019). In classrooms, the basic needs of

competence, relatedness and autonomy must be met by the teacher for students to be engaged. If teachers can create classroom learning environments including instructional practices that meet students' needs, then students will be more motivated and more engaged. Overall, motivation is an antecedent for student engagement and should be considered when discussing instructional strategies to support positive student outcomes (Bond & Bedenlier, 2019).

Measuring and Observing Student Engagement

Bigatel and Edel-Malizia (2018) argue that when examining whether student engagement is occurring one must observe two factors concurrently; what teachers do to engage the students and what the students are doing instruction. There is very little research that has been able to examine both factors at the same time. There have been several types of studies that examine and provide different methods for monitoring student actions to determine if they are engaged. The methods are varied but most often rely on students self-reporting about their level of engagement or their off-task behaviors or their own levels of satisfaction with the design and teaching of courses (Alley, 2019; Kearney & Maakrun, 2020). There are definite limitations to the data that is produced by self-reporting and this type of data may not be the most useful or reliable to gather a clear picture of what happens when students are engaged. Other measures that are commonly used as indicators for student engagement when using technology include: amount of time logged onto a program or device and work produced or completed. While these are certainly student actions it is difficult to say that these actions equal engagement on all levels-behavioral, cognitive, and affective. The National Survey of Student Engagement (NSSE) is a tool used at the higher ed level to have students self-assess their levels of engagement over time. The data

produced by this tool is used to make correlations between aspects of student engagement and positive student outcomes such as higher grades, work completion and graduation rates (Schindler, et al., 2019).

Engagement with Educational Technology

There are challenges to define what it looks like when students are engaged while using technology. The main challenge is that there is not a working definition for what engagement looks like (Kearney & Maakrun, 2020). Some researchers even argue that student use of educational technology has little positive impact on student engagement. Bigatel & Edel-Malizia claim that learning in an online environment or an environment that relies heavily on technology can be less engaging for students because there is a lack of face-to-face contact with the teacher or peers, which may lead to students feeling disconnected (2019). This type of classroom environment does not fulfill the students' developmental needs. Additional studies examined how using technology was more distracting for students and decreased the levels of cognitive and behavioral engagement. Students were less engaged when they reported trying to multitask, such as having multiple tabs open on devices or checking their phones, while using educational and computer-based technology (Kearney & Maakrun, 2020; Schindler, et al.,2017). A literature review analysis by Schindler, et al. discovered that different types of educational technology such as blogs, web-conferencing, wikis, social media sites and digital games have varying levels of success when it comes to student engagement and methods which involved required participation were more engaging (2017).

Supporting Teachers' use of Educational Technology

Bond, Buntins, Bedenlier, Zawacki-Richter and Kerres describe the need for teachers to be knowledgeable about instructional practices and how to use educational technology

to support student learning in this way, “technology can amplify great teaching, but great technology cannot replace poor teaching” (2020). For educational technology to enhance instruction teachers must be informed and use the technology appropriately in classrooms. Research by Cardullo, Wong, Burton and Dong (2021) examined factors which influence how and when teachers use educational technology in their instruction. The factors include perceived usefulness of the technology and the perceived ease of use of the technology. This highlights the need to provide professional development to teachers to increase their knowledge and comfort level with the use of different types of technology. Cardullo, et al. (2021) used a Technology Acceptance Model (TAM) tool to survey teachers about the relationships between the levels of support they received and their use of the school Learning Management System (LMS), self-efficacy, and what they perceived as positive outcomes from using the LMS. Teachers who received professional development training and support reported overall positive attitudes towards using technology and predicted that it would have positive outcomes for their students (Dolighan & Owen, 2021). This information highlights the importance of determining teachers’ levels of comfort and proficiency with using educational technology and supporting their needs with professional development.

Technology Post Pandemic

The landscape of educational technology has grown increasingly complex following the COVID-19 pandemic. With thousands of tools now available to teachers, the challenge is no longer simply acquiring technology but effectively integrating it into instruction in ways that are pedagogically sound. As Scanlon (2021) explains, "Technology-enhanced learning consists of much more than a set of research-informed products. It is a complex system, which includes communities, technologies and

practices that are informed by pedagogy (the theory and practice of teaching, learning and assessment)."

According to a survey by LearnPlatform, the number of educational tools available to schools had almost tripled, reaching 1,417 products during the 2021–22 school year compared to pre-pandemic levels (Klein, 2022). During the pandemic, many companies offered free access to digital programs, leading teachers to adopt a wide variety of tools without a consistent vetting process or long-term implementation strategy. As a result, many districts now face uncertainty about which technologies are actively being used, whether they align with curricular goals, whether they adequately safeguard student data and privacy, and whether they are equitably accessible to all students.

Additionally, the abundance of disconnected technology tools has created new challenges for educators. Platforms often require separate logins, function differently, and generate student data across multiple systems, contributing to greater frustration rather than streamlining instructional practices. Instead of making teachers' work more efficient, poorly integrated technology ecosystems can make it harder to manage classrooms effectively and use data to drive instructional decision-making.

Impacts of AI on Teaching and Classrooms

Artificial intelligence (AI) offers significant benefits to educational practice, including the development of personalized learning platforms, adaptive assessment systems, predictive data analytics, and conversational agents that support student learning (Akgun & Greenhow, 2021). However, with the emergence of tools such as ChatGPT in 2022, important questions have been raised regarding the broader impacts of AI on education and assessment (Bower, Torrington, Lai, Petocz, & Alfano, 2024). AI

tools have the potential to save time and enhance instructional effectiveness by assisting teachers with grading, providing automated feedback, differentiating instruction based on student needs, and offering data-driven insights to inform instructional decisions.

Despite these advantages, the integration of AI into classrooms also presents new challenges, particularly in maintaining academic integrity. The widespread availability of AI generated content increases the likelihood that students may use such tools to complete assignments, complicating efforts to assess authentic student learning (Oye, Frank, & Owen, 2024). As a result, educators must develop clear guidelines and policies that promote the responsible use of AI while preserving expectations for originality, critical thinking, and ethical conduct in academic work.

Measuring Proficiency Using Educational Technology

In the past, teacher technology proficiency was often defined more narrowly—primarily as a teacher's ability to operate hardware and software effectively. Early definitions emphasized technical competence and basic computer literacy, such as using word processors, spreadsheets, and presentation tools, with little emphasis on instructional design or pedagogy.

For example, in the early 2000s, ISTE (International Society for Technology in Education) described proficiency in terms of mastering productivity tools and understanding basic ethical and safety issues related to technology use (ISTE, 2000). Teachers were considered proficient if they could: use digital tools for communication and classroom management, demonstrate awareness of copyright and fair use and operate software for lesson delivery or grade reporting

Similarly, Ertmer (1999) described technology integration barriers as either first order (external) or second order (internal). At that time, much of the focus was on

overcoming first order barriers like lack of access or training, and proficiency was implicitly framed as getting comfortable with the tools, rather than strategically applying them to instruction.

In educational literature, teacher technology proficiency is defined as more than just the ability to operate digital tools; it encompasses the effective integration of technology into pedagogy to enhance student learning. This proficiency involves a combination of technical skills, pedagogical strategies, and reflective practices.

The previously mentioned framework that encapsulates this comprehensive view is the Technological Pedagogical Content Knowledge (TPACK) model. TPACK emphasizes the intersection of three primary forms of knowledge: technological, pedagogical, and content knowledge. According to Mishra and Koehler (2006), effective technology integration in teaching requires an understanding of how these domains interact to facilitate meaningful learning experiences.

Further research supports this integrated perspective. For instance, Eskici and Çayak (2023) found a significant positive relationship between teachers' technology proficiency and their ability to integrate technology into their lessons. Their study highlights that proficiency is not solely about technical know-how but also involves the capacity to apply technology in pedagogically sound ways to meet diverse student needs. According to one study, teachers were considered confident about using technology when they were not deterred by lack of resources, knowledge, or time; they found or invented ways to obtain needed resources even when they encountered barriers (Ertmer, P. A., Gopalakrishnan, S., & Ross, E. M.,2001). Additionally, some technology-using teachers work in school districts that have made large investments in staff development and on-site support (Ertmer, et al., 2001).

Limitations and Gaps within the Research

The research that has been conducted on the topic of student engagement as it relates to the use of educational technology has some limitations. There is not a consistent method to collect data; studies have included quantitative, qualitative, and mixed methods. This makes it more challenging to compare data or find emerging trends.

In studies that include educational technology, there is often a lack of information about the design of the lessons. Without information about the lessons, it is difficult to make clear determinations about what impacts student engagement the most. There are too many unnamed variables or factors which could be contributing to the results. In addition, there is not much information that discusses how or why teachers choose to use certain types of educational technology.

Most of the current research has been conducted at higher education levels. There has been limited current research to examine student engagement with the increased use of technology at the middle and elementary school levels.

Educational technology, when used effectively, can support positive student outcomes and enhance student learning. Post-pandemic it will be important to assess how the technology is being used and if teachers require professional development and training to support this work, so that educational technology can be used effectively to foster an engaging and rigorous learning environment for all students.

CHAPTER III

METHODS

This study analyzed and described the experiences of middle school teachers and how these impacted their use of educational technology in the classroom. Yin (2009) defines a case study as "an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (p. 18). This single case-study approach allowed me to provide a clearer understanding of the experiences of middle school teachers and their use of educational technology to support student learning.

Settings and Participants

Participants in this study were middle school teachers from a mid-sized school district in Oregon. The school district being studied is located in a large suburban community in the Pacific Northwest. The population of the surrounding community is approximately 100,000 residents and the school district serves 11,380 students. There are four traditional middle schools, and one K-8 school. According to Oregon Department of Education report cards, 46% of students qualify for free or reduced lunch across the district. Two middle schools were recipients of Verizon Innovative Learning grants which provided professional development for staff, technology coaches and chrome books with internet access for students during the 2019-2020 and 20202021 school years. The district has identified one staff person to serve as the Technology & Innovations coach for secondary schools.

This study's eligibility criterion was that participants must be teachers who teach middle school. The sample was not homogeneous as it included teachers with varying

levels of experience who taught different content areas and had varying levels of technology skills.

Participants were sent an email inviting them to participate in an online Qualtrics Survey. A third party, the Technology Coach for secondary schools, sent the original invitation to participate. Additionally, some participants forwarded the link to other colleagues in the district. The invitation contained the informed consent page, including a description of the study. Those who opted to participate took the survey by clicking on a link on the informed consent page. Participation was completely optional. The study consent form, survey and all procedures were reviewed and approved on October 15th, 2024, by the University of Oregon Institutional Review Board.

This study utilized purposive sampling because participants were selected based on the common characteristics of being a middle school teacher who has worked in the specified school district (Miles & Huberman, 1994). Participants were allowed to share the link to take the survey with colleagues in their building. This allowed for some snowball sampling to occur and increase the sample size (Miles & Huberman, 1994). The sample size for the study was 31 teachers. This sample included participants in multiple buildings and across academic content areas

Data Collection Procedures

The data was collected by a semi-structured survey in Qualtrics (see Appendix A). For further clarification of responses some participants were asked to participate in an interview that was recorded via Google Meets. The purpose of the interview was to allow participants to expand on their responses from the survey and for me to ask follow-up questions in response to their survey answers. Participants were asked for a follow-up interview if their initial responses were one- or two-word answers that did not clearly

describe the thinking of the participants. Participants were sent an email asking them if they were willing to be interviewed. Participant survey responses were downloaded from Qualtrics into an Excel spreadsheet. I uploaded all responses into Dedoose, a mixed-methods software program (SocioCultural Research Consultants, 2021). According to its developers, Dedoose is a research and evaluation data analysis application (REDA) that supports both qualitative and mixed methods approaches to data analysis ("What is Dedoose? – Dedoose Learning Center"). I then conducted four coding cycles to identify patterns and themes within and across the participants' data.

My qualitative analyses were both inductive (first phase) as well as deductive (second phase) as I first allowed the categories and themes to emerge from the data and then identified key terms used by participants in short answer responses to create a provisional coding framework. I merged findings from my inductive and deductive approaches in my second round of coding and refined my coding framework over subsequent rounds of coding. I kept a research journal throughout my data analysis phase to record reflective memos that emerged for me in the process of coding (Saldaña, 2013).

First Cycle Coding: Read and Review

The first step in my analysis was to read through each participant's response to every question, line by line, in the order in which they were submitted. During this initial reading, I was not focused on finding patterns or themes yet—I was simply trying to get a feel for the data. While no clear themes stood out at this stage, I took notes in my research journal to capture any early impressions or interesting observations to revisit later in the process. This first round of reading gave me a sense of the tone and variety in participant responses. It also helped shape how I approached the next phase, which involved more

coding methods like frequency coding to begin organizing and interpreting the data more systematically.

Second Cycle Coding: Frequency Coding

In the second round of analysis, I used frequency coding (Saldaña, 2013). This meant I went through each survey response line by line and kept track of how often certain words or phrases appeared. I took a deductive approach, using key words embedded within the survey questions as a starting point for my codes. As I read through the responses, I organized and tallied them in my research journal, keeping track of the different words participants chose to answer each question.

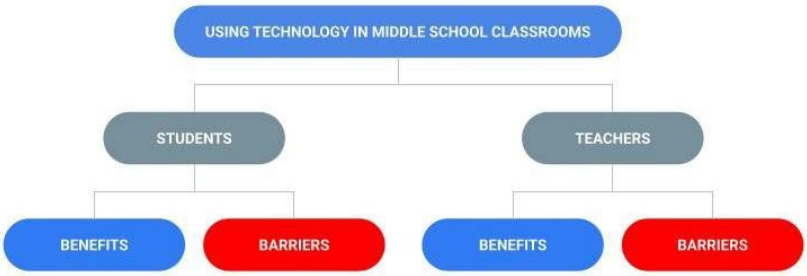
As I looked at the most commonly used terms and ideas across responses, two broad categories started to stand out: benefits and barriers. These two themes came up the most frequently and covered a wide range of responses. I found that participants described both benefits and barriers not just for students, but also for themselves as teachers. This helped shape the next phase of my coding and theme development.

Third Cycle Coding: Concept Driven Coding

During the next phase of analysis, I utilized Concept Driven Coding (Saldaña, 2013). Concept-driven coding is deductive coding because at this point, I was using a pre-defined set of codes or themes to analyze my data. It is an expansion of the Frequency coding. All participant responses were placed into one of four categories: Student Benefits, Student Barriers, Teacher Benefits and Teacher Barriers (see Figure 2).

Figure 2

Deductive Categories for Coding



Fourth Cycle Coding: Pattern Coding

Prior to the fourth phase involving pattern coding, all descriptor and qualitative data were uploaded into Dedoose (SocioCultural Research Consultants, 2021). Using Dedoose allowed for the efficient application of codes to excerpts and provided flexibility to revise or consolidate codes. A strength of the program is its wide range of visualization tools, which supported identifying patterns and relationships between qualitative and mixed methods data.

To prepare the Excel data for upload, sociodemographic descriptors were labeled using Dedoose's required formatting. Specifically, I added the prefix "_ddqual_" to each relevant column header. Five variables were formatted this way to ensure recognition by the program: years of teaching experience, content area taught, years in the current building, grades taught, and a user identifier number (assigned by Qualtrics based on survey completion order). These variables were categorized as descriptors in Dedoose and allowed me to analyze potential relationships between participant characteristics and coded qualitative data.

The remaining participant responses in the spreadsheet were uploaded as direct quotes and automatically labeled as *excerpts* by Dedoose. I then coded each excerpt according to the question it addressed (excluding sociodemographic items). This process initially resulted in 18 child codes: one for each open-ended survey question. The parent codes remained as *Benefits* and *Barriers*.

During this phase, I employed pattern coding to examine connections between participant sociodemographic descriptors and the parent and child codes I assigned to excerpts. As described by Saldaña (2013), pattern coding involves grouping previous codes into a smaller number of overarching categories or themes. This method supported a more focused and iterative process for code consolidation of the 18 child codes.

At this stage, I felt that the number of child codes was too high and lacked the clarity needed to generate meaningful themes. While Dedoose's mixed methods features, such as the Descriptor X Code Case Count Table, allowed me to explore patterns between codes and participant variables, the analysis did not reveal distinct trends. Variables like years of experience and content area were too broad and, when treated individually, resulted in 31 unique descriptor combinations, further complicating pattern recognition.

Some original descriptor items, such as lists of hardware and software currently available to teachers, provided limited value to coding. Much of this technology is standardized across the district and did not offer insight into how or why teachers use educational technology. However, open-ended responses about desired technology offered more information on teachers' needs and

priorities.

Despite this process, I continued to struggle to identify coherent themes across the data from the parent and child codes that I had identified. As a supplementary step, I

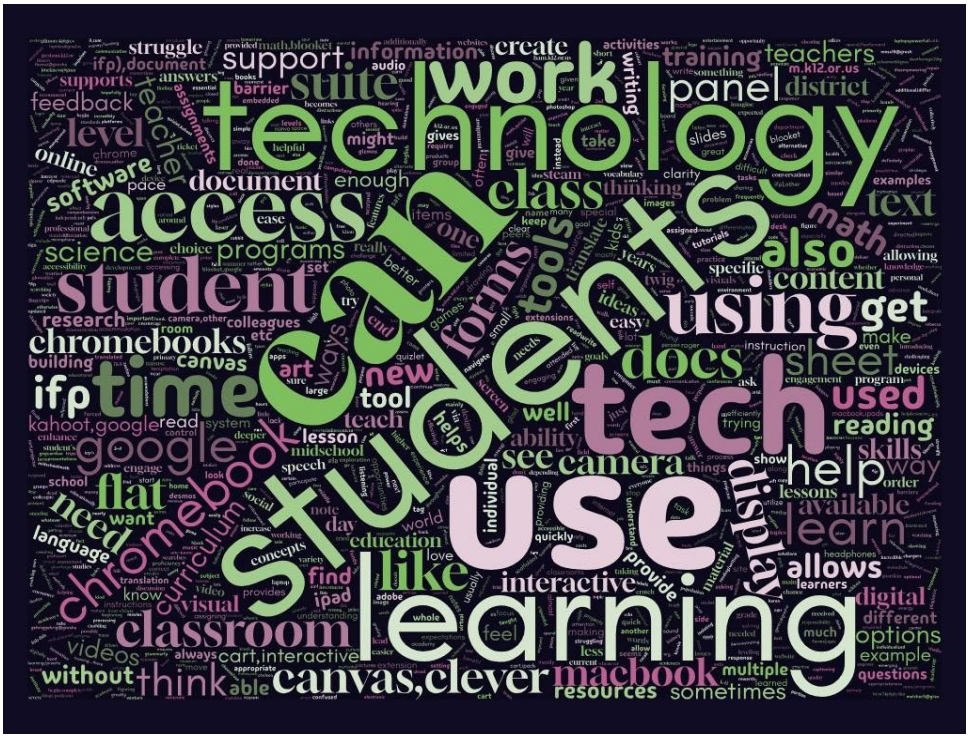
generated a word cloud (Figure 3) using the text from the open-ended survey responses to visualize the frequency of key terms. Several words stood out in the visual: Use, Students, Learning, Technology, Can and Access. Based on this observation I reorganized my parent codes. This led to the emergence of three new preliminary themes:

1. Accessing (Using) Technology
2. Professional Development
3. Technology and Student Learning

These categories provided a foundation for thematic analysis and reorganization of the child codes.

Figure 3

Word Cloud of Frequent Terms



Fifth Cycle Coding: Selective Coding

To use the Dedoose analysis tools more effectively, I implemented selective coding as described by Saldaña (2013). This phase involved consolidating both descriptor

and content codes to allow clearer patterns to emerge from the data. For example, I restructured the broad content area categories into four more meaningful groups: Humanities (language arts and social studies), Math & Science, Special Education, and Other (which included AVID, Spanish, World Music, Band, PE, Health, and Art). This consolidation reduced the number of content area codes from fourteen to four. Similarly, I reorganized the years of teaching experience variable into five defined ranges: 1–5 years, 6–10 years, 11–15 years, 16–20 years, and 21 or more years. These changes helped reduce noise in the dataset and allowed for more effective pattern recognition using Dedoose's Code Co-Occurrence tool. The Code Co-occurrence table shows how frequently two codes appear on the same excerpt. It's essentially a matrix that visually represents the relationship between different codes, indicating how often they are used together in my data (SocioCultural Research Consultants, 2021). To be considered significant a code must have a Code Co-occurrence value of at least five.

Despite these improvements, the three new parent codes of Accessing (Using) Technology, Professional Development, and Technology and Student Learning assigned to participant responses from the open-ended questions still did not reveal clear thematic patterns. Continuing with selective coding, I began to recognize a reciprocal relationship between teacher and student experiences with technology. Specifically, the barriers faced by students—as described by teachers—often influenced the barriers teachers themselves experienced, especially in terms of access and professional development. Similarly, the benefits of technology for student learning were often described in tandem with the supports teachers needed to provide those benefits, including training and infrastructure.

Based on these connections, I reorganized the parent codes into four categories that more accurately represented the patterns in the data:

1. Accessing & Using Technology
2. Professional & Adult Learning
3. Technology Supports Student Learning
4. Technology Does Not Support Student Learning

I also reduced the number of child codes from sixteen to twelve, consolidating them to align with the reorganized parent codes (see Appendix B). Once again, I used Dedoose's Code Co-Occurrence tool to further explore patterns across codes and descriptors, which helped to guide the next phase of the study.

Sixth Cycle Coding: Thematic Analysis

The final approach involved Consolidated Thematic Analysis. Thematic analysis is a method used in qualitative research to identify, analyze, and interpret patterns of meaning (or "themes") within a dataset (Braun & Clarke, 2006). It provides an approach to examining how participants make sense of their experiences or practices by focusing on repeated ideas across the data. I used Dedoose's Code Co-occurrence a final time to guide final consolidation and redefinition of categories. The four themes that were most strongly endorsed through code cooccurrence were: *Benefits to Student Learning, Barriers to Student Learning, Using Educational Technology for Learning and Professional Development as Adult Learning.*

In the Results section below, excerpts and quotes from participants are identified by a coding system to make the responses non-identifiable and to protect confidentiality of participants. Direct quotes from the open-ended survey questions will be cited by the assigned user number from Qualtrics and the corresponding question number. For example, a quote from

User 1 for question number twenty-three would be cited by (T1, Q23). In this coding schema, “T” is for “teacher.”

Revisiting the Research Sub-Questions

One of my original research sub-questions—"How do middle school teachers describe their level of proficiency using technology when teaching?"—assumed that participants would self-assess and describe their personal sense of proficiency. However, upon analysis, it became evident that this question was too broad to be effectively operationalized in the context of my qualitative interviews.

Rather than directly describing or quantifying their *level of proficiency*, participants tended to focus on what they do with technology, the skills they apply, the pedagogical strategies they use, and their beliefs about how technology impacts student learning. Their responses were richer in descriptions of practice and mindset than what I would have collected from self-ratings or a typical definition of proficiency.

As a result, the remainder of this study reframes "proficiency" based on the data collected. Instead of relying on a predefined measure, proficiency is defined here as *the integration of technological skills, pedagogical knowledge, and reflective classroom use that support student learning*. This definition emerged from patterns in how teachers used, adapted, and reflected on technology in their daily practice. I feel that this definition better honors the complexity of teaching with technology in a middle school classroom. These early qualitative findings led me to rephrase the first sub-research question to be “How do middle school teachers describe in relation to educational technology their integration of technological skills, pedagogical knowledge and reflective classroom use to support student learning?”

CHAPTER IV

RESULTS

This chapter presents the findings of my qualitative study, which explored middle school teachers' experiences using educational technology in the classroom. Using the Dedoose software platform for coding and analysis, I identified key themes that address the central research question: *What are middle school teachers' experiences using educational technology in the classroom?* Three sub-questions also guided the analysis:

1. How do middle school teachers describe their integration of technological skills, pedagogical knowledge, and reflective classroom use to support student learning?
2. What kinds of educational technology are being used in middle school classrooms, and how do teachers select the tools they use?
3. In what areas do middle school teachers perceive a need for more professional development related to designing engaging, technology-enhanced lessons?

The themes presented in this chapter emerged through iterative coding, culminating in the sixth coding cycle. These themes are supported by direct quotes from participant responses.

Participant Demographics

This study had responses from thirty-one teachers. Participants taught a variety of content areas. The content areas included PE, Health, Language Arts, Band, Art, World Music, Math, STEAM, Social Studies, AVID, Science, Spanish and Special Education.

Some participants taught more than one subject. Nineteen percent of teachers (six participants) taught Humanities, 19% (six participants) taught Special Education, 45% of teachers (fourteen participants) taught Math and Science and 16% (five participants) taught other subjects.

The participants also represented a wide range of teaching experience, ranging from three years to twenty-eight years. The number of participants at each experience level was similar, having relatively equal representation from each group. Nineteen percent (six participants) taught from 1-5 years, 19% (six participants) taught from 6-10 years, 16% (five participants) taught from 11-15 years, 22.5 % (seven participants) taught from 16-20 years, and

22.5% (seven participants) taught twenty-one or more years.

Available Technology

Participants identified that there is a lot of technology currently available in classrooms. Figure 4 shows the types of hardware used in classrooms. All classrooms have an interactive flat panel device (IFP) and a microphone or audio projection system. Each teacher is issued a Macintosh laptop. Sixteen (52%) participants indicated that their classrooms have access to a Chromebook cart for student use. iPads are used sporadically in a few classrooms, particularly in STEAM and Art classrooms. Twenty-two (71%) participants also used a document camera to project to the IFP.

Figure 4

Types of Hardware Used in the Classroom

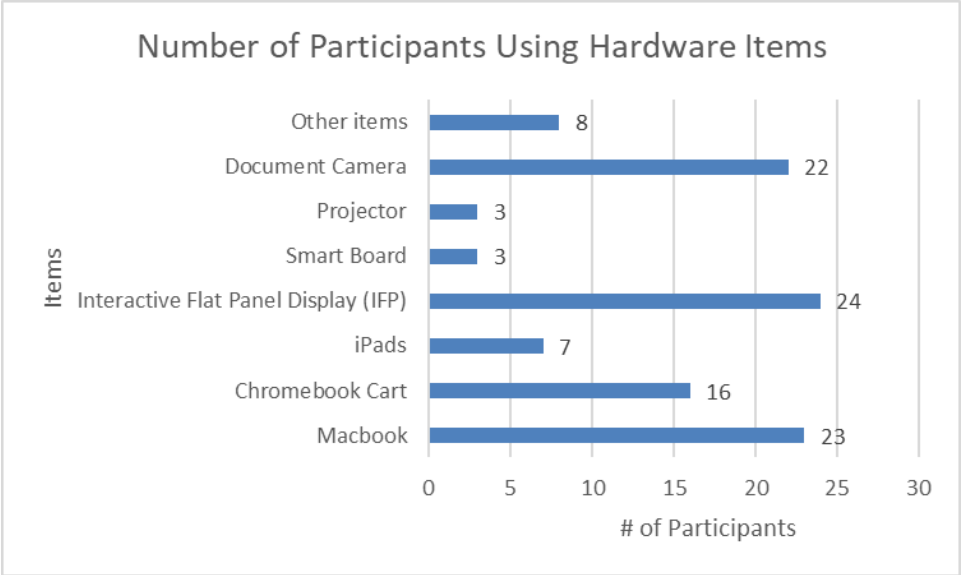
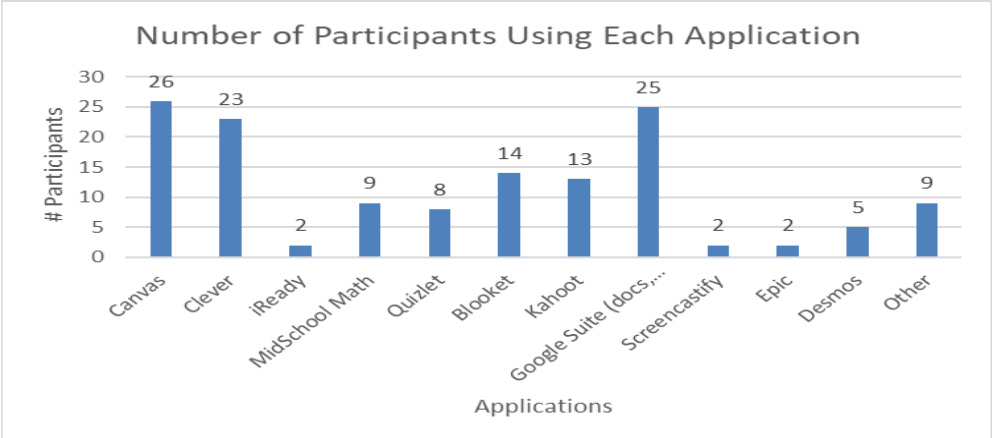


Figure 5 shows the number of participants using each software application. There were a range of types of programs, apps and software being used in classrooms. There were common programs across the academic content areas such as: Canvas, Clever and Google Suite. Other programs varied by content area.

Figure 5

Participants using each Application



Desired Technology

Participants shared a range of technologies they would like to have in their classrooms, often tied closely to the content areas they teach. For example, a math teacher noted the potential benefits of allowing students to annotate directly on their devices: "Chromebooks with stylus pens or something similar so students can annotate math on the computer" (T21, Q7). Similarly, teachers of creative subjects such as art expressed a desire for more interactive tools that would enable students to engage beyond basic typing tasks. One art teacher described a comprehensive vision for integrating digital media tools into the classroom, explaining

> I would like to have iPads with iPad pencils (or similarly high control stylus options) in my classroom for students to take their own source photos, quickly create grids and other drawing tools to scaffold drawing skill exercises, rapid testing of design ideas for their work (by taking a photo of current progress and then using drawing tools on their image to experiment), document their work, create digital artwork in programs like Fresco or Procreate, create simple animations in PS Express, stop motion animation, graphic design, [and] connect iPad to my IFP (T26, Q7).

In addition to content-specific needs, some participants noted a broader desire for technology that supports struggling learners. One participant emphasized, "There's not much for the general population that I would like, but for students who struggle with reading/writing, I would love if there were more technology options for them to use" (T3, Q7). These responses suggest that while teachers are interested in enhancing subject-specific instruction with targeted technologies, they are also mindful of how technology can support accessibility and inclusion for all students.

Overall, the technologies teachers expressed a desire to use reflect a strong focus on enhancing student engagement, supporting diverse learning needs, and expanding

creative possibilities in the classroom. Table 1 identifies the types of technology desired by each content area that is taught.

Table 1

Desired Technology by Content Area

Content Area	Types of Technology Desired
Math & Science	PC computers PC laptops- powerful enough to do robotics, run the 3D printers and Glow forge AI coding eSports Chromebooks with stylus pens or something similar so students can annotate math on the computer Digital Microscopes More vocational equipment such automotive and solar power parts
Humanities	There's not much for the general population that I would like, but for students who struggle with reading/writing,
Special Education	Grammarly Rofocus extension for Chrome Orbit Note
Other	Really any tool to help support my nonreaders Canva Adobe Acrobat professional Adobe Illustrator Adobe Photoshop and Photoshop express Adobe Fresco Unsplash Art programs like Chrome Canvas Step trackers, heart rate monitors, sleep trackers (wearables)

Benefits to Student Learning

Support for Diverse Learners

Participants consistently emphasized the role of technology in supporting students with diverse learning needs, particularly those with IEPs or 504 plans. One participant highlighted how assistive technology tools promote independence and reduce reliance on adult support:

> I use technology to level the playing field for students who have IEPs or 504s. Technology that can read to them or write as they speak or help them understand the text better. It also offers a way for them to do it independently without adult support.(T1, Q18).

Another teacher repeated this idea by focusing on how using familiar digital tools can help students to overcome some barriers: “I also find that any tech that is used breaks through the IEP and 504 issues. Computers are a medium they use often, so it meets the criteria of the special needs” (T20, Q18).

The most mentioned tech tool to support students who are Emerging Multilingual Learners (EML) was the ability of students to use translation tools on Chromebooks, iPads and phones. “I have one-to-one conversations using translation devices apps. I also have EML students auto translate on their Chromebooks” (T14, Q17). These examples demonstrate how teachers view technology as a key tool for supporting equitable access and independence for diverse learners, particularly those with IEPs, 504 plans, or language barriers.

Basic Skills for All Learners

Beyond special education accommodations, teachers discussed how using educational technology in the classroom improved access to basic skills for all learners. One teacher described the value of a lesson learned during the pandemic as it related to

using technology effectively: “Also, during the pandemic I found that by creating a lesson in digital format, (primarily using slides and video) I was forced to clarify what I wanted students to learn and do. If it's clearer to me, then I can make it clearer to students” (T23, Q9).

Teachers also pointed to clarity and the ability to present information in multiple were key benefits of using digital formats for presenting in the classroom:

> I want to keep students' attention, to have words and images that support what I am teaching so learners engage multiple senses... during the pandemic I found that by creating a lesson in digital format... I was forced to clarify what I wanted students to learn and do. If it's clearer to me, then I can make it clearer to students (T23, Q9).

One participant described how technology increased student agency and comfort, especially for those hesitant to participate: “Almost every student has a device at home... The barrier to entry is low, and I think this can help students feel safe and less worried about making mistakes” (T12, Q10). Other teachers highlighted the importance of providing multiple ways to engage with content, including visuals, audio, and rewatchable videos:

> I think it supports students by allowing students to participate in ways they are already familiar. Almost every student has a device at home (either personal cell phone, laptop, etc). The barrier to entry is low, and I think this can help students feel safe and less worried about making mistakes. Again, providing clarity and multiple modes of access. Providing the visual along side the audio for students is essential. Offering resources on screen for the whole class to access throughout a class period helps empower students as learners and self-managers (T26, Q10).

In creative subjects like art, tech tools create an environment that fosters experimentation. One art teacher stated, "I've given reluctant students, worried about 'ruining' their work, my iPad after taking a photo of their piece so I can give them a visual example... and then clear it all away so they can experiment. Other students who

need adaptations... have used tech tools to bridge their skills to concepts" (T26, Q10). These insights show that educational technology not only enhances instructional clarity and access to content, but also empowers students to engage more confidently, independently, and creatively in their learning.

Student Directed Learning

Another prominent theme that emerged was how technology empowers students to take control of their own learning pace and often the way they demonstrate their learning. Survey participants described that technology supports critical thinking in ways such as allowing students to engage at their own pace and feedback tools help to build confidence in their learning and understanding. One participant emphasized how self-paced work encourages deeper thinking and even peer-to-peer support: "When on-task, it gives the student time to think and discover at their own pace. It can also cause students to want to help others because they might feel empowered and confident in their understanding of the tech" (T12, Q14). This example illustrates how giving students control over the pace of their learning can not only deepen their thinking but also foster a collaborative, student-driven learning environment.

Collaborative tools that are available to students were observed as important for promoting shared problem-solving: "They can find answers quickly and work collectively in groups when given an assignment where they can share and collaborate simultaneously to enhance their work level" (T29, Q14). Six participants mentioned the importance of immediate feedback in helping students reflect on errors and engage in the learning process more actively. One participant stated, "I think it supports student learning by giving immediate feedback for student work. By having this feedback, it engages the brain to try to figure out the mistakes. This is the real process of learning"

(T20, Q10). These responses highlight how timely feedback, and collaborative platforms can transform technology into a dynamic tool for deeper reflection, peer interaction, and active problem-solving.

Technology was also viewed as a hands-on tool for exploring new concepts and using the tool for sense-making of new information: “Student learning should be hands-on. Technology can provide students with opportunities to explore new concepts, but technology needs to be used as a tool” (T14, Q10). This perspective reinforces the idea that technology is most effective when it supports hands-on, exploratory learning experiences that help students make meaning of complex concepts.

Supports Student Engagement

Seven (23%) participants identified student engagement as a primary benefit of technology integration. One participant shared that technology could reach students who might otherwise disengage with traditional teaching methods: “I use it for engagement. Using technology can engage students that would not otherwise be engaged” (T16, Q9). Teachers described how technology helped their ability to meet diverse learner needs by supporting multiple learning styles and providing more ways to demonstrate learning: “It allows for teachers to differentiate assignments and projects for students. It is also good for tapping into more learning styles” (T16, Q9).

Teachers described how differentiation was not limited just to the design of their assignments but also extended to accessibility tools available to support students. Participants noted the importance of tools like text-to-speech, speech-to-text, translation tools and digital research tools in making learning more personalized and inclusive: “When they’re engaged with the content, they use technology to increase their access to the topic at hand via text to speech, speech to text, research, access to higher learning via

appropriate websites, access to supported programs that access different ways of learning" (T1, Q12).These examples demonstrate that technology, when integrated into lessons and classrooms practices, can both capture student interest and scaffold learning.

Support for Students to Control Their Learning

Another theme that emerged from participant responses was how technology empowers students to take control of their learning by allowing them to work at their own pace and choose how they engage with content. One teacher illustrated this by describing how video-based instruction offers students more flexibility than whole-class instruction:

> One example is watching a video to find answers to a worksheet. Students on an electronic device can set their own pace, turn on captions, rewind/fast-forward to find the information, etc. This is much more difficult to do as a class with the IFP where students are competing with the big screen and possibly missing important information. Everyone processes at different speeds (T12, Q12).

This example highlights how technology supports individualized pacing, giving students more control over the timing and flow of their learning experience.

Other teachers described how tech tools can support personalized learning by adapting to individual needs and offering students choice in how they demonstrate understanding:

> It allows students to work at their own pace and take the learning to their level. For example: A student struggling with reading can have the text read to them or simplify an article, and students that are learning at a high level can work through extensions within the programs. It allows students to choose/use different modes of showing their learning through the various programs (T16,Q12).

This reinforces how technology enables differentiation by offering flexible entry points for students and allowing them to engage in ways that match their strengths and needs.

Barriers to Student Learning

Despite the many benefits of technology, participants also described several challenges and barriers that can limit its effectiveness in supporting student learning. The most commonly reported concern was distraction, particularly with internet-connected devices. One teacher stated that,

> Tech in the classroom can lead to distractions because the internet is at their fingertips. This includes a multitude of available free games, access to laptop cameras, access to other websites that aren't part of lessons, etc. Clear expectations must be set from the very start to help students understand the purpose of the technology, and to remember what is and isn't allowed (T12, Q13).

This reflects a widespread concern that without strong boundaries and expectations, technology can easily divert students' attention away from academic tasks. Another teacher expressed concern about "learned helplessness"—students becoming too reliant on technology for immediate answers stating,

> Another barrier is the ease in which students can resolve their problem, rather than spending some time trying to work it out themselves. In a way, it is a learned helplessness. I think students resist being confused for very long and quickly default to getting the 'answer' (T20, Q13).

This example highlights how overdependence on digital tools can weaken students' problem-solving, persistence and critical thinking skills.

Teachers also mentioned academic dishonesty, isolation, and even declines in foundational skills such as handwriting and communication. One participant discusses how technology can negatively impact how students communicate with one another saying, "Technology can be isolating, so that the sharing of ideas is limited and students are less likely to be exposed to others' perspectives... For Chromebook users, poor typing skills can be a barrier" (T23, Q13). Concerns like these emphasize the need for

intentional instructional strategies that balance independent work with meaningful collaboration. One teacher even described how students' basic skills have declined stating,

> Students' handwriting is suffering significantly... I think sometimes students don't understand that what is said/viewed online is not appropriate for the academic or 'real' world. It is what is referred to as 'keyboard courage.' Their sense of self, community, and society is skewed because of what they are able to view online (T3, Q15).

This observation suggests that excessive or unsupervised digital exposure may contribute to both academic skills decline and shifts in social behavior.

One participant shared how their own hesitation to use certain tools—due to concerns over misuse—may unintentionally limit students' access to engaging and challenging resources stating,

> I know there are resources out there that would challenge and enhance students' learning, but I am leery of students using shortcuts rather than using it to learn... So, my lack of use is a barrier for some students that might benefit from some engaging tech that would help students think and learn (T20, Q15).

This quote illustrates how teacher apprehension, while rooted in valid concerns, can also become a limiting factor in students' exposure to potentially valuable learning opportunities.

Using Educational Technology for Learning

Purpose for Using Technology in the Classroom

Participants described several key purposes for using and integrating technology into the classroom. The most common themes were student engagement, providing support for diverse learners and simply providing visual supports for all students during instruction.

Engagement

Several teachers discussed the role technology plays in supporting student engagement and particularly for students who might be difficult to reach using traditional teaching methods. One participant explained “I use it for engagement. Using technology can engage students that would not otherwise be engaged” (T16, Q9). Another teacher discussed the importance of engaging multiple senses saying, “I want to keep students' attention, to have words and images that support what I am teaching so learners engage multiple senses. I've found that things as simple as getting to write on the IFP helps to motivate students to engage and (hopefully) learn” (T23, Q9). These examples illustrate how teachers view technology as an important tool for sustaining student interest and participation in learning.

Support for Diverse Learners

Participants describe how technology serves as an important support for their diverse learners, especially students who struggle with reading and writing. One teacher discussed the importance of assistive technology tools "To support their ability to access their education when they cannot read or write or both” (T2, Q9). Another participant described how technology can be used for differentiation stating, “Also, I use it for differentiation. It allows teachers to differentiate assignments and projects for students. It is also good for tapping into more learning styles (T16, Q9). These responses suggest that teachers see how technology supports an inclusive learning environment that meets the needs of varied learners.

Visual Supports

Finally, teachers frequently mentioned the use of technology to provide visual supports that enhance comprehension and accessibility. A participant described how

interactive tools like IFPs and embedded timers supported visual learning and classroom management:

> Some classroom technology I use can help more students can see and follow along (IFP). Embedded timers help keep the lesson on pace and also let students know how much time they have to begin/complete work. I like some tech because it makes the lessons, examples, and/or demos more accessible to more students and in different ways. GoGuardian lets students know they are being monitored and can help them passively stay on task (T12, Q9).

Others pointed to the expanded possibilities for instruction through digital media, highlighting a “Variety of learning methods, variety of products, visuals, demonstrations, examples, modeling, primary source examples” (T27, Q9). Overall, participant responses suggest that teachers perceive technology as integral to fostering engagement, differentiation, and accessibility, thus enhancing both the teaching and learning experience in the classroom.

Choosing Technology for the Classroom

When selecting technology for classroom use, participants identified several key factors they considered important: ease of use, time investment, training availability, and the overall impact on student learning. One teacher explained that they evaluate technology by asking, "Ease of learning the tech myself, the time investment to do it right, how much (if any) training I have received from the district, the tech's practicality versus set-up time versus potential payoff (will it help the kids learn something), and whether it is visually appealing to me and students" (T12, Q16).

Teachers also focused on student accessibility and engagement when making choices. As one participant noted, "How easy it is for learners to use and engage with the tech. If the tool seems like it can greatly enhance learning, it's worth it to teach students to use it well. Who does it serve and who does it limit or create barriers for?" (T23, Q16).

Another participant emphasized balancing ease of use with learning benefits, stating, "Can everyone use it to better their learning, is it easy to understand, is it engaging for the student, does it reduce teacher workload, does it do a better job helping me teach and students learn than not having it?" (T28, Q16). These responses show that teachers view the selection of technology as a thoughtful process, weighing not just their own needs but also the needs and accessibility of their students.

Barriers to Using Technology in the Classroom

Despite the benefits of technology integration, teachers reported several barriers that complicate its use. Time emerged as a major obstacle, with one participant explaining, "Time to become a master at the tech, in order that it would be a useful tool to use with students" (T20, Q8). Others highlighted the lack of specific training, particularly for supporting special education students, noting simply, "Training. Understanding how to use [technology] in a special education setting" (T1, Q8).

Financial constraints were also a concern. One participant stated, "Money is usually the main barrier" (T16, Q8), while another mentioned lack of device familiarity, explaining, "I have operated in the Mac world for years, and have almost no experience using a Chromebook" (T26, Q8). Finally, some teachers pointed to a general lack of awareness regarding available tools: "Lack of funding, and lack of awareness of what tools are out there" (T3, Q8). These barriers highlight the challenges teachers face when attempting to effectively integrate technology into daily instruction.

Supporting Student Access to Technology

Participants shared the strategies they used to ensure students could successfully access and use technology. Establishing clear expectations and routines was a common theme. One teacher described their process: "Establishing expectations for how we take

care of technology in the classroom, making sure my Chromebook cart is plugged in, having enough headphones for everyone all the time, providing multiple examples of how to interact with the tech, and offering multiple learning/practice opportunities whenever exploring something new" (T12, Q11).

Others emphasized providing detailed tutorials and step-by-step instructions. As one participant explained, "We only use tech that there is enough of for each student. I give detailed instructions on how to access each site. I also give tutorials on using the sites before asking students to use them on their own" (T21, Q10). Another teacher highlighted the importance of technical troubleshooting skills: "I've learned to troubleshoot and address some of the more frequent issues with student Chromebooks" (T23, Q11). These examples demonstrate that successful technology integration often depends on proactive management and scaffolding by the teacher.

Professional Development and Adult Learning

How Teachers Learned to Use Technology

Most participants reported that they learned how to use technology primarily through independent efforts rather than formal training. One teacher shared, "Mostly learn on my own when I have time. We've received some educational technology PD in staff meetings, but it's almost always too fast with glossing over important details. Plus, we don't usually re-visit the specific PD" (T12, Q20). Others echoed similar experiences, with one participant noting, "Mostly I've learned on my own or from colleagues who've tried new things... it seems like as ed tech has proliferated, the responsibility to learn to use it has fallen more on individuals" (T23, Q20). Another added, "Most professional development has focused on a specific tool and its features, rather than on student engagement and learning" (T23, Q20). Participants also mentioned relying on informal

sources such as online searches, webinars, younger colleagues, and social media platforms (T23, Q21).

What Teachers Want from Future Professional Development

When asked about their needs for future training, teachers strongly emphasized the importance of meaningful, practical, and sustained professional development. One participant expressed a need for more in-depth training on existing systems: "I would appreciate PD on systems we already use so that I can use them as efficiently as possible" (T12, Q22). Another pointed out the unrealistic nature of brief or isolated sessions: "In a perfect world, one of the periods in our day would be dedicated to innovation and learning of new ideas and technology. It cannot be done in a 30-minute PD at the beginning of the day" (T20, Q22).

Participants also described a need for more individualized support. One teacher said, "I'd really love a real person to sit with me, listen to my 'Is there a way...?' and 'I don't know how to...' questions and show me the answers or direct me to the right place to learn" (T26, Q22).

Others expressed a desire for professional development focused on emerging challenges such as AI integration, preventing academic dishonesty, and using AI tools to enhance instruction (T27, Q22). Overall, teachers' responses indicate a strong preference for personalized, hands-on, and continuous learning opportunities that focus not just on tools, but on effective teaching and learning practices involving technology.

Trends Across Years of Experience and Content Areas

Trends for Professional Development and Adult Learning

Analysis of trends across years of experience and content areas revealed that teachers predominantly learn technology through self-directed exploration and peer

collaboration, rather than formal professional development. Curriculum adoption processes and district-created tools were also commonly cited as sources of learning. Teachers across all groups expressed a strong desire for more hands-on, revisit able training opportunities, with increasing interest in integrating AI tools and making better instructional use of classroom technologies like

Interactive Flat Panels.

Table 2

Code Co-Occurrence for Professional Development and Adult Learning

	WHAT PD WANT	Curriculum Adoption/Implementation	District Created Opportunities	Classes about specific products	Coaching Sessions 1:1 or small group)	Opportunity for practice and revisiting the training	Summer Tech Academy	Using the IFP Better	give credits for learning programs	Using AI in the classroom	Providing Feedback & Scoring with AI	WHERE THEY LEARNED	Curriculum Adoptions	District Created Resources/Tools	Social Media (Tik Tok, Facebook, etc.)	eers	Self	**PD in Building**
Years of Teaching: 1-5	2	0	0	0	0	0	0	0	0	0	0		1	1	0	0	1	4
Years of Teaching: 6-10	3	0	0	1	0	1	0	0	0	0	0		1	0	0	1	2	3
Years of Teaching: 11-15	3	1	0	0	1	0	0	1	0	0	0		1	2	1	2	1	4
Years of Teaching: 16-20	5	0	0	0	0	1	0	0	0	2	0		0	1	1	4	2	5
Years of Teaching: 21+		1	1	2	0	2	2	0	1	3	2		1	1	1	1	3	6
Content Taught: Special Education	4	0	0	0	0	0	0	0	0	0	0		1	1	0	2	2	4

Content Taught: Other	5	0	1	2	1	1	0	1	1	0	0		0	2	1	2	3	5
Content Taught: Humanities	5	0	0	0	0	1	2	0	0	5	2		1	1	2	2	1	6

To better illustrate the trends and patterns identified in participant responses related to professional development and learning sources, Table 2 provides a summary organized by years of teaching experience and content area. As shown, participants across all groups reported a strong reliance on self-teaching and peer collaboration, while formal professional development opportunities were less frequently cited as effective. Emerging needs, particularly around artificial intelligence (AI) integration and more effective use of Interactive Flat Panels (IFPs), were also highlighted as priorities.

Table 3

Summary of Trends in Professional Development Needs and Learning Sources by Teaching Experience and Content Area

Category	Trends Observed
Main Ways Teachers Learn	Self-teaching, Peers, District resources, Social Media (rising slightly)
Most Common PD Sources	Curriculum adoptions, District-created tools
Most Desired PD Formats	1:1 or small group coaching, hands-on practice opportunities, revisiting training
Newer Needs Emerging	Using AI in classrooms, AI for feedback/scoring, Better IFP use
Teachers with 1–5 Years	Rely more on Peers and Self; less formal PD requested
Teachers with 6–15 Years	Heavy self-learning; some social media learning; request more structured PD
Teachers with 16+ Years	Strong call for practical application-focused PD (especially AI and IFP usage)
Special Education Teachers	Need AI tools for struggling learners; self-learning emphasized
"Other" Content Area Teachers	More dependent on Peers and Social Media; want more specific content-based training

Humanities Teachers	High use of District resources; want coaching and applied practice sessions

Trends for Accessing and Using Technology

To better illustrate the trends and patterns identified in participant responses related to accessing and using technology, Table 4 provides a summary organized by years of teaching experience and content area. The trends in participants' reported barriers and technology selection reveal that ease of use, student engagement, and positive learning outcomes were the most influential considerations when teachers chose classroom technology. Across experience levels and content areas, teachers cited funding limitations and time to learn new technologies as significant barriers to effective integration into classroom use. Additionally, concerns about district-imposed restrictions and device availability were noted, particularly among more experienced teachers and those in specialized content areas. These patterns suggest that successful technology integration depends not only on tool selection, but also on systemic support and a need for ongoing teacher training.

Table 4

Code Co-Occurrence for Choosing and Accessing Technology

	BARRIERS GETTING & USING TECH	District controlling the available apps	Funding/ Money	Limited Experience with Hardware /Software	Class Size	Student Behaviors	Time to Learn/Lack of Knowledge	FACTORS TECH CHOICE	Availability of Devices	Ease of Use for Student	Can Be used by Diverse and Struggling Learners	Ease of Use for Teacher	Engagement	Fits the Curriculum/Standards	Positive Student Outcomes	Price	Time to learn the Tech vs Benefit it Provides	What is allowed by the district
Years of Teaching: 1-5		0	2	0	0	1	3		0	2	0	2	1	3	1	1	0	0

Years of Teaching: 6-10		0	1	0	1	0	4		0	1	1	1	1	0	1	0	2	0
Years of Teaching: 11-15		0	3	2	1	0	1		3	3	2	1	0	1	0	0	1	1
Years of Teaching: 16-20		1	1	1	0	1	2		1	2	0	3	0	2	0	0	1	0
Years of Teaching: 21+		0	3	0	0	0	1		1	1	1	3	4	2	3	0	1	1
Content Taught: Special Education		0	0	0	0	0	2		1	1	1	1	0	1	2	0	1	0
Content Taught: Other		0	1	2	1	0	0		3	2	2	2	1	1	1	0	1	0
Content Taught: Humanities		0	3	0	1	0	3		1	2	0	2	1	2	2	0	2	1
Content Taught: Math & Science		1	6	1	0	2	6		0	4	1	5	4	4	0	1	1	1

Trends for Barriers to Student Learning

Across participants, the most common concerns related to student use of technology centered around limitations on creativity, increased distractions, and the growing ease of academic dishonesty through AI tools. Table 5 shows these issues were noted across experience levels and content areas, although experienced teachers more frequently mentioned learned helplessness and lesson design challenges, while newer teachers highlighted the need for clear expectations and classroom management strategies. The data in Table 6 suggests that while technology offers many opportunities for engagement, without careful planning, it can also undermine critical thinking, collaboration, and student perseverance.

Table 5

Summary of Trends in Barriers to Using and Accessing Technology by Teaching Experience and Content Area

Category	Trends Observed
Major Barriers	Funding, Time to Learn, District Restrictions
Top Tech Selection Factors	Ease of Use (Students/Teachers), Engagement, Positive Student Outcomes
Teachers 1–5 Years	Focus on Ease of Use, Need Time to Learn Tech
Teachers 6–10 Years	Balance Ease of Use with Time Investment
Teachers 11–15 Years	Funding and District Control More Frustrating
Teachers 16+ Years	Focus on Curriculum Fit and Device Availability
Math & Science Teachers	Funding and Specialized Tech Needs are Key Barriers
Humanities Teachers	Engagement and Outcomes over Device Type
Special Education Teachers	Focus on Accessibility and Struggling Learners
"Other" Content Teachers	Need More Device Availability and Flexible Tools

Table 6

Code Co-Occurrence for Barriers to Student Learning

	Describe any way that students' use of tech is disempowering or creates bar...	Can limit creativity and innovation	Distraction from Task	Easier to use AI to Cheat	Learned Helplessness	Need Clear Expectations from Adults to Stay on Task	Not Everyone has internet access at home	Sleep Disruption	Encourages Individualization and not Collaboration	Lesson was not well-designed to use tech to support thinking	Overuse and kid lose engagement	REquires Students to be better Consumers of Knowledge from Different sources	Reduces Need for Critical Thinking	Teachers don't know enough about using AI	Tech is hard to navigate or learn
Years of Teaching: 1-5	4	0	3	0	1	2	0	0	2	0	0	1	1	0	3

Years of Teaching: 6-10	3	0	2	0	1	2	1	0	2	1	1	0	1	0	1
Years of Teaching: 11-15	3	1	0	0	2	1	0	0	1	0	0	0	1	0	2
Years of Teaching: 16-20	3	0	2	1	1	0	0	0	1	2	1	0	0	1	2
Years of Teaching: 21+	5	0	3	1	3	1	0	1	1	0	0	0	2	1	0
Content Taught: Special Education	3	0	2	0	2	0	0	0	0	0	0	0	1	0	1
Content Taught: Other	4	1	2	0	5	1	0	1	0	0	0	0	1	0	1
Content Taught: Humanities	5	0	2	2	2	1	1	0	4	1	1	1	2	1	1
Content Taught: Math & Science	6	0	4	0	1	4	0	0	1	2	1	0	1	1	5

To better illustrate the trends and patterns identified in participant responses related to barriers to student learning, Table 7 provides a summary organized by years of teaching experience and content area.

Table 7

Summary of Trends in Barriers to Student Learning by Teaching Experience and Content Area

Category	Trends Observed
Main Disempowering Factors	Loss of Creativity, Distraction, AI Cheating, Learned Helplessness
Teachers 1–5 Years	Focus on Distraction, Cheating, Need for Clear Expectations
Teachers 6–10 Years	Emphasis on Critical Thinking, Managing Student Attention
Teachers 11–20 Years	Concern about Overuse, Poor Lesson Design, Helplessness
Teachers 21+ Years	Broader concerns: Isolation, Creativity Loss, Behavior
Math & Science Teachers	Concerned about Distraction, Cheating, Creativity Limits
Humanities Teachers	Concerned about Critical Thinking and Tech Navigation
Special Education Teachers	Focused on Managing Student Expectations
Other Content Teachers	Concern about Isolation, Need for Collaboration

Analysis of participant responses revealed several ways in which technology use can be disempowering for students. Across all experience levels and content areas, teachers most commonly cited loss of creativity, increased distraction, the ease of using AI to cheat, and the development of learned helplessness as major concerns. Teachers with 1–5 years of experience emphasized the need for clear expectations to help students stay on task, while those with 6–10 years focused more on how technology can reduce critical thinking and distract from learning goals. Teachers with 11–20 years of experience highlighted challenges related to overuse of technology and poor lesson design that fails to support deeper thinking. Teachers with 21 or more years raised broader concerns about technology fostering isolation, behavior issues, and a loss of innovation.

Across content areas, Math and Science teachers expressed particular concerns about distraction, cheating, and creativity loss, while Humanities teachers noted issues

with tech navigation and students' critical thinking. Special Education teachers primarily stressed the need for clear expectations to support student success, and teachers in "other" content areas, such as arts and PE, pointed to the risk of technology encouraging individualization at the expense of collaboration. These findings suggest that while technology offers many benefits, its unsupported use can create significant barriers to student learning.

Trends for Supporting Student Learning

Participants overwhelmingly emphasized that technology plays a significant role in supporting student learning in a variety of ways, as shown in Table 8. Teachers reported that technology provided access to resources not otherwise available in the classroom, opportunities for faster feedback, and tools that help develop basic skills and promote deeper thinking. Across all experience levels, a major theme was the use of technology to support diverse learners, particularly through scaffolding tools and multiple means of engagement. Teachers also cited self-pacing, student choice, and multiple ways to demonstrate learning as important benefits. Those with 1–5 years of experience highlighted student empowerment through self-paced learning and hands-on opportunities, while those with more than 21 years of experience were particularly strong in emphasizing support for diverse learners and access to otherwise unavailable resources. Special education and Humanities teachers most often pointed to technology's ability to engage struggling learners and provide visual and flexible learning opportunities, while Math and Science teachers focused more on basic skill development, gamification, and hands-on applications. Overall, these findings suggest that teachers view technology not just as a tool for delivering content, but as a powerful means of individualizing instruction and supporting a wide range of student learning needs.

Table 8

Code Co-Occurrence for Supporting Student Learning

THEME: Supporting Student Learning	Access to Resources Not Readily Available in Clasrooms	They are Digital Natives	ools to supp ort Basic Skills	Feedback is faster to students to correct errors	help students to think	Supp ort Diverse Learners	Gamification	Visual Opportunities	Tools for Struggling Learners	Engagement/Motivation	Hands on Opportunities	Multiple Ways to show learning	Self-acing	tudent hoice	students to control their own le...
Years of Teaching: 1-5	5	0	2	2	4	4	0	0	2	0	1	2	2	1	5
Years of Teaching: 6-10	1	1	1	0	6	2	0	1	6	1	0	1	2	1	3
Years of Teaching: 11-15	1	0	1	2	3	6	0	3	0	1	0	0	2	0	3
Years of Teaching: 16-20	1	2	0	2	3	7	0	1	1	0	0	0	2	3	3
Years of Teaching: 21+	3	1	2	2	6	12	1	2	7	0	0	2	4	3	5
Content Taught: Special Education	2	1	1	0	5	4	0	0	6	0	0	1	1	0	3
Content Taught: Other	2	0	0	0	4	9	1	3	0	0	0	1	3	2	4
Content Taught: Humanities	4	2	2	3	6	4	0	3	7	1	0	2	5	6	5
Content Taught: Math & Science	3	1	3	5	7	2	0	1	3	1	1	1	3	0	7

To better illustrate the trends and patterns identified in participant responses related to how technology supports student learning, Table 9 provides a summary organized by years of teaching experience and content area.

Table 9

Summary of Trends in How Technology Supports Student Learning by Teaching Experience and Content Area

Category	Trends Observed
Main Benefits Identified	Access to resources, Faster feedback, Development of basic skills, Support for diverse learners, Student choice, Self-pacing
Teachers 1–5 Years	Focus on Self-Pacing, Hands-on Opportunities, Student Choice
Teachers 6–10 Years	Focus on Supporting Struggling Learners, Engagement, Self-Pacing
Teachers 11–20 Years	Emphasis on Support for Diverse Learners, Visual Opportunities, Promoting Deeper Thinking
Teachers 21+ Years	Strong focus on Access to Resources, Support for Diverse Learners, Student Motivation
Special Education Teachers	Highlight Technology for Struggling Learners, Support Diverse Learning Needs
Other Content Teachers	Focus on Visual Opportunities, Hands-on Learning, Engagement
Humanities Teachers	Stress Multiple Ways to Show Learning, Student Choice, Support for Basic Skills
Math & Science Teachers	Emphasize Basic Skill Development, Gamification, Hands-on Learning

The following chapter will interpret these findings, discuss their implications for practice, policy and programs as well as explore how they address the central research questions guiding this study.

CHAPTER V

DISCUSSION

The analysis of participant responses revealed that middle school teachers use educational technology primarily to enhance student engagement, provide visual and multimodal supports, and differentiate instruction for diverse learners. When selecting technology for their classrooms, teachers prioritized ease of use, accessibility for all students, and the potential to improve learning outcomes. However, this study also reinforced concerns raised in earlier research regarding barriers to technology integration. Consistent with findings by Inan and Lowther (2010) and Hew and Brush (2007), teachers cited time constraints, insufficient training, and funding limitations as major challenges. Similarly, participants' concerns about student distractions and over-reliance on technology echo findings by Zhao and Frank (2003), who highlighted unintended consequences of technology use in classrooms.

Teachers emphasized the importance of supporting student access through careful management of technology use. Professional development related to educational technology was often self-directed or peer-supported, with participants expressing a strong desire for more sustained, hands-on training that connects technology use directly to student learning goals. These findings inform a better understanding of the realities middle school teachers face when integrating technology.

The results from this study reflect a nuanced understanding of how middle school teachers experience the use of educational technology in their classrooms. Participants described a range of benefits, including increased student engagement, personalized learning opportunities, support for diverse learners, and enhanced opportunities for student critical thinking. At the same time, teachers acknowledged significant barriers,

such as distractions, over-reliance on technology, issues with skill development, and concerns about misuse and inequitable access between students and different classrooms. These findings highlight both the promise and the challenges of integrating technology into instructional practice and point to a need for intentional support for both students and teachers, thoughtful planning, and responsive professional development.

Purpose for Using Educational Technology

While technology is readily available in every building and classroom, it is surprising that technology is not being consistently used to support student learning. One issue that became clear over the course of this project is that there appears to be no consistent purpose described by teachers for using educational technology. Without a common purpose or vision for using technology, it is challenging to train teachers to implement a plan.

The district in this study has Technology Standards for students in grades K-12. The standards are based on the SAMR model (Hamilton, Rosenberg, & Akcaoglu, 2016) and have a clear continuum for what students should know and be able to demonstrate at each grade level. However, there are no clearly communicated expectations for how schools and teachers should teach them. At the beginning of each school year, there are Digital Citizenship lessons that are shared by Instructional coaches in the district. These lessons focus more on the etiquette of using technology appropriately and how to remain 'safe' in a digital environment. This information is very important but does not take into consideration actual skills that students need to use technology to support their learning. Our current students are considered "digital natives." They have grown up using technologies such as tablets, cell phones, and computers. What we don't teach are the skills that students need. According to Education Week, these include graphing, using

spreadsheets, analysis tools, formatting styles, citing digital sources and typing skills, coding, file management, and media literacy to assess the accuracy and legitimacy of information they see online (Langreo & Solis, 2024).

Teachers were able to identify both benefits and barriers that technology creates for student learners. I believe that both could be supported or mitigated if the district had a clear purpose and vision for the use of educational technology in the classroom. This clear purpose would help teachers know what needs to be done in their classrooms, which in turn will help teachers identify their needs for professional development using technology.

Accessing Technology in the Classroom

Once teachers have a clear understanding of what technology skills need to be implemented in the classroom, they should be able to communicate what they need for students to access technology more frequently and successfully. Several teachers, especially those who teach classes other than the standard core classes (humanities, science, math) expressed the need for students to also have access to Chromebooks in their classes. In most schools, there are not enough Chromebooks available for every classroom. Classes such as Band and Art have articulated ways that they want to use technology to support but don't have access to computers. If a common purpose for using technology existed for the district, it would be easier for teachers to justify why they also need technology in classrooms beyond core content.

Allowable Resources

Participants in the study frequently mentioned that a big barrier to using technology was "the district" and not being allowed to use resources that they wanted. A clearer explanation about what criteria are considered when selecting allowable apps,

programs and software is needed. We need a published set of critical minimums so that teachers can use them when researching resources and not get excited about something that will not be allowed. Teachers feel frustrated when they spend time and energy searching for something that fills a need in the classroom, only then to be told that they can't use it. It would be beneficial to develop a system for teachers to communicate with the tech department or tech instructional facilitators the needs they are seeing in the classroom and then receive coaching and support to find appropriate, allowable technology.

Budgeting to Support Technology

Teachers in this study mentioned that money was a significant reason that they don't use technology in their classrooms. They don't feel that there is enough money available to access the technology that they want or need to be better teachers. In my experience as a building principal, I have found that schools do not allocate much money from the discretionary budget for technology. The money that is budgeted typically is spent on repairing and replacing student and staff computers. I wonder if this is because of the cost of programs such as license agreements. Programs such as Go Guardian can be useful in supporting classroom management of students when they are using computers, however the per pupil cost is very prohibitive for many building budgets.

Classroom budgets allocated to teachers are spent on classroom supplies which do not include money for technology. The amounts that classrooms typically receive would not be adequate to cover the cost of even one program. This creates a barrier for principals expecting that teachers are using technology in their classrooms and a barrier for teachers because they report that this factor keeps some of them from even looking for new or more technological resources.

Professional Development and Adult Learning

After a clear purpose for using technology has been established, the process of identifying and providing professional development for teachers to effectively integrate technology into their lessons should be the next step. While teachers recognize the value of educational technology, their experiences reveal that current professional development models often fall short, leaving many educators to independently seek out the training and resources they need to integrate technology effectively. Participant responses consistently emphasized that most learning occurred informally—through self-teaching, peer collaboration, and trial and error— rather than through structured, district-provided professional development.

Redefining Teacher Proficiency with Educational Technology

While the original research questions anticipated that teachers would describe their own levels of technological proficiency, the findings of this study suggest that "proficiency" is far more nuanced than simply mastering basic operational skills. It involves more than general comfort or confidence with educational technology. Previous frameworks such as the Technology Acceptance Model (TAM) and Technological Pedagogical Content Knowledge (TPACK) have explored how teachers' perceptions of efficacy and attitudes influence their technology use. TPACK, in particular, emphasizes the importance of pedagogical content knowledge when integrating digital tools effectively into instruction.

Building on this foundation, the current study—through the perspectives of middle school teachers—suggests a more expanded definition of proficiency. Here, technological proficiency is not defined solely by what teachers know or can operate, but by how they intentionally integrate technology to enhance student engagement, support

diverse learners, and foster critical thinking. Teachers demonstrated proficiency through reflective practice, adjusting their instructional approaches based on student needs and learning outcomes. This reconceptualization positions proficiency as a dynamic, context-dependent skill set that blends technical ability with instructional strategy and adaptability.

Participants' responses revealed that true proficiency involves the intentional and thoughtful integration of technology into instruction in ways that promote student engagement, support diverse learners, and foster critical thinking. Additionally, many teachers demonstrated proficiency through reflective practice—adjusting their use of digital tools in response to student needs and evolving classroom contexts. These insights suggest that district efforts to evaluate and support teacher proficiency must move beyond one-size-fits-all technical training. Instead, they should prioritize pedagogical alignment, adaptable implementation, and continuous reflection to ensure technology is used to deepen student learning.

To support this reconceptualization, this study offers a working definition of a "proficient" middle school teacher in educational technology. Proficiency, as described by participants, is best understood as a combination of applied technical skill, pedagogical intentionality, and reflective decision-making. A proficient teacher effectively integrates digital tools into instruction, strategically enhances learning opportunities, and adapts use based on student needs and instructional goals—not simply through comfort with devices, but through instructional purpose and student impact.

Addressing Teachers' Professional Development Needs

The findings from this study highlight a significant gap between the professional development teachers have historically received and the support they believe is necessary

for effective technology integration. Participants reported that much of their knowledge about educational technology was gained informally—through self-teaching, collaboration with peers, or trial and error—rather than through structured, district-provided training. Although some professional development opportunities existed, they were often described as one-time sessions that moved too quickly, glossed over key details, or focused narrowly on introducing specific tools without connecting to broader instructional goals.

Building on these findings, teachers identified several specific learning needs that must be addressed to better integrate technology into their classrooms. First, they emphasized a strong need for time to explore and practice with technology before being expected to use it meaningfully with students. Participants expressed that they often lacked time during the school day or school year to engage deeply with new tools like Interactive Flat Panels (IFPs), learning management systems such as Canvas, updates to administrative systems like Synergy, and emerging technologies like AI. This limited time created hesitation and superficial use, rather than integration that enhances student learning.

Teachers also clearly articulated the need for training that goes beyond basic functionality. They want to learn how to use technology for engagement, how to support diverse learners more effectively, and how to create assignments and assessments that leverage technology as a learning tool, rather than encouraging shortcut behaviors like simply "looking up" answers. Few participants, for example, could describe robust strategies for supporting language learners with technology beyond basic translation tools, suggesting an important area for growth in a district with many language learners. Teachers consistently voiced a need for PD that focuses on instructional design and

classroom management strategies that align with technology use, emphasizing that technology must be integrated into lessons—not treated as a stand-alone activity disconnected from curricular goals.

Methods for Delivering Professional Development

In terms of methods for delivering professional development, participants advocated for more differentiated, ongoing, and flexible options. Many emphasized that training should be personalized to varying experience levels, from basic users to more advanced early adopters. Suggestions included offering coaching for individuals and small groups, drop-in office hours, video libraries for on-demand support, and revisiting trainings regularly rather than offering one-shot workshops.

Schools could also benefit from capitalizing on peer learning, recommending that the district and schools highlight teachers who already model strong technology integration to lead or mentor others. Teachers clearly indicated that they learn best when they can observe, collaborate, and innovate alongside colleagues rather than passively receive information.

The findings also point to a broader concern: if teachers are not supported to grow their skills, students' learning opportunities will be limited. Students today are digital natives, and they already engage daily with technology that is increasingly sophisticated and pervasive. Several participants pointed out that adult hesitation, lack of familiarity, or limited training should not be the reason students miss out on rich, relevant learning experiences. Preparing teachers to integrate technology meaningfully and confidently is not just an issue of professional growth, but one of equity and access for students in a rapidly changing world.

In summary, teachers' descriptions of their needs make clear that professional development for educational technology must evolve—focusing not only on tool acquisition but also on pedagogical integration, student engagement, and authentic learning design—to truly support both teachers and the learners they serve.

Student Learning

Beyond professional growth, the findings also emphasize that effective technology integration has a direct and powerful impact on student learning, particularly in fostering engagement, supporting diverse learners, and developing critical thinking skills. Students will have a richer experience when their teachers use technology frequently and effectively in the classroom. Failing to teach students to be responsible users of technology and critical consumers of information does a disservice to their future success.

Technology Supports Student Engagement and Motivation

Students today have been immersed in technology their entire lives; it shapes how they interact with the world. They are accustomed to immediate access to information, often through platforms designed primarily for entertainment such as TikTok, social media, and online gaming. These experiences typically involve short bursts of content that demand only brief attention spans. As a result, one of the primary challenges for educators is helping students differentiate between technology used for entertainment and technology used for learning. Students are unlikely to remain engaged with long, unstructured tasks unless assignments are broken into smaller, manageable components.

To better engage students, teachers must design assignments and assessments that promote student choice, creativity, collaboration, and multimodal demonstrations of learning. Many schools have begun to incorporate Universal Design for Learning (UDL)

principles into lesson planning, which align well with technology integration. UDL encourages varied means of expression, allowing students to use technology to represent their learning in diverse, personalized ways. Providing students with choices can be a powerful motivator, fostering greater ownership and engagement in their learning process. Additionally, assignments should prioritize deeper learning outcomes rather than focusing solely on narrow methods of assessing mastery. Technology offers opportunities for self-pacing when paired with timely and specific feedback, enabling students to move forward without waiting for traditional grading cycles, especially on formative tasks.

Shifting instructional practices in this way will require changes for many educators, particularly those accustomed to more traditional methods of assessment and lesson delivery. As such, teachers will need targeted professional learning focused on designing assignments that encourage critical thinking rather than mere information retrieval. If students can simply "Google" an answer, educators must reconsider whether the questions being asked are meaningful and whether the tasks are truly promoting cognitive engagement. Instruction must move beyond simply locating information and instead prioritize teaching students how to analyze, evaluate, and apply what they learn. In addition to supporting motivation and engagement, technology also plays a vital role in expanding access for students with diverse learning needs.

The findings of this study both support and extend existing research about educational technology integration in classrooms. Prior studies have emphasized that technology can enhance student engagement, foster differentiation, and promote the development of 21st-century skills (Ertmer & Ottenbreit-Leftwich, 2010; Mishra & Koehler, 2006). Participants in this study confirmed these benefits, frequently noting that

technology allowed for student choice, supported diverse learners, and created opportunities for self-paced learning.

Technology Expands Access for Diverse Learners

It was notable that many teachers in this study had limited knowledge of how to support language learners beyond the use of basic translation tools or Chrome extensions for text-to speech functions. In a district where students with disabilities and language learners perform well below those of grade level peers, this highlights a critical need for professional development focused on expanding the repertoire of technological supports available for English Language Development (ELD) students. Similarly, there is a pressing need for better integration of technology to support students with disabilities. A collaborative approach to lesson planning— between general education teachers, special education teachers, and ELD specialists—could significantly improve how technology is used to address the diverse needs of all learners. Co-planning and resource sharing would not only promote more equitable access but also lead to richer and more inclusive learning experiences across all classrooms.

Another gap that emerged in participants' responses was the lack of discussion around supporting gifted and advanced learners through the use of technology. Gifted students are a critical part of the diverse learner population, yet strategies for using technology to meet their needs were largely absent. Integrating principles of Universal Design for Learning (UDL)— particularly by offering student choice, opportunities for deeper exploration, and multiple means of demonstrating mastery—could provide advanced learners with more rigorous, engaging, and meaningful learning experiences. Technology, when used thoughtfully, has the potential to differentiate instruction at all

levels, supporting both struggling and advanced students in achieving their fullest potential.

Technology Can Also Create Learning Barriers

While technology offers numerous benefits to student learning, it can also create significant barriers if not intentionally integrated into instruction. Participants in this study frequently noted that access to internet-connected devices increases the likelihood of distraction, with students often drawn to games, social media, or unrelated websites during instructional time. Several teachers expressed concerns about students developing "learned helplessness," where they rely on technology to immediately find answers rather than engaging in problem-solving or perseverance. Additionally, technology can foster academic dishonesty, particularly with the growing availability of AI tools that allow students to bypass critical thinking processes. Participants pointed to emerging challenges, such as managing rapidly evolving AI tools and resources in the classroom, a topic only recently beginning to appear in scholarly discussions (Luckin, 2021). These results suggest that, while access to technology is improving, systemic supports for professional learning and clear instructional purposes for technology use are increasingly critical. Without these supports, even well-resourced classrooms may fail to fully realize the transformative potential of educational technology.

Teachers also observed that technology sometimes promotes isolation rather than collaboration, as students work independently rather than engaging with peers to develop and exchange ideas. Finally, without clear expectations and purposeful instructional design, students may over-rely on technology as a crutch, limiting the development of foundational skills such as communication, handwriting, and critical analysis. These barriers highlight the need for teachers to approach technology integration thoughtfully,

emphasizing active engagement, collaborative learning, and critical thinking over passive consumption of information.

Implications for Practice, Professional Development, and Policy

Information discovered in this project can be used to support teaching and learning in the school district. Themes and patterns that emerged from the data can be used by district and building administrators to support teachers in effectively using educational technology in classrooms. Data about what additional professional development teachers feel would be beneficial can inform decisions that are made about professional learning opportunities that are created for teachers. Information about the types of educational technology that are currently being utilized in classrooms can help our district make more informed decisions about the technology that is available for teachers, technology that teachers would like to use, and technology that is not being used and could possibly be replaced.

Table 10 summarizes the key policy implications that emerged from the findings of this study, highlighting areas where district-level action could better support educational technology integration. First, ensuring equitable technological access remains essential, as several participants noted inconsistent access to devices and internet among students. Second, sustainable budgeting practices are needed to maintain, upgrade, and expand technology resources, addressing widespread concerns that funding limitations hinder innovation and access. In addition, the study emphasizes that professional development must be ongoing, differentiated, and focused on instructional integration rather than just technical tool use, responding to teacher feedback about the ineffectiveness of one-time training sessions. Finally, improving communication about available technology resources—through electronic newsletters, instructional coaching,

or regular showcases of teacher leaders—was identified as a necessary step, as some teachers reported a lack of awareness about existing district-supported tools. Collectively, these policy implications point to the need for a more strategic approach to technology integration that addresses infrastructure, training, communication, and sustained teacher support.

Table 10

Summary of Policy Implications for District-Level Support of Technology Integration

Policy Area	Implication	Connection to Findings
Technology Access	Ensure all classrooms and students have equitable access to up-to-date devices and internet.	Teachers reported inconsistent access to devices and tech gaps among students.
Technology Budgeting	Allocate sustainable funding for purchasing, maintaining, and upgrading instructional technology.	Teachers cited funding limitations as a barrier to tech use and innovation.
Professional Development	Fund continuous, differentiated PD that focuses on technology integration, not just tool operation.	Teachers requested hands-on, revisitable, practice-based PD focused on instructional use.
Communication of Resources	Develop consistent strategies (newsletters, tech hubs, showcases) to inform teachers about available tools and updates.	Some teachers were unaware of existing district tech tools and resources.

Table 11 summarizes critical implications for improving professional development to support technology integration. Teachers emphasized the need for ongoing, revisit able PD rather than isolated sessions, and highlighted the importance of differentiating training based on experience and skill level. To address the diverse professional development (PD) needs of teachers, the district should consider implementing a more flexible and differentiated model for training related to technology integration. Findings from this study revealed that teachers' PD needs vary significantly

depending on their content area, teaching assignment, and experience level. Therefore, a one-size-fits-all approach may no longer be sufficient to support effective technology use across classrooms.

It is recommended that the district begin by surveying teachers to gather data on their specific needs and preferences. This data can then inform the design of a responsive PD model that offers multiple entry points for learning. For example, concurrent content-specific sessions could be offered during existing PD windows, such as weekly collaboration times or Wednesday training blocks. In addition, offering a variety of formats—including pre-recorded instructional videos, live virtual sessions (e.g., via Google Meet), and scheduled office hours with the district Technology Coach—would allow teachers to engage in professional learning in ways that best align with their schedules and learning styles.

Moreover, the district could consider empowering building administrators to select from a set "menu of trainings" curated by the Technology Coach or instructional technology team. This approach would enable leaders to tailor PD offerings to the needs of their individual school communities while maintaining alignment with broader district goals. Ultimately, this flexible model recognizes that ongoing, differentiated, and job-embedded professional development is essential for supporting teachers in moving beyond basic tool usage toward intentional, pedagogically grounded integration of technology.

Participants also called for a shift in focus from simply learning new tools to integrating technology meaningfully into instruction. Hands-on, practice-based opportunities, such as live modeling and co-teaching, were identified as essential for

building confidence. Teachers reported learning best from peers already using technology effectively and requested flexible delivery options, including coaching, video libraries, and asynchronous modules. Additionally, there was a strong need for targeted training on emerging technologies like AI, reflecting growing concerns about classroom implications. These findings point to the need for professional development that is practical, personalized, and aligned with teachers' instructional goals.

Table 11

Summary of Implications for Professional Development to Support Technology Integration

Focus Area	Implication	Connection to Findings
Ongoing Professional Development	Offer continuous, revisit able PD opportunities instead of one-time sessions.	Teachers described one-off trainings as ineffective and overwhelming.
Differentiated Learning	Tailor PD to teachers' varying experience levels and needs, from basic tech skills to advanced integration.	Participants at different experience levels expressed different needs, yet PD was often one-size-fits-all.
Instructional Integration Focus	Shift PD to emphasize how technology supports engagement, deeper learning, and critical thinking.	Teachers wanted to move beyond just learning tools to applying them meaningfully.
Hands-On, Practice-Based PD	Provide live modeling, co-teaching, and application opportunities during PD sessions.	Teachers requested real-time practice to feel confident using new technologies.
Peer Learning Opportunities	Leverage experienced teachers to mentor and model effective technology use for their peers.	Participants reported learning best from colleagues already using tech successfully.
Flexible Delivery Formats	Incorporate coaching, drop-in office hours, video libraries, and asynchronous learning options.	Teachers asked for more accessible and flexible learning opportunities.

Training on Emerging Technologies (AI)	Prepare teachers to understand, implement, and manage new tools like AI in classroom instruction.	Teachers expressed uncertainty and concern about AI tools and ethical challenges.

Table 12 outlines key implications for instructional practice to support more effective technology integration in classrooms. Teachers emphasized the need for professional development that is ongoing, differentiated, and hands-on, focusing on pedagogy and lesson integration rather than isolated tool training. A major barrier identified was the lack of time for teachers to explore and practice with new technologies, suggesting a need to find ways to embed adult learning of technology into regular PD time. It should not be a separate consideration for adults when discussing lesson planning, using the aligned curriculum and developing daily lesson plans.

Participants stressed that technology should be woven into daily instruction for students, not treated as a separate or occasional activity. There was also a strong call for strategies and resources to better support diverse learners, particularly language learners and students with disabilities. Teachers expressed the importance of designing student-centered assignments that foster critical thinking, creativity, and authentic engagement, rather than promoting surface-level use of technology.

Finally, the study reinforced that peer learning—creating opportunities for teachers to learn from colleagues already integrating technology effectively—was one of the most valued and impactful supports. Together, these findings highlight that successful technology integration requires thoughtful instructional planning, professional collaboration, and sustained support structures.

Table 12

Summary of Implications for Practice: Supporting Effective Technology Integration

Practice Area	Implication	Connection to Findings
Professional Development Design	Offer ongoing, differentiated, and hands-on PD focused on pedagogy and lesson integration, not just tools.	Teachers requested coaching, revisit able trainings, and more practical, application-based learning.
Time for Technology Mastery	Embed dedicated time for teachers to explore, practice, and integrate technology meaningfully into lessons.	Lack of time was a major barrier for mastering and using tech effectively.
Focus on Instructional Integration	Support teachers in embedding technology into daily instruction, not treating it as an "extra" or separate activity.	Teachers emphasized the need to move beyond tech as a standalone activity toward tech-enhanced lessons.
Supporting Diverse Learners	Provide training and resources on using technology tools to differentiate instruction and support language learners, students with disabilities, and struggling learners.	Teachers highlighted limited strategies for supporting diverse learners through technology.
Student Centered Learning	Encourage the design of assignments and assessments that promote critical thinking, creativity, and student choice using technology.	Teachers stressed concerns about "shortcut" behaviors and emphasized technology's role in fostering deeper thinking.
Leveraging Peer Expertise	Create formal opportunities for teachers to learn from colleagues already successfully integrating technology.	Teachers noted peer learning as one of the most effective ways they learned about tech practices.

Recommendations for Future Research

Several recommendations for future research emerged from the findings and limitations of this study.

- **Broaden the Sample Population:** Future studies could expand beyond one district to explore middle school teacher experiences across multiple districts or states to increase

generalizability. It would be interesting and beneficial to expand the research and explore teacher practices at elementary and high school levels.

- **Include Student Perspectives**: Research capturing how students view the impact of technology on their learning could provide valuable insight into the effectiveness of different integration strategies.
- **Study Parental Support for Technology**: Future research should examine how schools can better support families, especially those who may not be tech-savvy, in assisting their children with technology-based learning and provide them with opportunities to stay involved in their student's learning.
- **Focused Research on AI Integration**: As AI tools become more prevalent, there is a growing need for studies on how teachers can ethically and effectively incorporate AI into classroom practice.

Limitations

It is important to consider possible limitations to the study which can pose threats to the validity of the findings. Primary limitations in this study were associated with the sample and my relationship with the participants and setting, and the challenge of recruiting participants from a teaching workforce who are already very busy. While the initial framing of the research question sought to explore teacher self-perceptions of technological proficiency, the data did not yield direct responses aligned with this aim. Instead, participants shared detailed descriptions of classroom technology use, beliefs about its value, and examples of implementation. This shift suggests that future studies might benefit from more precise wording (e.g., focusing on *practices* or *integration strategies* rather than *proficiency*), or combining qualitative inquiry with a structured self-assessment tool to capture perceived proficiency levels.

Summary of Key Findings

The purpose of this qualitative study was to explore middle school teachers' experiences using educational technology in their classrooms. In an era where technology is increasingly embedded in education, understanding how teachers perceive, integrate, and support student learning through technology is critical to informing future practice and policy.

This study found that while teachers recognize the potential of technology to enhance engagement, support diverse learners, and promote critical thinking, they face significant barriers such as lack of time, insufficient professional development, and funding limitations. Importantly, teachers stressed the need for clearer district-wide expectations and more sustained, practical, and differentiated professional learning opportunities. Additionally, emerging challenges related to AI and student independence highlight the need for evolving instructional practices.

Significance of Study

These findings contribute to the growing body of literature emphasizing that access to devices alone is not sufficient when using educational technology to support student learning. Successful technology integration requires thoughtful instructional design, robust professional learning, and ongoing teacher support. By centering the voices of middle school teachers, this study sheds light on the realities of classroom practice and offers valuable insights for administrators, policymakers, and educators striving to bridge the gap between technological availability and meaningful educational use.

In an increasingly digital world, preparing students to navigate technology critically and responsibly is essential. Teachers must be equipped not only with tools but with pedagogical strategies and confidence to integrate technology in ways that empower all learners. The findings of this study reinforce that educational technology is most impactful when it is integrated by teachers with intention, supported by professional learning, and guided by a clear vision for student use and success.

APPENDIX A

Qualtrics Survey Questions

1. Grade Levels Taught
2. Content Areas Taught
3. Years of Teaching Experience
4. Years of Teaching in Current School
5. What kinds of technology(hardware) do you have in your classroom?
6. What kinds of educational software (programs, apps, websites) do you use in your classroom?
7. What other educational technology items would you like to have in your classroom? Describe them.
8. What barriers keep you from getting and/or using more educational technology?
9. When using educational technology to deliver instruction to students, what is its purpose? Why do you use it?
10. How do you think technology supports student learning in your classroom? Why do you think this?
11. What strategies do you use to ensure that all students are able to access the technology in the classroom?
12. Describe the ways that technology empowers students to control their own learning.
13. Describe any way that students' use of tech is disempowering or creates barriers to their learning.
14. In what ways does your use of tech in the classroom help students to think and learn more?

15. In what ways does your use of tech present barriers to students' abilities to think and learn more?
16. When considering different types of educational technology to use during instruction, what factors influence your decision?
17. What types of educational technology do you use to support diverse learners such as EML (emerging multilingual) students?
18. What types of educational technology do you use to support diverse learners such as students with disabilities (504 or IEP)?
19. What types of educational technology do you use to support diverse learners such as TAG students?
20. What types of professional development have you participated in that focused on using educational technology in the classroom?
21. Where else have you learned about technology?
22. What additional professional development would you like to receive to support using technology in your lesson planning and classroom instruction?
23. If you have a problem involving technology, how do you get assistance?

Appendix B

Final Parent and Child Codes

Parent Codes	**Child Codes**
Accessing & Using Technology	Supporting Student Access to Tech Barriers to Getting Tech
	Factors Influencing Tech Choices
Benefits to Student Learning	Supports Critical Thinking Supports Diverse Learners Supports Engagement Supports ALL Learners Supports to Control Their Own Learning
Barriers to Student Learning	Describe ways tech is disempowering Ways tech creates barriers to learning
Professional Development & Adult Learning	What professional development would they like to receive Where they learned about tech

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