No Teacher Left Behind. Integrating Technology in Urban P-12 Classrooms Using the SAMR Model: A Qualitative Case Study of Urban Public Schools

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Abstract

In this study, I investigated the integration of technology in urban P–12 classrooms using the SAMR (Substitution, Augmentation, Modification, Redefinition) model as a framework. The research explored how urban teachers employ technology to enhance instruction and the impact of these practices on student outcomes. Using a qualitative case study design, the study involved semi-structured interviews with 20 urban educators, focusing on their experiences with technology integration. The findings revealed that substitution of traditional methods with digital tools is most common, with teachers using learning management systems and interactive tools to streamline tasks. Augmentation occurred when technology enhanced the learning experience, providing real-time feedback and collaboration. Modification was observed in lessons redesigned through technology, where students created multimedia projects and engaged in simulations. The results highlight the importance of teacher preparedness, infrastructure, and professional development in advancing technology use, suggesting that while substitution is prevalent, progress toward more transformative technology integration is contingent on systemic support. The study's insights are crucial for developing strategies to optimize technology integration in urban educational settings.

Keywords: technology integration, SAMR Model, urban education, P-12 classrooms, educational technology, qualitative case study.

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Chapter 1: Introduction

School administrators and stakeholders assert the need to incorporate technology into P–12 learning environments, especially during the COVID-19 pandemic (Lisi, 2021). As the world undergoes increasing digital transformation, educators face the challenge of identifying innovative methods to employ technology based on its potential to promote creative thinking in students (Li et al., 2022). Rapid technological advancements offer opportunities and challenges for educational professionals striving to stay informed about best practices in integrating digital tools within their classrooms (Göçen et al., 2020). This beginning sets the groundwork for a comprehensive investigation into the effectiveness and impact of implementing different technological approaches, tools, and devices in urban P–12 settings. A multilayered context encompasses the fusion of technology in urban P–12 educational spaces, considering socio-economic aspects, discrepancies in resource accessibility, insufficiently funded school infrastructures, and the demand for highly proficient educators capable of effectively incorporating technology-based instructional techniques to captivate diverse learner demographics.

Several issues arise when integrating technological elements into teaching methodologies; for instance, a lack of adequate training or support may hinder effective utilization and result in underusing or misusing these devices (Tueller et al., 2020). Studies demonstrate that when expertly applied, innovative technological interventions improve student achievement and motivation (Ibáñez et al., 2020). Current research provides an understanding of various aspects of technological integration, including its implications on pedagogical strategies and instructional design models like the SAMR (substitution, augmentation, modification, redefinition) framework, which guides educators in thoughtfully incorporating digital tools

(Syathroh, 2022). The advancements achieved through technology integration across various education levels indicate a potential for enhancing educational outcomes. Therefore, there is a need to explore how urban schools can effectively use technology to prepare their students for life after school.

By exploring these themes through this investigation, the aim was to expand comprehension of how technological developments could be exploited more effectively within metropolitan P–12 environments. This qualitative case study research arose from several contributing factors. First, it recognizes that while substantial research on technology integration in education exists, myriad explorations have neglected to concentrate exclusively on urban P–12 settings, where complex socio-economic elements are at play. Second, despite numerous scholars scrutinizing various aspects of successful technological integration solutions, a gap remains in understanding the most effective approaches for integrating technology to improve student outcomes within these contexts (Perry, 2018).

This qualitative case study probed the intricacies entwined with technology integration in urban P–12 learning spaces. As part of this inquiry, the SAMR model was introduced as a potential structure for enabling more effective implementation strategies. Furthermore, numerous facets of research methodology and design were discussed, encompassing qualitative investigative techniques and case study design. An essential aspect of exploration involved contributing to comprehending the challenges and opportunities associated with integrating technology into metropolitan P–12 classrooms, thus guiding future instructional policies and practices.

This qualitative research was meant to enrich educational results for students residing in urban areas by scrutinizing how digital tools could be utilized more proficiently within these unique environments. In conclusion, this study’s introduction emphasized the pertinence and significance of examining urban P–12 classroom technology integration from diverse perspectives. By systematically and sensitively addressing these concerns, efforts were made to provide valuable insights into optimal practices that educators, eager to maximize technological resources for enhanced student success, may adopt. The ongoing nature of this investigation cultivated an increasingly profound pool of knowledge that informs future endeavors to bridge the gap between potential capabilities and tangible outcomes when seamlessly integrating technology within educational contexts.

Statement of the Problem

The problem to be addressed in this study is that inefficient integration of technology in urban P–12 classrooms results in suboptimal student performance and inadequate preparedness for a digitized world (Rajasekaran & Casap, 2022; Singun, 2025). Challenges include resource disparities, insufficient teacher training, and inadequate infrastructure (Perry, 2018; Stahl et al., 2018). While studies on technology integration exist, few focus on urban P–12 contexts. Timotheou et al. (2023) highlighted the challenges of digital technology in education and recommended further research, particularly in P–12 schools. Similarly, Vidal-Esteve and Martín-Gómez (2023) suggested expanding research to other compulsory education settings. Urban P–12 schools, serving diverse student populations, often experience disparities in technology access, limiting students' readiness for digital careers, particularly those from lower-income backgrounds (Kalati, 2022). Many educators lack adequate training and support for effective technology-driven instruction. Addressing these issues requires bridging resource gaps, improving teacher training, and enhancing infrastructure to ensure equitable access to digital tools for academic and professional success.

This study addressed gaps in research by focusing specifically on urban P–12 technology integration. The findings contributed to theoretical frameworks such as the sociocultural theory of learning, which emphasizes the role of social and economic factors in education (Ünlüsoy et al., 2022), and the technological pedagogical content knowledge (TPACK) framework, which underscores the importance of educator proficiency in digital instruction (S. Lee et al., 2022). Investigating the barriers and best practices in urban technology integration ensures that this research provides insights for policymakers and educators, offering strategies to improve student outcomes and bridge digital divides. Ultimately, this study aimed to enhance urban schools' ability to prepare students for the evolving technological landscape.

Purpose of the Study

The purpose of this qualitative case study was to explore the effectiveness and impact of technology integration in urban P–12 classrooms using the SAMR model (substitution, augmentation, modification, redefinition) as a guiding framework. This study examined how urban educators applied technology to enhance instruction and improve student outcomes, addressing challenges such as socio-economic disparities, limited resources, and insufficient teacher training. The research was field tested in multiple urban P–12 schools in the northeastern United States, using a sample of 20 educators. Data were collected through semi-structured interviews that were field tested and classroom observations to analyze how teachers implemented technology at various SAMR levels and its impact on student learning. Findings from this study provide insights into best practices for integrating technology in urban classrooms, offering strategies to bridge digital divides and enhance instructional effectiveness. To protect participant confidentiality, pseudonyms were used for schools and educators.

Introduction to Theoretical Framework

The SAMR model, formulated by Puentedura, was the theoretical framework for this investigation. SAMR signifies substitution, augmentation, modification, and redefinition and embodies a hierarchy of technology incorporation tiers in the classroom (Lacruz, 2018). Using this four-level classification, educators must be capable of detailing and classifying their utilization of technology. The comprehensive nature of this framework also permits researchers and managers to perform evaluative assessments by carefully considering the integration of technologies within institutional and scientific contexts (Bicalho et al., 2023). Overall, the model directs educators in transforming their instruction with technology by advancing through these four phases, from merely substituting traditional techniques to completely transforming teaching and learning experiences.

Substitution

This is the first phase of the SAMR model. It involves the use of technology as a substitute for an action with no functional change (Bicalho et al., 2023). The initial level of substitution involves employing technologies to enhance teaching effectiveness and contribute to improved learning through their application. At the substitution level, educators employ technology as a direct substitute for a traditional tool or process without any significant change in the task (Bicalho et al., 2023). For example, a teacher may use a word processor instead of paper and pen for writing assignments. This level provides some advantages, such as improved legibility and ease of editing; however, it does not alter the nature of the task (Bicalho et al., 2023).

Augmentation

The second phase of the SAMR model is the augmentation phase. In augmentation, a teacher employs technology to enhance the task that was previously accomplished without it (Bicalho et al., 2023). It goes beyond mere substitution by adding functionalities that improve efficiency or quality. For example, an educator may employ word processor features such as spell check or a thesaurus to enhance the writing process. However, the core activity remains unchanged, although with added benefits. The first two levels of the SAMR model allow a teacher to change the input process; however, the content remains the same (Bicalho et al., 2023).

Modification

After augmentation, modification is the third phase of the SAMR model. In the modification phase, there is a notable transformation in the learning task through the use of technology. An educator redesigns the task by taking advantage of the unique capabilities of technology, leading to a substantial improvement (Blundell et al., 2022). For example, one might adopt collaborative writing using cloud-based platforms where multiple users can simultaneously contribute and edit. Ultimately, the task itself is changed, allowing for increased collaboration and interaction. The modification stage involves changing the task to allow for more cooperation (Blundell et al., 2022).

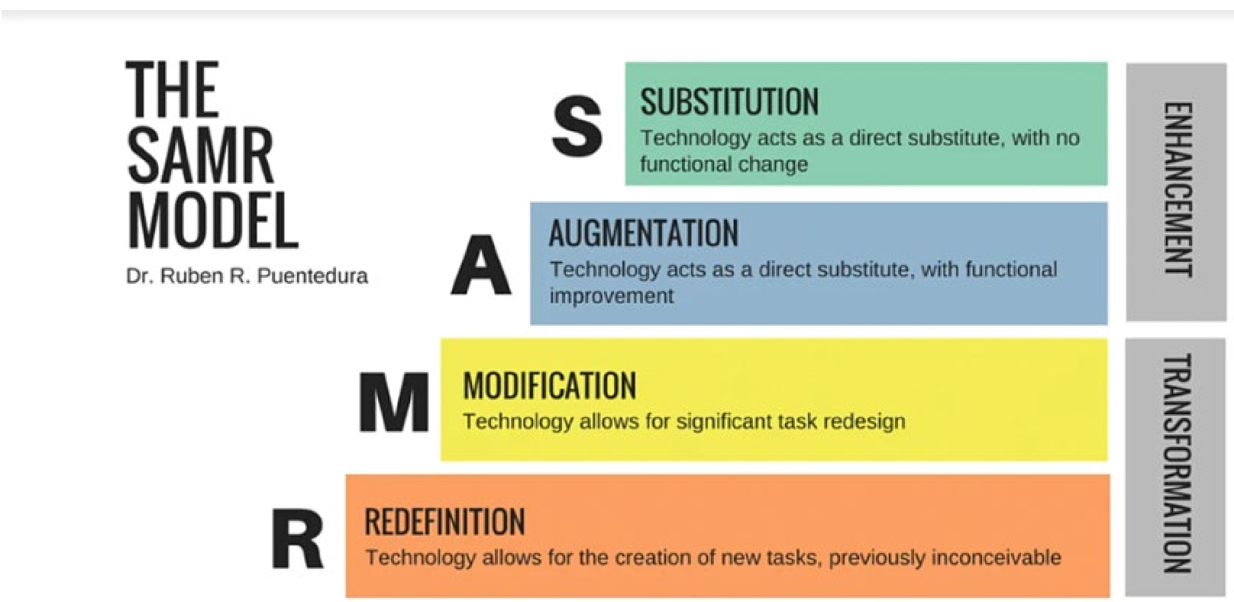
Redefinition

Finally, the redefinition phase is the highest level of the SAMR model and involves employing technology to enhance and transform the task and enable new, previously inconceivable learning experiences. It involves a fundamental shift in how a teacher approaches a task, creating opportunities that are not possible without technology (Blundell et al., 2022). For instance, a class might adopt virtual reality to simulate historical events. This strategy provides an immersive and experiential learning environment that changes how students engage with the subject matter. The redefinition stage encompasses a fundamental shift in how an educator or an institution approaches a task by incorporating technology (Blundell et al., 2022).

The SAMR model aligns well with this study's problem statement and research questions, as it provides a structured approach to assess the effectiveness of technology integration in urban P–12 classrooms. Furthermore, its design contributes to scrutinizing disparities in access and execution that might arise within these distinctive contexts (Zheng et al., 2018). By employing this conceptual framework to examine how various technological instruments are utilized at each echelon of the hierarchy, one can pinpoint best practices and ascertain domains for enhancement concerning technology integration in urban P–12 schools (Zheng et al., 2018).

Figure 1

An Illustration of the SAMR Model



Note. An illustration of the four phases of the SAMR model as proposed by Dr. Ruben Puendentura. Lacruz (2018). https://pressbooks.pub/techandcurriculum/chapter/samr/.

Introduction to Research Methodology and Design (Nature of the Study)

A qualitative research method and a case study design were used to gain insights into the effectiveness and influence of technology integration in urban P–12 classrooms, with a specific focus on the application of the SAMR model (substitution, augmentation, modification, redefinition) as a guiding framework. People employing this method typically aim to comprehensively explore a research phenomenon holistically, aligning with the primary objective of this study, which was to gather in-depth data on the research problem (Dawadi et al., 2021). Accordingly, the selection of this approach was based on its appropriateness for the research.

Employing this method facilitated an exploration of the perspectives, experiences, and viewpoints of educators with extensive expertise in the relatively underexplored subject. In contrast, a quantitative research method is used when relying on statistics and numerical data is essential for addressing a research problem (Scharrer & Ramasubramanian, 2021). According to Mulisa (2022), investigators typically opt for this approach when testing theories and determining their applicability in accounting for or describing a phenomenon under investigation. However, this approach was not chosen due to its inadequacy in investigating the views and experiences of educators, as the investigator could not adequately address the research questions for this study using statistical data.

In addition, a mixed-methods approach was not selected for exploring the phenomenon under study. This design is commonly used to capitalize on the strengths of qualitative and quantitative methods (Taherdoost, 2022). However, a quantitative focus would make a mixed-methods approach inappropriate to elucidate participants' views and experiences (Dawadi et al., 2021). This research was not meant to test hypotheses, assess whether there are correlations between variables, or look for numerical descriptions of the research topic, which are the factors that supported the preference for a qualitative method.

A case study design was utilized to investigate the optimal practices for integrating technology in urban P–12 classrooms to address suboptimal student achievement and inadequate preparedness for a rapidly digitizing world. This design is particularly advantageous when the intent is to explore the “how” and “why” questions of a study and to delve into the intricacies of a phenomenon, aligning well with the objectives of the proposed research (Mohd Basar et al., 2021; Yin, 2009). Furthermore, leveraging this design offers an invaluable opportunity to use multiple sources of pertinent study data to address the research problem, including archival data, participant observation, semi-structured interviews, and institutional document reviews. These sources were used to respond to the research questions. Alternatively, scholars using the qualitative method may employ other designs, such as narrative design, phenomenology, or ethnography. Specifically, phenomenology allows researchers to investigate participants’ lived experiences regarding a phenomenon under study, which is inconsistent with the project’s goal (Williams, 2021). Investigators may also use ethnography, in which they live and associate with the population under investigation for an extended time to address the research questions (Haines et al., 2022). However, time constraints made this design impractical. Finally, it was not prudent to use a narrative design because storytelling is not congruent with the desired outcomes of this project.

Research Questions

Three key research questions will be addressed in this study:

RQ1

How do urban P-12 teachers describe the use of substituting technology for traditional methods and materials in their classrooms?

RQ2

How do urban P-12 teachers describe augmenting traditional methods and materials using technology in their classrooms?

RQ3

How do urban P-12 teachers describe modifying traditional methods and materials using technology in their classrooms?

Significance of the Study

The significance of this study is rooted in its potential to contribute to a deeper understanding of how technological advancements can be leveraged more effectively within urban P–12 educational settings, an important area of focus given the dearth of knowledge regarding this research phenomenon (Stahl et al., 2018). This research was intended to identify best practices to help teachers and education stakeholders enhance student outcomes, including academic achievement and enthusiasm, by investigating the complexities surrounding technology integration in these unique environments and employing the SAMR model as a guiding framework. Additionally, this study makes a unique contribution to the field by addressing the notable gap in existing academic literature by focusing explicitly on urban P–12 contexts characterized by diverse socioeconomic factors and disparities in resource availability, which have a demonstrable impact on students' educational and instructional experiences (Bicalho et al., 2023).

The insights generated by this research are critical and relevant for educators, policymakers, and school administrators who endeavor to develop effective strategies for implementing technology in these specific contexts, as they can apply the findings to foster improved educational outcomes for students in urban settings. According to Valverde-Berrocoso et al. (2022), the incorporation of technology in education is a transformative force that significantly contributes to academic success. Thus, the study's findings enable educational stakeholders to gain timely insights regarding the adoption of technology in the educational sector and the potential to facilitate students' readiness in urban settings for their future pursuits in higher education and the professional landscape, and to promote the adoption of appropriate policy changes (Ramírez et al., 2021). Policymakers will find relevance in the study's focus on addressing the existing gap in the literature, especially in urban contexts marked by diverse socioeconomic factors and resource disparities (Ramírez et al., 2021). For school administrators, the findings offer practical strategies for implementing technology in these unique environments. Additionally, the study caters to academics by providing a unique contribution to the field through its exploration of the complexities surrounding technology integration using the SAMR model.

Overall, this research was designed in response to rapid technological advancements that continue to revolutionize the educational sector. Haleem et al. (2022) supported this assertion by stating that such advancements have ushered in a transformative era for education, revolutionizing traditional teaching methods and enhancing learning experiences through innovative tools, online platforms, and interactive resources (Ramírez et al., 2021). Therefore, this study provides an additional dimension for adopting technology in the educational sector and how it can optimize student performance and comprehension of concepts (Timotheou et al., 2023). Educational stakeholders, including researchers and professionals, could find the research critical for understanding the implications of technological advancements in the educational sector, thereby enabling them to stay informed and adapt their approaches.

Definitions of Key Terms

Educational disparities

Educational disparities refer to differences in access to quality schooling and vital resources for success across various socioeconomic demographics.

SAMR model

The SAMR model is an abbreviation for substitution, augmentation, modification, and redefinition. The SAMR paradigm serves as a blueprint for considering progressively more intricate inclusion of technology in educational environments (Tsybulsky & Levin, 2016).

Socioeconomic factors

Socioeconomic factors denote elements that pertain to a fusion of societal and financial conditions, including income echelons, resource access, and academic attainment (Noble et al., 2015).

Technology integration

Technology integration denotes weaving digital instruments and assets into scholastic practices to bolster teaching and learning experiences (Shamir-Inbal & Blau, 2021).

Thematic analysis

Thematic analysis is a qualitative data assessment method for detecting patterns or themes within text-based information, such as interview transcriptions or field notes from observations (Wæraas, 2022).

Underfunded school systems

Underfunded school systems refer to educational districts that acquire fewer financial resources than affluent areas, resulting in limited assistance available for students and instructors (Ikpa, 2016).

Urban P–12 classrooms

Urban P–12 classrooms are educational spaces within urban locales for kindergarten through 12th grade, encompassing elementary, intermediate, and secondary schools (Roeser et al., 2022).

Summary

This chapter provided the context for exploring technology integration in urban P–12 classrooms by identifying specific challenges faced in these educational environments. Given the rapid technological advancements, policymakers and educators must understand how technological tools can be effectively incorporated into teaching methods to improve student outcomes (Li et al., 2022). A careful examination of the extant literature, for example, Perry (2018), Rajasekaran and Casap (2022), Singun (2025), and Stahl et al. (2018), reveals an existing research gap regarding the successful integration of technology in urban P–12 classrooms. This gap is influenced by diverse socioeconomic factors and resource disparities that affect teaching and learning experiences. Thus, the problem addressed in this study is the challenge of inefficiently integrating technology in urban P–12 classrooms, contributing to suboptimal student achievement and inadequate preparedness for a rapidly digitizing world.

This qualitative case study aimed to explore the effectiveness and influence of technology integration in urban P–12 classrooms using the SAMR framework as a guide. This framework, representing substitution, augmentation, modification, and redefinition, was chosen as the theoretical lens for this study, as its components provide an opportunity to evaluate discrepancies in access and implementation that may arise in these unique circumstances. The research questions addressed how urban P–12 educators implement technology following the SAMR model and how these practices impact student performance. Specifically, the key research questions were:

- How do urban P–12 teachers describe substituting technology for traditional methods and materials in their classrooms?
- How do urban P–12 teachers describe augmenting traditional methods and materials using technology in their classrooms?
- How do urban P–12 teachers describe modifying traditional methods and materials using technology in their classrooms?

This study analyzed qualitative data to identify the factors contributing to successful implementation and best practices for integrating technology within these contexts. The significance of this research lies in its potential to enhance understanding of how technology can be utilized more efficiently within urban P–12 institutions, ultimately resulting in improved educational outcomes for students. The findings offer valuable insights for educators, policymakers, and academic administrators who aim to develop effective intervention strategies in these settings. Thus, the emphasis remains on the importance of technology integration within urban P–12 classrooms from diverse perspectives. The conclusions drawn from this investigation are expected to provide invaluable insights into the most effective approaches educators can adopt, ultimately enhancing educational outcomes and preparing students for their future higher education goals and professional endeavors in an increasingly digitalized world.

Chapter 2: Literature Review

Introduction

In this qualitative study, I investigated the impact of technology integration in urban P–12 schools, with specific attention paid to the applicability of the SAMR (substitution, augmentation, modification, redefinition) model as a guiding theory in understanding the way teachers use technology to replace traditional instruction and instructional materials. The problem addressed was the inefficient integration of technology in urban P–12 classrooms, which has led to suboptimal student achievement and inadequate preparedness for a digitizing world. Urban P–12 classrooms face challenges in technology integration, including resource disparities, inadequate teacher training, and insufficient infrastructure (Perry, 2018; Stahl et al., 2018), which results in low student performance and ill-prepared graduates who lack competencies as digitalization increases.

The underutilization of technology is a problem, especially in school communities with low funding and limited financial resources compared to more affluent areas (Ikpa, 2016). Urban schools encounter many problems in using technology, such as disparities in access to necessary equipment across socioeconomic categories, inadequate teacher training, and, as a consequence, poor infrastructure (Perry, 2018; Stahl et al., 2018). Successful integration of technology in the urban P–12 classroom necessitates a holistic approach that addresses not just tool access and resource availability but also professional development, instructional design, and the establishment of an instructional culture that values technology's transformative capability in learning (Kumar & Vijay, 2023). Integrating technology in classrooms, although important, must occur in environments that foster equity in accessibility and sustainability.

Adding technology into the classroom is not sufficient to improve student performance unless schools are equitably and sustainably supported with advanced technological infrastructure and facilities. Researchers have established the importance of technology-based learner enhancement, such as motivation and academic performance, especially when these technologies are applied in personalized, student-centered, and interactive learning experiences (Bouchrika et al., 2021; Yu et al., 2021, 2022). While the effectiveness of these efforts depends on teachers' skill in integrating technology within the context of learning objectives and appropriate instructional methods, the quality of such integration is the critical determinant of outcomes.

Presented in this chapter is a review of the scholarly literature related to technology integration, defined as weaving digital instruments and assets into academic practices to bolster teaching and learning experiences (Shamir-Inbal & Blau, 2021). The review is organized into the following sections: (a) theoretical frameworks for technology integration, (b) benefits and challenges of integration, (c) teacher training and pedagogical approaches, (d) the SAMR model, which serves as a blueprint for progressively more intricate technology inclusion (Tsybulsky & Levin, 2016), and (e) integration in urban, underfunded districts. The review synthesizes empirical studies, theories, reports, and commentaries through a thematic analysis approach to detect patterns and themes within the text (Wæraas, 2022).

The literature was obtained by conducting a search in education databases such as ERIC, Education Source, Academic Search Premier, as well as Google Scholar. The searches were conducted using a combination of terms including "technology integration," "educational technology," "P–12 education," "urban schools," "SAMR model," "teacher training," "educational disparities," and "socioeconomic factors." The search concentrated on sources published from 2020 to 2024 to ensure current and relevant literature. When assessing the effectiveness of technology integration in urban P–12 classrooms, scholars generally use qualitative methods such as thematic analysis of observational data, teacher interviews, and student focus groups. These strategies can produce insights into the difficulties, benefits, and real-life examples of technology incorporation into these educational environments. Addressing educational gaps and guaranteeing equal access to high-quality education demands a multifaceted approach that considers not only technological resources but also the broader socioeconomic factors that shape students' educational experiences. In addition, debating and solving these multifaceted issues allows educators and policymakers to develop fair and effective learning environments in which technology benefits students, regardless of socioeconomic status.

Theoretical Framework

The substitution, augmentation, modification, and redefinition (SAMR) model, developed by Dr. Ruben Puentedura, served as the guiding theoretical framework for this study (Porterfield, 2023). The model provides a structured approach to understanding how technology integration in education can progress from simple replacement of traditional methods to transformative learning experiences (MacMath, 2023). As technology becomes an essential part of modern education, it is critical to assess how it is integrated into classrooms, particularly in urban P–12 settings, where disparities in access, teacher training, and infrastructure often create barriers to effective implementation (Dimitriadou & Lanitis, 2023). The SAMR model allows for a hierarchical evaluation of technology use in these environments, offering insight into how educators can bridge the digital divide and leverage digital tools to enhance student outcomes.

The four-tiered structure of the SAMR model categorizes technology integration into levels ranging from basic substitution to complete redefinition of learning tasks. At the substitution level, technology is used as a direct replacement for traditional tools without altering the nature of the task. For example, replacing handwritten assignments with a word processor may improve legibility but does not change the fundamental learning experience (Bicalho et al., 2023). The next stage, augmentation, enhances the learning process by adding functional improvements. A teacher, for instance, may utilize spell check or online thesauruses in word processing, which improves efficiency but still maintains the same core task structure. The modification stage represents a significant shift, where technology redesigns learning activities, such as allowing students to collaborate on cloud-based platforms for real-time feedback and peer review. Finally, at the redefinition stage, technology enables entirely new learning experiences that were previously impossible. A history teacher using virtual reality to immerse students in historical events exemplifies this highest level of technology integration, transforming the way students engage with content (Blundell et al., 2022).

This study employed the SAMR model because it provided a structured lens for evaluating technology use in urban P–12 classrooms and identifying best practices for optimizing student engagement and learning outcomes. Given disparities in access to digital resources and varying levels of technological literacy among educators, it was crucial to assess whether urban schools primarily operated at the substitution and augmentation levels or were progressing toward modification and redefinition, where technology creates more engaging and interactive learning experiences.

Several studies have successfully applied the SAMR model in educational settings, demonstrating its utility in evaluating and enhancing technology-based instruction. One such study was conducted by Nair and Chuan (2021), who examined the impact of a modified SAMR model on student learning outcomes in a private college in Melaka, Malaysia. This quantitative study employed an experimental design with control and experimental groups, focusing on a business communication course. The control group underwent traditional teaching, while the experimental group was taught using technology-based instruction guided by the SAMR model, which was further integrated with Bloom's taxonomy and the technological pedagogical content knowledge (TPACK) framework. Findings revealed that content, pedagogy, and technology were absent at the substitution level but became increasingly integrated at the augmentation, modification, and redefinition levels. The study concluded that students in the experimental group exhibited significantly higher performance at these three stages, highlighting the effectiveness of technology-enhanced instruction. The research supports the premise that moving beyond basic substitution is necessary for maximizing the impact of digital tools in education.

A similar study by Arantes (2022) explored how the SAMR model could be applied as a research framework in online learning communities. The study focused on seven pre-service teachers engaged in a WhatsApp-based online learning community, where they discussed computational topics from the digital technologies curriculum. This qualitative study examined how the progressive levels of SAMR influenced the teachers' ability to navigate data-rich learning environments. The findings indicated that SAMR aligns effectively with online learning models, particularly in fostering collaborative learning and digital fluency. The study demonstrated that the SAMR framework provides a structured approach for integrating technology-based interactions, emphasizing its potential to reshape learning beyond traditional classroom settings.

Both studies illustrate the practical applicability of the SAMR model in assessing and improving technology-based learning experiences, demonstrating its effectiveness in fostering deeper engagement and pedagogical transformation. Their success in higher education settings suggests that the model provides a structured approach to evaluating and enhancing technology integration, making it equally relevant to P–12 education. In urban classrooms, where resource constraints and teacher preparedness significantly impact instructional effectiveness, the SAMR model offers a scalable framework for ensuring that technology moves beyond mere substitution to transformative learning experiences. Given that both studies underscored the model's role in facilitating meaningful pedagogical change, its application in this study was expected to yield similar success by helping urban P–12 educators navigate technological challenges, optimize instructional strategies, and enhance student outcomes.

The SAMR model was chosen for this study because it aligned directly with the research problem, purpose, and questions. The research aimed to understand how urban P–12 educators employed technology at different SAMR levels and how these practices influenced student learning outcomes. Additionally, it helped identify barriers that prevented schools from reaching higher levels of technology integration and offered practical solutions for improving digital adoption in urban settings. Other theoretical frameworks, such as the TPACK framework by Mishra and Koehler (2006), focus on the interaction between technology, pedagogy, and content knowledge, making it useful for teacher training. However, SAMR was particularly suited for this study because it explicitly categorized technology integration and provided a clear roadmap for enhancing digital learning.

Furthermore, this study expanded on existing research by applying SAMR in the context of urban P–12 schools, where socioeconomic disparities often limit access to advanced digital tools. While prior studies have demonstrated the effectiveness of technology-enhanced learning, there is a gap in research focusing specifically on urban classrooms, where challenges such as teacher training deficiencies, digital access disparities, and infrastructure limitations create obstacles to effective implementation. The SAMR model, therefore, offered a comprehensive and structured approach for analyzing technology integration in urban P–12 classrooms. Its progressive framework allowed for a detailed assessment of how digital tools impact teaching and learning at various levels. Prior studies, such as Nair and Chuan (2021) and Arantes (2022), provide evidence that the SAMR model effectively supports technology-driven instruction, demonstrating its relevance as a research framework.

Integrating Technology in the Classroom

The theoretical framework that underpinned this qualitative case study research was the SAMR model. Dr. Ruben Puentedura devised the SAMR model, a framework used to categorize four degrees of classroom technology integration (Puentedura, 2014). SAMR is the acronym for the four stages: substitution, augmentation, modification, and redefinition (Boonmoh & Kulavichian, 2023). The SAMR model was developed as a common language in various disciplines, where instructors seek to individualize learning and clarify abstract ideas. With the SAMR model, remote and blended learning possibilities become more viable because integrated classroom technology enhances the teaching and learning experience for both teachers and students (Boonmoh & Kulavichian, 2023). Following this four-stage classification, teachers must be capable of specifying and classifying their application of technology.

The multidimensional nature of this framework allows researchers and managers to perform evaluative assessments by carefully examining the integration of technologies within institutional and scientific contexts (Bicalho et al., 2023). The model guides teachers through the transition of their instruction with technology by traversing through the four phases, from substituting traditional methods to fully transforming the teaching and learning experience. A detailed discussion of the SAMR model phases was presented in preceding sections.

Substitution

Substitution is the first stage of the SAMR model, whereby technology is used in a similar way to how content was previously taught. At this point, technology replaces a part of the traditional teaching method with either the same or a similar one. Substitution involves introducing technology for an action that is not accompanied by any functional change (Bicalho et al., 2023). The initial level of substitution also entails the use of technologies to support teaching effectiveness through their application. At the substitution level, teachers use technology as an analog of a traditional instrument or process by modifying the task little or not at all (Bicalho et al., 2023). The best practices at this level generally provide limited benefits; for instance, it is easier to edit work. However, the nature of the task remains unchanged.

Augmentation

The second phase of the SAMR model is augmentation. In this phase, a teacher employs technology to enhance a task that was previously accomplished without it (Nair & Chuan, 2021). The technology again directly substitutes a traditional tool or method, but with functional improvements to the student experience. Augmentation goes beyond substitution by adding functionalities that improve efficiency or quality (Nair & Chuan, 2021). Teachers must determine whether the technology increases or augments a student's productivity and potential in meaningful ways. The first two levels of the SAMR model allow a teacher to change the input process; however, the content remains the same.

Modification

The third phase of the SAMR model is modification. At this stage, the learning task is transformed through the use of technology. An educator redesigns the task by taking advantage of technology's unique capabilities, leading to substantial improvement (Blundell et al., 2022).

Instead of simple replacement or enhancement, this represents a true redesign of the lesson and its outcomes. The teacher must assess whether the technology significantly alters the learning task (Blundell et al., 2022). The task itself is changed, often allowing for increased collaboration and interaction.

Redefinition

Redefinition is the top level of the SAMR model. It involves using technology to transform the learning task and enable new, previously inconceivable learning experiences (Blundell et al., 2022). Redefinition introduces a paradigm shift, allowing teachers to reimagine a task in ways that were not possible without technology (Blundell et al., 2022). This strategy aims to create vivid, immersive learning environments that differ from traditional methods. The redefinition stage transforms how students interact with content and how schools approach technology integration systemically.

The SAMR model aligned with this study's problem statement and research questions, as it provided a structured approach for evaluating the impact of technology integration in urban P–12 classrooms. Additionally, the model allowed for scrutiny of disparities in accessibility and performance that might arise in these contexts (Zheng et al., 2018). By applying this conceptual framework to analyze the use of various technological tools at each level of the hierarchy, it was possible to identify best practices and areas for improvement in technology integration across urban P–12 schools.

Importance of Integrating Technology for Teaching and Learning in P–12 Classrooms

Integrating technology into teaching and learning in P–12 classrooms can increase instructional efficiency and improve student academic performance. Researchers generally agree that technology integration benefits students by enhancing classroom engagement and performance (Godfrey, 2024; H. Y. Lee et al., 2022). In this section, the different ways technology has improved teaching and learning in P–12 classrooms are presented, beginning with its role in improving classroom engagement.

Technology Boosts Classroom Engagement

Integrating technological tools into instruction can boost P–12 student engagement. Educational games, when incorporated into lessons, make content more engaging and promote greater student involvement (Ross, 2020). Students are motivated to remain active during instruction when participating in educational games. These activities often help students stay attentive throughout lessons and make learning more enjoyable (Hébert et al., 2021). Immediate feedback provided by educational games further encourages student participation and improves their interactive learning experience.

In addition to real-time feedback, gamification and interactive simulations enhance student engagement. Students participate more actively in gamified lessons due to the competitive aspects, which boost motivation and learning (Mårell-Olsson, 2021). Students can track their progress while completing assignments and earning rewards in the form of points, which leads to greater engagement (Zhao et al., 2022). Gamification encourages participation in group tasks and discussions (Erickson et al., 2020). Furthermore, interactive simulations support student understanding of complex subjects, such as science, by offering immersive, hands-on experiences (Araiza-Alba et al., 2022; Zhan et al., 2022). These tools foster critical thinking and innovation, as students explore topics with greater curiosity.

Beyond enhancing critical thinking and creativity, integrating multimedia presentations, virtual reality, and augmented reality increases engagement and makes learning more memorable. Tools like animation provide a diverse instructional experience that improves student comprehension (C. F. Chiu, 2020). Visual aids clarify complex concepts, reinforcing student understanding (Lumapenet, 2022). Multimedia presentations, such as videos, offer interactive, engaging learning experiences. Virtual and augmented reality create unique environments that ignite students' imaginations, increasing concentration and enhancing engagement (Fransson et al., 2020; Jang et al., 2021; Mystakidis et al., 2021). These immersive settings serve as landmarks for memorable learning. Technology integration also helps educators personalize instruction, as explored in the next subsection.

Technology enhances engagement (Jang et al., 2021; Mystakidis et al., 2021). Learners often feel more enthusiastic and confident in what they have learned when technology is integrated (McNicholl et al., 2023). Students tend to be more satisfied with their learning experiences (Pandita & Kiran, 2023). Overall, the literature affirms the importance of using technology to enhance student engagement, learning, and satisfaction.

Technology Supports Personalized Learning

Integration of technology contributes to providing personalized learning experiences to students. Students' personal needs are met by leveraging algorithms that offer adaptive learning platforms, enabling them to receive personalized reports (D. Lee et al., 2021). Additionally, artificial intelligence offers an adaptive learning platform that allows students to track their academic goals (Alamri et al., 2021; Kakish et al., 2022). When used in teaching, technological tools enhance the delivery of differentiated instruction depending on students' capabilities. Teachers can offer customized content to different students, particularly in inclusive classrooms. Integrating technological tools into instruction also facilitates real-time personalized feedback (El Hajj & Harb, 2023; Knoop-van Campen et al., 2023). Teachers may further tailor their feedback based on student performance in assignments or assessments completed through digital platforms. Students achieve self-directed learning by utilizing adaptive learning systems aligned with their individual needs and preferences.

Beyond personalized feedback, technology enables self-paced learning. At the individual level, students can monitor and evaluate their progress based on their own pace (Olokunde, 2023). A self-paced learning approach motivates students to continue completing tasks and activities at increasingly advanced levels after mastering prior material. This process deepens their conceptual understanding. Technological tools provide students with valuable insights into their academic development via data-driven analysis (Ross, 2020). Based on these insights, students can make informed decisions to refine areas of difficulty. Digital resources are also widely accessible and customizable to accommodate diverse learner needs, thereby empowering students (AlGerafi et al., 2023). Blending technological tools into instruction supports the varied needs of students within P–12 classrooms. Technology's role in increasing students' access to information is addressed in the next section.

Technology allows for personalized lessons (Alamri et al., 2021). Researchers have emphasized the importance of integrating new technologies, such as artificial intelligence, to enhance personalization (Pratama et al., 2023). Personalized lessons have been shown to improve learning efficiency (Juniarni et al., 2024). Prior research supports the value of using technology to create personalized learning experiences that enhance academic outcomes.

Technology Eases Access to Information

The incorporation of technology provides P–12 students with broad access to information. Students can utilize internet resources such as digital libraries to explore extensive academic materials (Polly et al., 2021). The use of internet-enabled tools enriches student understanding across a wide array of concepts, thereby contributing to a more effective learning experience. Students can access digital libraries and e-books that may not be available through traditional school libraries. Online access to diverse e-resources promotes positive reading habits (Stará & Vodrážková, 2022). Various digital learning platforms offer supplemental materials that support standard classroom instruction. Multimedia resources, such as educational apps and videos, further enhance comprehension of complex topics (Ardalan & Iozzo, 2021). Leveraging these tools allows students to access a wide range of learning materials and improve their academic experiences. The following section examines how teachers can use technology to promote student collaboration.

Leads to Better Student Collaboration

Utilizing technological tools enhances collaboration both inside and outside the classroom. Students can engage in discussions through online forums, which promote collaborative learning (DiFrancesca & Spencer, 2022; El Hajj & Harb, 2023). Online platforms such as Google Classroom allow students to share content and respond to peer questions, strengthening communication and cooperative skills. Collaborative documents, supported by cloud-based tools, foster communication, problem-solving, and decision-making as students work together toward a shared goal (Evans, 2020). Group projects facilitated by these tools also contribute to improved collaboration.

Online platforms enable students to support one another in completing challenging tasks. Collaborative learning environments foster transparency and accountability (Rice, 2021). Students can provide peer feedback and review individualized or group assignments, contributing to a classroom culture centered on cooperation and mutual support (Ames et al., 2021). P–12 students using collaborative technologies develop team-based mindsets and contribute to a sense of interconnectedness.

Technology facilitates collaboration among users (Mitchell, 2023). It allows communication across geographic boundaries and enhances interactions between students and teachers (Garlinska et al., 2023). Collaboration supported by technology improves engagement (Ramírez-Donoso et al., 2023). Overall, research supports the notion that technology fosters improved learning and student engagement through enhanced collaboration.

Creativity and Innovativeness

Classroom collaboration resulting from technological integration may also positively impact student creativity and innovation. The use of digital tools can stimulate creativity by allowing students to explore problem-solving techniques. P–12 students exposed to technology in learning develop critical thinking skills that support the resolution of complex problems (Ross, 2020). Students demonstrate innovation when using digital tools by approaching challenges with new strategies developed through technological exposure (Popov et al., 2020). For instance, students can develop video games using programming software, applying their creativity and technical skills.

STEM students, in particular, benefit from exposure to technologies such as robotics kits and engineering platforms, which nurture creative problem-solving and real-world application (Tedre et al., 2021). These students can also design and program robots to generate innovative solutions. Such tools encourage experimentation and iterative design, helping learners move beyond conventional learning and into domains requiring original thinking and innovation.

By helping students develop and design their own applications, technological tools positively influence creativity and innovation. Students using technology can leverage programming languages and coding to create innovative games that support their learning (C. F. Chiu, 2020; Tedre et al., 2021). Interactive applications may be designed through coding, and exposure to multimedia creation software enhances students' creativity in digital media (Chen & Cao, 2022). Students also acquire narrative skills useful for learning through the use of multimedia creation software. Exposure to 3D design applications fosters a creative mindset, allowing learners to build models and applications that contribute to immersive virtual learning environments (Chen & Cao, 2022; Wu & Liao, 2020). Teachers cultivate creativity and innovation by guiding students in embracing technology tools.

Challenges Implementing Technology in P–12 Classrooms

Although technological integration enhances creativity, engagement, and collaboration, implementing technology in P–12 classrooms remains challenging despite its educational benefits (Smilie, 2022). Teachers and students may find it difficult to navigate technology-based instruction. Policymakers, educators, and administrators must address these challenges to ensure effective integration (Alqahtani et al., 2022). The following sections outline key barriers to implementation.

Disparities in Accessing Technology

Lack of access to digital tools, including infrastructure and internet connectivity, remains a significant challenge to implementing technology in P–12 settings. Research indicates that inequities in access impede effective integration (Moldavan et al., 2022; Power et al., 2020; Reynolds et al., 2022). For example, students without computers may struggle with technology-enhanced instruction due to inexperience (Mann et al., 2021). Similarly, teachers may also lack access to web-based platforms, further complicating integration (Kormos & Wisdom, 2021). Ritzhaupt et al. (2020) reported that many students lack reliable internet access, creating a digital divide. These findings consistently show that disparities in computer access and connectivity significantly hinder implementation.

Digital illiteracy is also a barrier to effective integration. Students lacking digital literacy struggle to utilize web-based tools, while those with digital proficiency are more adaptable and motivated (Liu et al., 2021). A lack of digital skills, such as using online platforms and tools like Google Classroom, deters the adoption of online learning models (Kormos, 2022; Si et al., 2022). Both students and teachers may lack sufficient training and experience due to poor access to infrastructure (Chisango & Marongwe, 2021; Hébert et al., 2021). Consistent findings across studies confirm that inadequate access contributes to technological illiteracy, which, in turn, hinders technology integration.

Disparities also exist in terms of infrastructure. Lack of access to modern facilities at home and school impedes implementation (Francom et al., 2021; Machusky & Herbert-Berger, 2022). Kormos and Wisdom (2023), in a study of 423 participants, found that schools with poor infrastructure often have unreliable internet, critical for digital instruction. Rural schools in particular may lack classroom space, computer labs, and internet access, all of which are essential for integrated co-teaching (Chisango & Marongwe, 2021; Kormos, 2022). Some rural areas also experience unstable electricity, further limiting access (Francom et al., 2021). Thus, weak infrastructure both at home and at school exacerbates challenges in implementation.

Despite increased research on access disparities, findings are not always consistent. Power et al. (2020) suggested that individualized and whole-class instruction by teachers can help bridge digital divides and foster collaboration. S. Lee et al. (2022) found that English language learners have demonstrated strong digital outcomes with technology-based instruction, even in the face of broader challenges. However, Crompton et al. (2021) noted that despite access, illiteracy gaps and digital inequities persist. Lomos et al. (2023), based on data from 420 participants, observed that poor financial investment in information and communication technologies (ICT) limits infrastructure, deepening the digital divide. These contrasting findings suggest that more research is needed to identify reliable, scalable solutions.

A digital divide persists in determining who can access educational technologies. As a result, some students are positioned for greater success than others (Afzal et al., 2023). These disparities often emerge early and persist throughout a student's academic life (Kaarakainen & Saikkonen, 2023). The educational benefits of technology are therefore distributed unequally, often reflecting broader racial and socioeconomic inequalities (Gee et al., 2023). To improve educational equity, the literature affirms that all students must have equal access to appropriate technologies.

Lack of Technological Training and Support Programs

Educators with inadequate digital training and limited support programs can hinder the effective integration of technology in P–12 classrooms. Analyzing data from an online survey with 107 participants, Y. An et al. (2021) reported that poor implementation of digital learning in classrooms was significantly associated with a lack of technology training and online professional development among teachers. Cardullo et al. (2021) further asserted that teachers with inadequate training and insufficient administrative support, particularly for using web applications and troubleshooting technical issues, had low self-efficacy in managing online classes. Supporting these findings, Ogodo et al. (2021) also suggested that although some educators had basic technological competence, the absence of online training prevented them from effectively engaging students and implementing online learning. In a systematic review of 57 articles, Crompton et al. (2022) found that schools offering technical support and professional development enabled teachers to prepare for the use of digital tools in instruction. Overall, inadequate training and a lack of support programs can deter teachers' ability to implement and utilize digital learning tools effectively.

Insufficient teacher training continues to be a major factor hindering digital integration in P–12 classrooms, drawing growing attention in the academic literature. In a quantitative study, Kormos (2022) suggested that underutilization of school technology stemmed from user errors and trials linked to poor digital skills. These findings support the need for professional development that provides teachers with digital guidance and instructional competence. Even when websites and computers are available, some teachers may struggle with online lesson delivery due to inadequate pedagogical skills stemming from a lack of training (Francom et al., 2021). While Crompton et al. (2022) focused on teachers, Crompton et al. (2021) addressed students, showing that students with inadequate training in digital platforms were less engaged, thus reducing the overall effectiveness of technology integration. Despite these varied focal points, the findings collectively indicate that insufficient training and support lead to a lack of essential pedagogical skills, complicating efforts to integrate digital tools in classrooms. The financial burden of acquiring and maintaining classroom technology also presents a major obstacle to successful integration, as explored in the following subsection.

Appropriate training in the use of technology is essential to achieving equitable outcomes when integrating digital tools into teaching (Fernández-Cerero et al., 2023). Researchers emphasize the importance of digital competence for understanding how technology can enhance learning (Méndez et al., 2023). Teachers familiar with technology are more likely to adopt it and use it effectively (Zenda & Dlamini, 2023). As a result, professional development is necessary to support improved student outcomes through technology.

Technological Cost and Sustainability

Financial investment in educational technology remains a barrier to implementing digital learning in P–12 classrooms. Prior research has shown that the cost of purchasing technological equipment, such as computers, is often prohibitive for rural schools, limiting the availability of digital tools (Araiza-Alba et al., 2022). Analyzing data from 20 studies, Kay and Jovanovic (2021) concluded that maintenance costs for wearable technology were particularly high, discouraging schools from adopting such tools. Fransson et al. (2020) similarly noted that purchasing computers and establishing reliable internet access entails high costs, which may be unaffordable for teachers and parents in low-income communities. Vendors of internet services, laptops, and related technology may charge premium rates, which further deters schools from implementing online learning systems.

Even when teachers receive support and have access to devices, the ongoing cost of maintenance, software licensing, and digital tool purchases continues to be a significant deterrent to classroom technology use (Francom, 2020). Licensing fees and technology upgrades add to the financial burden and may discourage teachers from incorporating online tools (Tang, 2020). Overall, high acquisition and maintenance costs, combined with limited access to licenses and training, hinder the effective integration of educational technologies.

Across the reviewed literature, the most frequently cited barriers to digital integration in P–12 classrooms include: (a) the cost of acquiring and sustaining technology; (b) a lack of teacher training and support; and (c) persistent digital divides. Teachers play a central role in navigating these challenges. The next section presents a review of the literature on the role of the urban teacher.

The Role of the Urban Teacher

The pedagogical aims of P–12 instructors, coupled with their knowledge base, can serve as reliable indicators of whether technology will be integrated into classroom instruction. Educators frequently contend with the ramifications of poverty while teaching in schools situated in African American and Latino communities (Anderson & Olivier, 2022; Mason-Williams et al., 2023; Ramsay-Jordan, 2020). Research has shown that children attending public schools in urban areas encounter numerous challenges and are less likely to be exposed to technological learning tools during daily instruction compared to their counterparts in affluent communities (Ramsay-Jordan, 2020). Korovkin et al. (2023) highlighted that the digital divide is no longer solely a consequence of access; rather, the interplay of race and income level now constitutes the leading factors fueling inequity in technology use in schools across the nation.

While early theories attributed limited technology integration in urban schools to access, availability, and digital illiteracy, the current literature lacks systematic research documenting this issue in urban America. There is a notable gap in scholarship exploring the attitudes, behaviors, and competencies of urban teachers, which may help explain the limited integration of technology in these schools (Karakose et al., 2023; Luo et al., 2022; Valtierra & Whitaker, 2021).

Urban teachers often identify and document students with limited access to digital tools, enabling schools to advocate for additional resources. Students' socioeconomic background influences their access to, and effective use of, technology. Nieuwenhuis et al. (2021) investigated the impact of neighborhood-level poverty on computer use among fourth- and fifth-grade students in P–12 schools. The researchers found that community-level poverty contributed to underutilization of technology among urban students. Their study revealed that neighborhood disparities were significant predictors of students' access to and usage of computers.

These findings advanced research in this field by demonstrating how technological inequities worsen learning conditions in underserved communities. The study utilized data from the Avon Longitudinal Study of Parents and Children and U.S. Census zip code data from the American Community Survey. By extrapolating data on computer use, the researchers revealed that children in under resourced neighborhoods experience the same digital inequalities in school that their parents face in broader society.

Research has indicated that lack of access to and use of technological tools impedes educational attainment, with limited computer usage correlating with broader social inequities experienced by students in urban settings. Nieuwenhuis et al. (2021) also discussed literature on the social norms and peer attitudes associated with concentrated poverty, which were linked to low computer use. However, the literature does not adequately address how teachers' interactions with urban students influence technology use in classrooms.

This study investigated the impact of technology integration in urban P–12 schools, with specific attention paid to the applicability of the SAMR (substitution, augmentation, modification, redefinition) model as a guiding framework for understanding how teachers use technology to replace traditional instruction and materials. The problem addressed was the substandard implementation of technology in P–12 classrooms located in urban districts across the United States. At present, technology is not consistently integrated into daily instruction, resulting in suboptimal student performance. As the world becomes increasingly digital, this failure to incorporate technology means that many urban students are not acquiring the skills necessary for success in a globalized society.

The digital divide represents a global challenge, rooted in disparities in access to and use of information and communication technologies among P–12 students with varying levels of social and economic resources. Zhao et al. (2022) investigated economic disparities between student populations in urban and rural China and concluded that geography was a strong predictor of digital fluency. Their findings revealed significant socioeconomic gaps between rural and urban families, with urban schools outperforming rural counterparts. In contrast, in the United States, urban schools often rank at the lower end of the digital equity spectrum. The study emphasized that mere access to technology is insufficient to resolve digital literacy deficits among underprivileged students, ultimately undermining technology integration efforts in P–12 education.

Classroom learning activities should be designed to foster digital skills development, with teachers playing a fundamental role in creating supportive classroom environments. This support should manifest through activities that simultaneously enhance students' technology proficiency. Zhao et al. (2022) contended that, in the future, schools must adopt proactive strategies to integrate technology into classroom activities, particularly for students from lower socioeconomic backgrounds. Numerous studies highlight the need for research investigating barriers that inhibit teachers from effectively integrating technology into urban P–12 classrooms, a critical issue for supporting disadvantaged student populations (Kormos, 2022; Xie et al., 2023).

Teacher Attitudes

Regardless of whether teaching in urban or rural settings, teachers bear the ultimate responsibility for ensuring the success and sustainability of technological integration in the classroom. In both contexts, they are tasked with motivating students while adapting the learning environment to foster collaboration (T. K. Chiu et al., 2021; Choi & Chung, 2021). While administrators oversee procurement and system-wide support for technology, teachers remain the pivotal force in transforming classroom instruction through technology integration.

Adapting and reinventing classroom practices to strengthen teacher–student collaboration is central to effective pedagogy (T. K. Chiu et al., 2021; Choi & Chung, 2021). Pongsakdi et al. (2021) examined how ICT (information and communication technology) use affected teachers' attitudes and student perceptions, finding that shifts in teachers' attitudes could ultimately shape student perspectives. Bowman et al. (2022) reported that teachers valued how technology supports classroom preparation, promotes inclusivity, facilitates distance learning, and enables audio-visual instruction in P–12 settings. However, negative attitudes often stemmed from technical challenges encountered during instruction.

Rydchenko et al. (2023) explored the influence of teachers' attitudes toward technology in P–12 schools in Kazakhstan. Teachers in the study acknowledged technology's classroom benefits, including 3D visualization and distance learning (Chie et al., 2021). They self-reported positive attitudes toward integration, citing technology's ability to streamline both instructional and administrative tasks. Their attitudes directly influenced students' academic motivation and performance. Students reported that their teachers' enthusiasm toward technology positively affected their own engagement and achievement.

Although both negative and positive teacher attitudes have been associated with technology integration, discrepancies exist between how teachers and students define a "positive attitude." While teachers often believe that merely encouraging ICT use reflects a positive stance, Rydchenko et al. (2023) argued that a truly positive attitude involves motivation and active technology integration into instruction. The literature shows that teacher attitudes vary, from strong support for interactive whiteboards to aversion due to implementation challenges. Rydchenko et al. (2023) noted an ongoing lack of consensus among researchers regarding the precise factors that shape teachers' technology attitudes.

Despite these discrepancies, students often indicated that teachers who demonstrated technological knowledge, used digital tools creatively, and integrated them effectively were viewed as having positive attitudes. However, students also noted that such usage was often infrequent (Rydchenko et al., 2023). Even when teachers lacked advanced technical skills, students remained supportive if teachers exhibited enthusiasm toward technology integration (T. K. Chiu et al., 2021). Many students, already familiar with digital tools, were eager to help their teachers. Through these interactions, students gained access to the latest technologies (Rydchenko et al., 2023). This dynamic suggests that a teacher's willingness to learn and integrate technology, rather than technical mastery alone, motivates student support and engagement.

Although both students and teachers attempt to integrate technology into the classroom, inefficient implementation in urban P–12 schools continues to result in suboptimal student achievement and limited preparation for a digital world. While Taat and Francis (2020) acknowledged the value of updated classroom technologies, they questioned whether teachers' attitudes toward computers influenced student acceptance of technology-rich environments. Some researchers identify teachers as change agents and argue that improved knowledge and skills reduce tech-related anxiety, thereby increasing integration (Fernández-Batanero et al., 2021).

However, other studies have found the opposite, indicating that excessive reliance on technology may lead to techno-stress, stemming from fears about the negative impacts of technology in education (Reynolds et al., 2022; Strimel et al., 2020). The intensive use of ICT-based tools has been cited as a contributing factor to techno-stress. The core challenge lies in striking a balance between leveraging technology to enhance instruction and minimizing stress among both teachers and students. Addressing teachers' attitudes and preparedness emerges as a critical step toward efficient technology integration without compromising educational quality in P–12 classrooms.

Even though research has documented both the positive and negative impacts of teachers' attitudes on technology integration, digital tools can sometimes cause students to lose focus on content and become overly dependent on technology. Educators may experience discomfort using technology due to prior negative experiences or perceived functionality issues (Murray et al., 2020; Smith et al., 2020). Consequently, these teachers may avoid integrating technology into daily instruction. For example, a teacher who repeatedly encounters problems with a digital projector may switch to a low-tech flipchart to avoid class disruptions. Although Taat and Francis (2020) questioned the generalizability of their findings due to homogenous samples and small sizes, the consistency of results across multiple studies warrants further investigation. Student disengagement from core content and teacher apprehension about technical failures remain significant barriers to effective technology integration in P–12 classrooms. These concerns can be mitigated through training, user-friendly platforms, and consistent technical support.

A key factor in effective technology integration is alignment between teachers' instructional goals and the capabilities of the technology. A systematic mapping review involving P–12 educators revealed that when teachers purposefully integrated modern literacies, such as blogging, video conferencing, and other digital tools, with their instructional objectives, technology enhanced and amplified teaching practices (Short et al., 2021). As teachers gained mastery of these tools and incorporated them into lessons, the adoption of educational technologies accelerated organically. Classrooms evolved into collaborative learning environments where teachers and students engaged with technology in real time (Short et al., 2021). Rather than viewing technology as an external add-on, it became embedded within instructional design, leading to dynamic, experiential learning. Teachers developed confidence as they explored how to use these tools to meet instructional goals.

This qualitative case study emphasizes the importance of experiential professional development that addresses both technical competencies and attitude shifts necessary for long-term digital transformation in classrooms. By addressing functionality and belief systems, teachers can become empowered as change agents for effective technology adoption (Short et al., 2021). Experiencing how digital tools promote engagement and learning enhances teachers' appreciation of educational technologies. Reflection combined with hands-on exposure better prepares teachers to embrace technology intentionally rather than view it as a burden.

Providing access to devices alone does not guarantee effective classroom technology use. Teachers often lack the time, skills, and equipment needed to fully engage students with digital tools (Ferri et al., 2020; Winter et al., 2021). Developing engaging, tech-rich lesson plans requires time that many educators do not have (Ferri et al., 2020). In a qualitative study, Tang et al. (2021) found that teacher beliefs were a stronger predictor of technology use than the mere presence of devices. Their study revealed that interactions between students and teachers shaped teacher attitudes, which in turn influenced how technology was embraced in the classroom. Participants who rated themselves as confident with technology were more likely to integrate it into lesson planning and instruction.

Ensuring a seamless technology-enabled learning experience involves more than just providing access to tools and technical support. Minimizing technical disruptions that hinder teaching is equally critical (Ferri et al., 2020; Winter et al., 2021). However, findings from Tang et al.'s (2021) study may lack generalizability due to contextual differences in ICT access. The study highlighted that most teachers received limited training on technology integration and lacked sufficient time to explore meaningful application strategies.

This lack of preparedness can amplify the negative effects of technical issues and reduce teachers' willingness to incorporate technology. While Tang et al. (2021) did not establish a direct causal relationship between attitudes and technology use, their findings reinforced the broader significance of human factors in technology adoption. The researchers also recommended that future studies ensure sufficient time is allocated for students to become familiar with potential technology breakdowns in instructional settings. Moreover, the attitudes and belief systems of teachers influence how effectively technology is integrated in the classroom.

Teacher Beliefs

The introduction of advanced information and communication technologies (ICTs) in P–12 classrooms challenges teachers' existing pedagogical beliefs and practices. Researchers have consistently emphasized that teachers' values and beliefs strongly influence instructional decision-making (Huguet et al., 2021; Schelling & Rubenstein, 2021). Beliefs are the psychological premises, propositions, or assumptions that individuals hold to be true. These convictions serve as a framework through which individuals interpret their physical and social environments. In education, pedagogical beliefs function as guiding principles, teachers' internalized assumptions about effective teaching and learning, which shape their classroom actions (Huguet et al., 2021).

Aligning technological innovations with educators' deeply held beliefs about teaching and learning can foster a more receptive mindset and sustainable adoption of educational technologies. By acknowledging and addressing this critical human factor, educational institutions can create an environment conducive to effective technology integration, ultimately enhancing students' learning experiences. While P–12 teachers recognize technology as a tool that can support constructivist learning, student benefits are often constrained by internal and external barriers (Hanny et al., 2023; Hébert et al., 2021). Technology integration is a complex process, and the relationship between instructional use and teachers' pedagogical beliefs has become a growing area of inquiry. Effective integration requires moving beyond traditional, teacher-centered strategies such as lecturing, hand-raising, or independent classwork (Murphy et al., 2021). Instead, teachers should leverage technology to foster collaborative, student-centered environments.

While aligning teachers' beliefs with classroom technology is essential, it is even more crucial to leverage digital tools to shift instruction toward more participatory and constructivist practices. Researchers stress the need to understand how pedagogical beliefs affect integration decisions, as misalignments may limit the effective use of technology (Cheng et al., 2022; Dikmen & Demirer, 2022). Successful integration requires addressing both internal (beliefs, attitudes) and external (access, training) barriers through a holistic approach. Aligning digital tools with student-centered pedagogies and ensuring institutional support unlocks the full potential of technology to improve learning outcomes in P–12 settings.

Aligning digital tools with student-centered pedagogy and providing necessary support enhances students' learning experiences. Bereczki and Kárpáti (2021) conducted a qualitative study examining how teachers' beliefs about technology influenced student use. The researchers interviewed 12 secondary school teachers, identified as experts in technology integration, and their students across six subject areas. The study used interviews, classroom observations, and document analysis. Findings revealed that expert teachers' beliefs about creativity shaped their instructional design, while beliefs about assessment served as a constraint. Participants implemented six broad strategies to foster creativity through technology: igniting creativity, supporting idea development, creating digital products, scaffolding processes, encouraging collaboration, and evaluating outcomes. The study also identified both subject-specific and general strategies with practical implications for future research.

Summary

This literature review examined how teachers' beliefs shape technology integration in P–12 classrooms. Some educators embraced technology to support student-centered learning (Hanny et al., 2023; Hébert et al., 2021), while others maintained traditional lesson structures (Bereczki & Kárpáti, 2021). Concerns about digital overuse and distraction (Cheng et al., 2022; Dikmen & Demirer, 2022) influenced integration decisions. Teachers lacking confidence often used technology for administrative purposes rather than instruction (Ogodo et al., 2021), while others viewed it as a distraction. T. An and Oliver (2021) argued that regular access shifts student perceptions toward educational use. Lediga and Ngoepe (2021) showed that mobile devices can enhance collaboration and differentiation, increasing engagement. However, first-order (external) barriers such as training and resources (Francom, 2020; Lai et al., 2022) and second-order (internal) barriers such as beliefs and attitudes (Perienen, 2020; Rowston et al., 2020) continue to shape adoption.

This literature also demonstrated that even with equal access, teacher perspectives determine how technology is implemented. Scholars remain divided on whether pedagogical beliefs directly influence integration. Although Pettersson (2021) explored how beliefs affect usage, others argue that external conditions are equally important (Bonner et al., 2020; T. K. Chiu & Chai, 2020). Adu-Boateng and Goodnough (2022) applied the SAMR model and identified persistent challenges, including inflexible curricula, insufficient professional development, and limited resources. Bagacina et al. (2024) emphasized that successful integration depends on aligning digital fluency with pedagogical intent. This study, guided by the SAMR model, evaluated these dynamics in urban P–12 classrooms to support technology adoption and improve student outcomes.

Chapter 3: Research Method

The purpose of this qualitative study was to explore the effectiveness and influence of technology integration in urban P–12 classrooms, with a specific focus on applying the SAMR model (substitution, augmentation, modification, redefinition) as a guiding framework to understand how teachers employed technology to substitute, augment, and modify traditional methods and materials. The problem addressed was the inefficient integration of technology in urban P–12 classrooms, which led to suboptimal student achievement and inadequate preparedness for a digitizing world (Kalati, 2022; Stahl et al., 2018). In this chapter, I discuss the research method and design used to collect data to address the research purpose and problem.

I present the rationale for the qualitative research method and case study design as the appropriate methodologies for exploring the influence of technology integration in urban P–12 classrooms. I also describe the population and sample, the instrumentation used for data collection, and the study procedures. The processes of data analysis, assumptions, limitations, and delimitations are also explained in this chapter. I conclude with a discussion of the ethical assurances, a summary of key sections, and a transition to Chapter 4.

Research Methodology and Design (Nature of the Study)

This study used a qualitative research method to explore the effectiveness and influence of integrating technology in urban P–12 classrooms using the SAMR model as a guiding framework. A qualitative research method is appropriate when the intent is to investigate a phenomenon in-depth as experienced and perceived by participants (Dawadi et al., 2021). Merriam and Grenier (2019) asserted that qualitative researchers explore a phenomenon in its natural setting, allowing for comprehensive assessment and analysis. Using a qualitative approach, this study examined whether the SAMR model helped teachers in P–12 classrooms successfully substitute, augment, and modify traditional methods and materials.

Another rationale for selecting a qualitative method was the ability to describe a phenomenon in depth using non-numerical data. Yazan (2015) stated that collecting and analyzing non-numerical data is essential when quantification of the phenomenon is inappropriate. Patton (2014) explained that data in the form of participants' views, perceptions, opinions, and experiences allows researchers to investigate a phenomenon comprehensively. In this study, non-numerical data were collected and analyzed to demonstrate the effectiveness and influence of technology integration in P–12 classrooms as guided by the SAMR framework. The goal was to gain insights into the dynamics of technology integration in urban classrooms by addressing the challenges experienced by teachers in metropolitan educational settings.

One unique characteristic of the qualitative research method is the vivid description of the research phenomenon. Merriam and Grenier (2019) opined that by documenting how participants described the phenomenon in its natural setting, researchers could gain an in-depth understanding of the problem. Since technology is crucial in education, investigating how the SAMR framework guided the augmentation, modification, and substitution of traditional teaching methods and materials supported the use of a qualitative research method. A detailed description and understanding of the effectiveness and influence of technology integration in P–12 classrooms as guided by the SAMR framework warranted the use of a qualitative approach.

Alternative methods, such as quantitative and mixed-methods research, were considered for this study. Quantitative research is used when the intent is to quantify a phenomenon using numerical data (Patton, 2014). Bloomfield and Fischer (2019) noted that quantitative approaches are typically used to examine relationships and patterns between study variables. However, this approach was not appropriate because the study aimed to collect and analyze non-numerical data rather than numerical data. The intent was not to examine relationships between dependent and independent variables but to investigate how participants described their experiences and perceived the effectiveness of integrating technology in P–12 classrooms as guided by the SAMR framework. Therefore, a quantitative methodology was rejected.

Mixed-methods research is used when the researcher intends to collect and analyze both qualitative and quantitative data. Doyle et al. (2009) described mixed-methods research as an approach that provides a comprehensive understanding of a phenomenon. Similar to qualitative and quantitative methods, mixed-methods research combines the strengths of both while mitigating their limitations (Plano Clark, 2016). While mixed-methods research could potentially provide a more comprehensive understanding of this phenomenon, it was not appropriate because the study's focus was exclusively on collecting and analyzing qualitative data.

A single case study research design, known for its flexibility in investigating complex phenomena, was employed. Yin (2015) described this design as allowing for in-depth exploration of the subject. Crilly (2019) further emphasized that it enables researchers to examine the complexity of a phenomenon in its natural setting. As a qualitative design, the case study approach permitted the exploration of a phenomenon from various perspectives within its natural context (Tomaszwski et al., 2020). Using this design, the study explored the effectiveness and influence of integrating technology in P–12 classrooms, guided by the SAMR framework. The case study design comprehensively examined how the SAMR framework guided teachers in urban schools to substitute, augment, and modify their traditional teaching methods and materials through technological integration.

The rationale for selecting a case study design for this qualitative research was anchored in the features that uniquely characterize this design. Case studies are used to explore and explain real-life issues within their contexts. Case study designs are exploratory, allowing investigators to collect data that address the why, how, and what research questions (Schoch, 2020). Addressing these questions provides researchers with detailed information about a phenomenon in natural settings. Alam (2020) explained that multi-phased analysis in natural contexts allows for a deeper understanding. Therefore, in this study, the case study design was used to explore the effectiveness and influence of technology integration in urban P–12 classrooms, focusing on the SAMR model as a guiding framework for understanding how teachers employed technology to substitute, augment, and modify traditional methods and materials.

Alternative designs considered but not used included phenomenology, grounded theory, and ethnography. Phenomenological research explores participants' lived experiences of a phenomenon (Moustakas, 1994). This design was not used because the study did not aim to explore lived experiences but to examine how teachers perceived and described the effectiveness of technology integration guided by the SAMR framework. Ethnographic research is used when the goal is to study culture and social norms (Fusch et al., 2017). Since the culture of teachers in metropolitan schools was not the focus, ethnography was rejected. Grounded theory is used when researchers aim to generate a new theory from participant data (Glaser & Strauss, 2017). This study did not seek to develop theory but to investigate the intersection of technology and education in P–12 classrooms. Thus, a case study design was deemed the most appropriate.

Population and Sample

The population for this study consisted of educators in urban school settings in the United States. The target population was P–12 educators from several schools in the southeastern United

States. Recruiting teachers from urban classrooms provided participants knowledgeable about the challenges of integrating technology in these contexts. The target population helped address how the SAMR framework guided substitution, augmentation, and modification of traditional teaching methods and materials.

The sample for this study included 30 P–12 educators, with 15–20 educators from the New Jersey area serving as the final sample. Targeting a sample of 30 participants allowed for data saturation (Guest et al., 2006). In addition to achieving saturation, this sample size helped mitigate the potential effects of participant attrition during data collection (Vasileiou et al., 2018). While there is no universal formula for qualitative sample size, experts recommend different approaches. Hennink and Kaiser (2022) reported that sample sizes depend on the research design and purpose. Mason (2010) noted that 15 participants were often sufficient in qualitative research. Vasileiou et al. (2018) suggested that as few as 12 participants may achieve data saturation.

Specific recommendations for case studies vary. Subedi (2021) suggested 20 participants for a single case study. Aguboshim (2021) reported that 20–30 interviews are often sufficient for saturation in qualitative case studies. Based on these recommendations, a minimum of 20 P–12 educators was recruited. This sample size aligned with the study's purpose, research problem, and research questions. The study comprehensively examined the effectiveness and influence of technology integration in urban P–12 classrooms, guided by the SAMR framework, to understand how teachers employed technology to substitute, augment, and modify traditional methods and materials. P–12 teachers provided valuable insight into the challenges of technology integration in urban schools and the role of the SAMR framework in guiding this process.

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Instrumentation

Semi-structured interviews served as the primary instrument for data collection. Interviews allow researchers to collect in-depth information about a phenomenon directly from participants (Rowley, 2012). Semi-structured interviews were selected for this study because they enable open-ended discussions and allow for probing questions to elicit deeper insights (Patton, 2014). As Cypress (2017) noted, qualitative researchers often favor semi-structured interviews because of the transparency and flexibility they provide. The cost-effectiveness and adaptability of this method further supported its use in this study.

The semi-structured interview protocol was developed after an extensive review of peer-reviewed studies and in alignment with the constructs of the SAMR framework (see Appendix C). The protocol ensured consistency across all interviews, with each participant asked similar questions in the same format. Probing questions were incorporated to clarify or expand upon participants' responses. To establish the sufficiency and appropriateness of the interview questions, an expert panel review was conducted; the expert panel review is considered a form of field testing.

The expert panel consisted of three Ph.D. holders in education, research methodology, and qualitative research. The individuals for the expert panel were recruited by word of mouth. After recruiting the three Ph.D. holders, I emailed them the semi-structured interview questions for review. The experts reviewed the questions for clarity, wording, and alignment with the research question, research purpose, and problem statement. In addition, they examined the questions for instances of researcher bias and estimated the time needed to complete the interviews. The expert panel's feedback aligned the interview questions with the purpose of the study and the problem statement.

I used the expert panel's feedback to minimize researcher bias and ensure the reported findings contributed to the study's credibility. During data analysis, I used my awareness of bias to review and discuss the participants' responses. By reducing the presence of researcher assumptions and presuppositions, I ensured that the phenomenon was addressed by participants' views, opinions, and experiences, thereby supporting credibility and transferability.

Instances of researcher bias addressed through the expert panel review were referenced during the data analysis phase to develop themes that aligned with the research problem and answered the research questions. Explaining the significance of researcher bias, Braun and Clarke (2023) asserted that it is crucial as it allows critical and independent review of the information collected from participants for informed analysis. Therefore, minimizing researcher bias was helpful in independently and critically describing how P–12 teachers used the SAMR model to integrate technology in teaching and the classroom. I also used the feedback from the expert panel to reword the interview questions for ease of understanding. The semi-structured interviews lasted between 45–60 minutes.

Study Procedures

The study procedures included the steps taken to recruit participants and collect the data necessary to address the problem. First, I received site permissions and IRB approval before contacting the P–12 teachers using a recruitment flyer. The flyers were posted on school noticeboards and on social media platforms frequently visited by teachers (Joseph et al., 2016). The flyer informed potential participants about the study's purpose, the problem being investigated, how data would be collected, and how their confidentiality would be ensured (Negrin et al., 2022). The flyer also included an email address that interested participants could use to express interest.

Teachers interested in participating contacted me via the provided email address. I screened them using predetermined inclusion and exclusion criteria (Negrin et al., 2022). Eligible participants were: (a) residing in the Southeastern United States, (b) P–12 teachers in selected urban schools, (c) aged 18 years or older, (d) with at least 3 years of teaching experience at their current school, and (e) familiar with classroom technology and prior users of the SAMR framework. Eligible participants received an email with the informed consent form. The consent form provided detailed study information (Manandhar & Joshi, 2020). Participants were given 5 days to review, sign, and return the form. Only teachers who returned a signed consent form were permitted to participate in the semi-structured interviews (Manandhar & Joshi, 2020).

Those who returned the signed form received a link to the Zoom platform for their scheduled interview. Interviews were scheduled at times convenient for participants. Before beginning, I debriefed participants about the study's purpose, the problem being explored, and confidentiality measures. I requested permission to audio-record the interviews (Busetto et al., 2020) and used Zoom's built-in recording feature. The interviews lasted approximately 60 minutes, after which participants were debriefed and dismissed (Busetto et al., 2020). Pseudonyms were used during the interviews to protect participants' identities and ensure confidentiality (Wang et al., 2024).

To ensure the credibility and accuracy of the findings, member checking was incorporated into the data validation process. Member checking, also known as respondent validation, is a qualitative technique that allows participants to review their interview transcripts, clarify statements, and confirm data accuracy before analysis (Motulsky, 2021). After each interview was transcribed, participants received electronic copies of their transcripts and were given 5 days to suggest corrections or clarifications. This timeframe balanced thoroughness with the study's timeline. The 20 P–12 educators had the opportunity to correct transcription errors, clarify responses, and provide additional context. This process enhanced credibility and kept participants' voices central to the study.

Data Analysis

After the semi-structured interviews, I transcribed the audio recordings using Zoom's transcription feature. Each transcript was emailed to the corresponding participant for review. Participants had 5 days to submit any changes. I then performed thematic analysis following Braun and Clarke's (2006) six-phase framework. MAXQDA software was used to organize, code, and visualize the data.

Familiarization With the Data

In the first phase of thematic analysis, I read and reread each transcript to develop familiarity with the content (Braun & Clarke, 2006). According to Braun and Clarke, repeated reading and note-taking support identification of key phrases and concepts for summarizing participants' input. This foundational phase supported the coding process.

After familiarizing myself with the data, I generated the initial codes, step two of Braun and Clarke's (2006) thematic analysis framework. I uploaded the transcripts into MAXQDA software for categorization and visualization. The initial codes were inductively developed and informed by the theoretical framework. After generating the initial codes, I analyzed them to identify patterns of experience that shaped the understanding of how the SAMR model guided technology integration with traditional teaching methods and materials (Braun & Clarke, 2023).

Searching for Themes

Following code generation, I examined the data for similarities and differences, combining or re-categorizing codes into potential themes. The codes were grouped based on their relevance to the research questions, problem, and purpose statements (Braun & Clarke, 2006). These emerging themes captured key meanings found across the dataset.

Reviewing the Themes

Next, I reviewed the themes to ensure each was clearly defined and distinguishable from others. I assessed whether each theme aligned with the problem statement and study purpose. During this step, I confirmed whether there were subthemes within larger themes and whether the existing data adequately supported the emergent themes (Braun & Clarke, 2006). This ensured internal coherence and clarity across all thematic constructs.

Naming and Defining the Themes

In this phase, I refined and assigned concise, descriptive names to the final themes, following Braun and Clarke's (2006) guidelines. Each theme name captured the essence of the theme's contribution to answering the research questions. Definitions were written to distinguish each theme and describe its connection to the overall study purpose and research design.

Write-Up Stage

In the final step, I wrote the results of the thematic analysis. I described each theme and linked it to specific data excerpts to illustrate how they answered the research questions. I also explained how these findings aligned with or diverged from prior literature. Themes were used to evaluate whether the SAMR model (substitution, augmentation, modification, redefinition) influenced how teachers integrated technology into instructional practices and materials.

Assumptions

Assumptions are unexamined beliefs that guided the study (Theofanidis & Fountouki, 2018). This study assumed that the qualitative case study design appropriately addressed the problem of ineffective technology integration in urban P–12 classrooms. I also assumed that a sample of 15–20 urban educators was sufficient for generating meaningful data. Lastly, I assumed that participants would respond truthfully and accurately.

Limitations

Limitations are factors beyond the researcher's control that may influence study outcomes (Theofanidis & Fountouki, 2018). This study had several methodological limitations. First, the small sample size may limit transferability of findings. Although qualitative research does not aim for generalization, the findings applied to the study's specific population. Additionally, while small samples yield rich data, the resulting volume of qualitative information may slow down analysis and interpretation.

Delimitations

Delimitations refer to the boundaries the researcher imposed (Theofanidis & Fountouki, 2018). This study was delimited to P–12 educators in urban classrooms across the Southeastern United States. The methodological approach was limited to qualitative inquiry using semi-structured interviews as the sole data collection instrument. Only educators with at least 3 years of experience and familiarity with the SAMR model were included.

Ethical Assurances

I adhered to ethical principles throughout the study. Approval from the IRB and permission from the study site were obtained before data collection. The principles of the Belmont Report, respect for persons, beneficence, and justice, were followed. Participants provided informed consent and were reminded of their autonomy in choosing whether to participate. To ensure confidentiality, I used pseudonyms or alphanumeric codes. Data were stored securely: digital data in an encrypted, password-protected folder and paper records in a locked safe. All data will be destroyed after 5 years via disk formatting and document shredding.

Summary

The problem addressed in this study was the inefficient integration of technology in urban P–12 classrooms, which has contributed to suboptimal student achievement and inadequate preparedness for a digitized world. The purpose of this qualitative study was to comprehensively explore the effectiveness and influence of technology integration in urban P–12 classrooms, with a specific focus on applying the SAMR model (substitution, augmentation, modification, redefinition) as a guiding framework to understand how teachers used technology to substitute, augment, and modify traditional instructional methods and materials. This chapter discussed the rationale for selecting a qualitative methodology over quantitative and mixed methods approaches. I also outlined the case study design and its appropriateness for the study. Additional sections of this chapter detailed the population, sample, sampling technique, instrumentation, and study procedures. I further described the thematic analysis process, study limitations, assumptions, and delimitations. In Chapter 4, I present the findings obtained using the methodology described in this chapter.

Chapter 4: Findings

In this chapter, I provide an overview of the study's context, guiding framework, and key findings on technology integration in urban P-12 classrooms. The purpose of this qualitative case study was to explore the effectiveness and impact of technology integration in urban P-12 classrooms using the SAMR model (Substitution, Augmentation, Modification, Redefinition) as a guiding framework. The inefficient integration of technology in urban P-12 classrooms results in suboptimal student performance and inadequate preparedness for a digitized world (Rajasekaran & Casap, 2022; Singun, 2025). The theoretical model used in guiding the study was the SAMR model (Bicalho et al., 2023). The study was guided by three research questions:

RQ1: How do urban P-12 teachers describe the use of substituting technology for traditional methods and materials in their classrooms?

RQ2: How do urban P-12 teachers describe augmenting traditional methods and materials using technology in their classrooms?

RQ3: How do urban P-12 teachers describe modifying traditional methods and materials using technology in their classrooms?

The next section is the Trustworthiness of the Data, which substantiates credibility, transferability, dependability, and confirmability through member checking, thick description, audit trails, and reflexive journaling. A description of the participants' demographics follows. A description of how the data was analyzed follows. The results section presents the findings according to the research questions. The evaluation of the findings follows where the findings are synthesized with findings from the literature. The chapter concludes with a summary of the findings.

Trustworthiness of the Data

Lincoln and Guba's (1985) naturalistic-inquiry framework guided all procedures for establishing the rigor of this qualitative case study. Because the entire findings chapter rests on participants' lived accounts of technology integration, each criterion, credibility, transferability, dependability, confirmability, and saturation, was addressed in all stages of the study. By achieving each criterion, I provide empirical assurance that the themes are grounded in participants' voices rather than my own assumptions.

Credibility

Credibility refers to the degree to which the findings are a representation of the participants' intended meanings (Lincoln & Guba, 1985). To ensure that the interpretations accurately reflected participants' intended meanings, a multi-layered member-validation process was employed. Immediately after transcription, each of the 20 interview transcripts was emailed to the respective participants; participants were given five days to review, annotate, or correct their verbatim transcripts. All participants responded within that window, with 16 approving their transcripts without change and four suggesting minor wording clarifications that were incorporated before coding. Credibility was further reinforced through triangulation across participants by comparing accounts from teachers of different grade spans (elementary, middle, high school) and subject areas, confirming that each major theme surfaced in multiple instructional contexts.

Transferability

Transferability refers to the extent to which readers can apply findings to other contexts (Lincoln & Guba, 1985). Rich, thick description of the study setting, inclusion criteria, and classroom contexts underpins transferability. The participants were urban P-12 educators in the

U.S. Southeast with at least three years' experience and prior exposure to the SAMR framework. During interviews, each participant elaborated on school resources, student demographics, and community technology infrastructure; those contextual details are woven into the participant narratives in the results section so that readers can judge similarity to their environments. Additionally, sample quotations retain references to grade level, content area, and technology platform, supplying the concrete situational cues necessary for informed comparison. By foregrounding contextual boundaries rather than universalizing the findings, the study invites readers to determine the extent to which the lessons learned about substitution, augmentation, and modification apply to other urban classroom settings.

Dependability

Dependability refers to the traceability and stability of the research process over time (Lincoln & Guba, 1985). An auditable analytic trail substantiates dependability. Every coding decision was recorded in MAXQDA's log function, creating time-stamped snapshots of code additions, merges, and renames as the six Braun and Clarke's (2006) thematic analysis phases unfolded. I maintained reflexivity to avoid influencing the study findings. The codebook was included to show how the data was analyzed.

Confirmability

Confirmability refers to the extent to which the study findings are shaped by the participants' data rather than the researcher's assumptions (Lincoln & Guba, 1985). To demonstrate that findings emanated from participant data rather than my bias as the researcher, I enacted several confirmability safeguards. First, reflexive journaling captured my assumptions about technology integration, prompting continual comparison between preconceived notions and emerging evidence. Second, the secure storage of all materials, including audio recordings, interview transcripts, notes, and MAXQDA project files, in an encrypted university drive prevents post-hoc alteration and preserves the chain of evidence for future scrutiny.

Demographic Characteristics

Twenty participants, urban P-12 teachers, took part in this study. I met the intended target sample size to be interviewed. All participants were current P-12 teachers employed in selected urban public elementary, middle, and high schools in the Southeast United States. The participants were above 18 years of age, with the average age for the participants being 38. The participants had at least three years of teaching experience at their present school, and their average years of experience were 12. The participants had documented knowledge of classroom technology and prior use of the SAMR framework in instruction. The participants taught different subjects, including Mathematics, Science, General Education, English, and Social Studies, among others. Data saturation was reached at the 20th participant, as there were no new responses between participants 15 to 20. The interviews were conducted via Zoom and lasted for 45 to 60 minutes. The total number of pages for the analyzed interview transcripts was 87 pages.

Table 1

Participants' Demographics

Participant	Age	Grade Level	Subject Area	Years of Experience	School Context
Participant 1	35	4th	Math/Science	8	Urban public elementary
Participant 2	37	Middle School	Science	10	Urban public middle school
Participant 3	34	3rd Grade	General Education	9	Urban public elementary
Participant 4	40	High School	Mathematics	15	Urban public high school
Participant 5	36	Middle School	Science	11	Urban public middle school

Participant	Age	Grade Level	Subject Area	Years of Experience	School Context
Participant 6	38	High School	English Language Arts	12	Urban public high school
Participant 7	33	Kindergarten	Early Childhood Education	7	Urban public elementary
Participant 8	39	High School	History	14	Urban public high school
Participant 9	35	Middle School	English Language Arts	9	Urban public middle school
Participant 10	41	Middle School	Special Education	16	Urban public middle school
Participant 11	37	8th Grade	Language Arts	12	Urban public middle school
Participant 12	42	High School	English	18	Urban public high school
Participant 13	38	7th Grade	Social Studies	13	Urban public middle school
Participant 14	34	5th Grade	Special Education (varied subjects	8	Urban public elementary
Participant 15	39	High School	Art	14	Urban public high school
Participant 16	36	Middle School	STEM	10	Urban public middle school
Participant 17	35	Elementary	Bilingual Education	9	Urban public elementary(Title I, bilingual setting)
Participant 18	43	High School	Alternative/Special Education	19	Urban public alternative high school
Participant 19	45	High School	History/Social Studies	22	Urban public high school
Participant 20	32	Elementary	General Education	5	Urban public elementary
Total	749	…	…	241	…
Average	38	…	…	12	…

Note. Demographic information of the participants.

Data Analysis Steps

Data was analyzed following Braun and Clarke's (2006) thematic analysis approach. The thematic analysis approach comprises six steps. MAXQDA software was used to arrange and manually code the data. The six steps are: (a) familiarization with the data, (b) generating initial codes, (c) searching for themes, (d) reviewing themes, (e) defining and naming themes, and (f) producing the report.

Familiarization with the Data

Braun and Clarke (2006) posited that researchers should familiarize themselves with the data by reading and rereading the transcripts. In this study, I first read the transcripts in their entirety while listening to the audio recordings to confirm the accuracy of the transcripts. Member checking was conducted to confirm the accuracy of the transcripts. Sixteen participants confirmed that the interview transcripts were an exact representation of their responses during interviews, while four participants mentioned that there was a need to edit minor errors, like wording. Imade adjustments to the four transcripts and reread each of the 20 member-checked transcripts twice for further comprehension. I took notes in the second and third readings.

Generation Initial Codes

Data excerpts that address research questions should be assigned labels known as codes (Braun & Clarke, 2006). All transcripts were imported into MAXQDA 24. Even though MAXQDA was used, Ihand-coded all the interview transcripts where meaningful text segments were highlighted and assigned low-inference, inductive labels that echoed participants' own words, such as interactive timeline, Google Classroom hub. I deliberately kept codes granular to avoid premature theorizing and to preserve links to the SAMR framework. Table 2 summarizes a section of the codes from the dataset. The full list of codes is shown in Appendix B.

Table 2

Codes

Code	Participant (*N* = 8)
Virtual courtroom simulation	2
Ecosystem tours	1
Tutorial Screencast videos	1
Podcast projects	1
Canva video ads	1
WeVideo editing	1
Multimedia persuasive stance	1

Note. Section of codes.

Searching for Themes

According to Braun and Clarke (2006), codes with similar patterns and meaning should be grouped to help identify candidate themes. In this study, I exported codes from MAXQDA to a Word document. I printed the Word document, contrasted and compared the codes, and grouped codes that shared semantic meaning, pedagogical purpose, or classroom context. Whenever a potential category emerged, I returned to the interview transcripts to reread the supporting quotations, ensuring that contextual meaning had not been lost. I continued to take notes, documenting how my own experiences as a former urban teacher could influence pattern recognition, serving as an audit trail of subjective decisions. Through three rounds of comparison and interview transcript checking, conceptually related codes coalesced into higher-order patterns, yielding a provisional set of candidate themes that mirrored the SAMR levels of substitution, augmentation, and modification. Table 3 shows a section of the categories obtained after clustering the codes.

Table 3

Categories

Code	Categories
Virtual courtroom simulation Ecosystem tours Tutorial Screencast videos Podcast projects Virtual courtroom simulation	Student-created multimedia experiences
Canva video ads WeVideo editing Multimedia persuasive stance	Student-created video ads

Note. Section Of Categories.

Reviewing The Themes

Braun and Clarke (2006) postulated that the candidate themes should be reviewed to obtain themes and subthemes that address the research questions. In this study, I reviewed the candidate themes, merged some, collapsed others, and obtained themes and subthemes. Each candidate theme was scrutinized for internal coherence and distinctiveness. I read the data excerpts in the interview transcripts to confirm that the candidate themes were fit. I confirmed whether the codes advanced a unique analyst story or were redundant. candidate themes that did not have the potential of being themes were classified as subthemes under the major themes they fit into. I confirmed that each subtheme was classified in the correct major theme. I obtained three major themes and 12 subthemes after the iterative review, which addressed the research questions and aligned with the SAMR framework.

Defining And Naming Themes

Theme names should be concise, addressing the research questions and themes defined to obtain a comprehensive understanding of how the themes address the research questions (Braun & Clarke, 2006). Clear, concise names and operational definitions were crafted for every theme and sub-theme, capturing their essence and boundaries. I began the naming process began by writing a one-sentence description for each theme and subtheme in a reflexive journal, then distilling that sentence into a short, participant-voice phrase, such as digital drafting and feedback. I then reread all quotations coded to the candidate theme to confirm whether the phrases echoed the lived experiences expressed in at least 80 % of the extracts and to differentiate the themes and subthemes from each other. Where misalignment emerged, the name was revised. After the first naming round, I returned to the interview transcripts to spot-check five randomly selected cases per theme, confirming that the proposed names still resonated with the data rather than my own inference. I then compared the refined names against the study's three research questions and the SAMR framework to ensure conceptual alignment. Tables 4 and 5 summarize the definition of the major themes and subthemes, respectively.

Table 4

Major Theme Definition

Theme Name	Theme Definition
Urban P-12 teachers use technology as a direct substitute for traditional methods and materials in their classrooms.	This theme captures instances where teachers replace traditional or paper-based tools and processes with digital equivalents without altering the core instructional task.
Urban P-12 teachers integrate technology to augment traditional methods and materials with added functionality and support.	This theme encompasses occasions where digital tools are woven into lessons to enhance or enrich existing activities, adding scaffolds, feedback loops, or accessibility features, while preserving the original task.
Urban P-12 teachers modify conventional tasks by redesigning them through technology to transform student learning experiences.	This theme reflects when teachers use technology to fundamentally redesign learning activities, creating new workflows, collaborations, or products that go beyond the traditional model.

Note. Definitions of major themes.

Table 5

Subtheme Definition

Subtheme	Definition
Digital class hub and management	Centralizing the distribution, organization, and communication of all instructional materials via a single digital platform instead of paper-based systems
Digital creative replacements	Replacing hands-on or paper creative outputs, such as timelines, posters, and animations, with digital tools that mirror the original task
Digital drafting and feedback	Swapping handwritten drafts and in-person commentary for digital document creation with real-time, in-document commenting features
Digital assessment and checks	Conducting formative assessments and comprehension checks through interactive digital quizzes and embedded video questions rather than paper worksheets
Barrier reduction and accessibility	Embedding built-in supports such as captions, text-to-speech, and translations into lessons to lower access barriers and accommodate diverse learner needs
Real-time feedback and collaboration	Leveraging live polling, shared documents, and co-editing tools to provide instant feedback and enable students to collaborate during the learning activity
Collaborative creation environments	Using shared digital workspaces such as Padlet, Google Slides, and virtual whiteboards to facilitate group ideation and co-construction of content that paper cannot support
Private individualized feedback	Delivering targeted, one-on-one feedback via comments, audio notes, or short video replies without interrupting whole-class instruction
Student-created multimedia productions	Engaging students in producing rich digital artifacts, such as videos, podcasts, or e-books, that go beyond the scope of static, paper-based assignments

Subtheme	Definition
Agency and design thinking	Empowering learners to select tools, formats, and project workflows, and to iterate on their work in authentic design-thinking processes
Virtual simulations and role-plays	Reimagining lessons as interactive, technology-driven scenarios or role-plays, such as mock trials, ecosystem tours that simulate real-world contexts
Student autonomy and culturally responsive design	Offering choice menus and selecting culturally relevant digital tools so students can express identity and voice while guiding their learning pathways

Note. Definition of subthemes.

Producing the Report

The obtained findings should be reported with data excerpts from the participants included to obtain thick and rich information (Braun & Clarke, 2006). In this study, I arranged the themes according to the research questions. Each theme and subtheme was introduced, two participant quotes included to support the subthemes, and a conclusion for each theme was included. Table 6 displays the major themes and subthemes in correspondence to the research questions.

Table 6

Major Themes and Subthemes in Correspondence to Research Questions

Research Question	Major Theme	Subtheme
RQ1: How do urban P-12 teachers describe the use of substituting technology for traditional methods and materials in their classrooms?	Urban P-12 teachers use technology as a direct substitute for traditional methods and materials in their classrooms.	Digital class hub and management Digital creative replacements Digital drafting and feedback Digital assessment and quick checks.
RQ2: How do urban P-12 teachers describe augmenting traditional methods and materials using technology in their classrooms?	Urban P-12 teachers integrate technology to augment traditional methods and materials with added functionality and support.	Barrier reduction and accessibility Real-time feedback and collaboration Collaborative creation environments Private, individualized feedback
RQ3:How do urban P-12 teachers describe modifying traditional methods and materials using technology in their classrooms?	Urban P-12 teachers modify conventional tasks by redesigning them through technology to transform student learning experiences.	Student-created multimedia productions Agency and design thinking Virtual simulations and role-plays Student autonomy and culturally responsive design

Note. Three research questions: three major themes: 12 subthemes.

Research Question 1

The first research question was: *How do urban P-12 teachers describe the use of substituting technology for traditional methods and materials in their classrooms?* One major theme, that is, urban P-12 teachers use technology as a direct substitute for traditional methods and materials in their classrooms, and four subthemes were obtained after the analysis that addressed this research question. The four subthemes were (a) digital class hub and management, (b) digital creative replacements, (c) digital drafting and feedback, and (d) digital assessment and quick checks.

Theme 1: Urban P-12 Teachers Use Technology as a Direct Substitute for Traditional Methods and Materials in Their Classrooms

This theme revealed that the participants have replaced analogue or paper-based tools and processes with digital equivalents without altering the core instructional task. Substitution emerged as a straight-across digital exchange: the paper-based or face-to-face task is preserved; however, it is implemented using technology. The participants framed these shifts as pragmatic solutions that save time, reduce clutter, and spark surface-level engagement. The theme breaks into four subthemes that map the most common day-to-day swaps.

Subtheme 1: Digital Class Hub and Management. The participants reported that a single learning-management system now carries the logistical load previously handled by paper packets, bulletin boards, and verbal announcements. The participants described the hub as an anchor that keeps students, parents, and colleagues synchronized in real time. This digital consolidation also serves as the launching point for most other tech activities.

Participant 6 observed that Google Classroom has become the organizational nerve center. The participant mentioned using Canva, Padlet, and Thinglink for more in-depth projects, which are also good for visual learners, stating:

> Google Classroom is the hub for everything: assignments, feedback, and announcements. I also use Edmodo for discussions, and Quizizz or Blooket for quick assessments. For

more in-depth projects, I like Canva, Padlet, and Thinglink. They're great for visual learners.

Participant 13 echoed the sentiment, stating. “Google Classroom is the home base. We use Slides, Docs, Jamboard, but also Padlet for brainstorming, WeVideo for editing, and Book Creator for digital portfolios.” These excerpts demonstrate how an all-in-one platform substitutes for multiple analog routines while leaving learning goals intact.

Subtheme 2: Digital Creative Replacements. A second pattern involved replacing physical posters, timelines, and dioramas with multimedia products that live entirely online. The participants described these swaps as just the same assignment, but louder and brighter, allowing students to embed hyperlinks, audio, or short video clips. The creative format stays familiar; only the medium changes.

Participant 1 explained that, instead of printing worksheets or showing a PowerPoint, they now assign an interactive timeline tool. The participant mentioned that the tool makes them feel as if they are exploring history instead of being informed about it, stating:

> I teach social studies, and we were doing this unit on civil rights and historical timelines, and instead of just printing out a worksheet or showing a PowerPoint, I used this interactive timeline tool. I can’t remember the name now, but it let students click into events, watch archived footage, and read primary sources. It made it feel more like they were exploring history instead of just being told about it. It was kind of cool to see them connecting the dots that way.

Participant 13 offered a parallel example, stating, “We remix, we debate through Flip, we create interactive timelines on Sutori, and, when I’m feeling bold, we code small historical games in Scratch." These excerpts demonstrate how familiar creative tasks are simply transplanted into richer, but still equivalent, digital environments.

Subtheme 3: Digital Drafting and Feedback. The participants also shifted the write-revise loop from paper to cloud documents. The participants praised real-time commenting and version history for making feedback visible and continuous rather than episodic. The core pedagogy of drafting and revising remains unchanged; immediacy and transparency are the new value-adds. Participant 2 highlighted Google Docs' comment stream, stating, "I can literally coach them as they write, leave tips, highlight things they're doing well, it is like having a rolling conversation with their draft. Super interactive." Participant 11 underscored voice-note options, stating:

> Version history in Google Docs is a lifesaver. I can track who did what in group work, and kids know I'm watching, so it keeps them honest. Also, voice comments. Sometimes it's easier to just talk feedback than type it.

These excerpts demonstrate how digital word-processing substitutes for paper while layering instantaneous guidance onto the traditional draft-revise cycle.

Subtheme 4: Digital Assessment and Quick Checks. The participants talked about trading paper quizzes for gamified, auto-scored assessments that provide instant data. The participants valued these tools for checking the pulse mid-lesson without losing momentum. The essential formative intent persists; only the delivery mechanism shifts.

Participant 3 talked about leaning on Kahoot and Blooket for sustained learning, which helps in enjoying competition and high energy, stating:

> Kahoot and Blooket are student favorites for sure. They enjoy the competitive element, and it keeps the energy high. That said, I don't rely on them heavily. Tools like Newsela

> or ReadTheory offer more depth. They engage students and align with skill-building, so I lean into those for sustained learning.

Participant 5 mentioned that they rely heavily on Google Slides and Jamboard, and Flip. The participant added that Edpuzzle is effective for checking understanding during videos, expressing:

> I rely heavily on Google Slides and Jamboard. I also like using Flip; it gets students to explain their thinking on camera, which helps me see where they're at. And I'm getting more into Edpuzzle, it's great for checking understanding during videos.

These excerpts mirror the formative function of paper quizzes while amplifying speed and student motivation.

These findings revealed that teachers deploy substitution as an efficiency-driven strategy. The participants talked about substituting paper-related work with technology. The practice streamlines management, enhances visual appeal, accelerates feedback, and sharpens formative checks, yet leaves learning objectives and cognitive demand largely untouched.

Research Question 2

The second research question was: *How do urban P-12 teachers describe augmenting traditional methods and materials using technology in their classrooms?* One major theme was obtained after analysis: urban P-12 teachers integrate technology to augment traditional methods and materials with added functionality and support, and four subthemes emerged that addressed this research question. The four subthemes were (a) barrier reduction and accessibility, (b) real-time feedback and collaboration, (c) collaborative creation environments, and (d) private, individualized feedback.

Theme 2: Urban P-12 Teachers Integrate Technology to Augment Traditional Methods and Materials with Added Functionality and Support

This theme indicated that teachers weave digital tools into lessons to enhance or enrich existing activities, adding scaffolds, feedback loops, or accessibility features, while preserving the original task. Teachers portrayed augmentation as a layer of digital features that enhance, rather than replace, established lessons. They emphasized how specific tools add accessibility scaffolds, instantaneous feedback, and richer social interaction to otherwise familiar tasks. Four interrelated subthemes illustrate these value-adding moves.

Subtheme 1: Barrier Reduction and Accessibility. Classroom technology was often praised for lowering linguistic, physical, or socio-emotional hurdles that impede learning. Participants described captioning, voice-typing, and visual prompts as small switches with huge payoff that let learners focus on ideas instead of interface frustrations. Several participants also highlighted apps that foster self-regulation before content delivery.

Participant 17 explained that they use technology to bridge languages, cultures, and learning styles. The Participant explained that multilingual students gain voice and confidence when they can record in their home language with on-screen captions, stating:

> I integrate technology as a bridge between languages, cultures, and learning styles. In our bilingual setting, we have students at many different points in their English language development. Tech lets me meet them where they are, while honoring where they come from. For example, I frequently use Google Translate, Immersive Reader, and Flip for language expression. Students might record a video in Spanish with English subtitles or use voice typing to tell their stories.

Participant 20 described replacing text-heavy login sheets with picture cards to curb password meltdowns:

> The Wi-Fi! It cuts out at the worst times. And sometimes the logins are too complicated. I've had third graders break down in tears over a mistyped password. We've started using picture cards with login info to help, but it's still a hurdle.

These excerpts demonstrate accessibility features that augment instruction by removing technical and emotional friction, allowing students to enter learning tasks on a more equitable footing.

Subtheme 2: Real-Time Feedback and Collaboration. Augmentation also manifested through live polling and embedded questions that surface thinking as it happens. The participants characterized these tools as running conversation starters that inform pacing and differentiation on the fly. The immediacy of student responses transformed static lectures into co-constructed experiences.

Participant 1 reflected that live polls reshape lesson tempo. The participant mentioned that Nearpod or Edpuzzle providing answers during live feels like they are building lessons together with the students, stating, "and when I use something like Nearpod or Edpuzzle, and I can see their answers coming in live, it just feels like we're building the lesson together. That instant feedback it's kind of a game-changer."

Participant 19 added that they use Google Workspace, Docs, Forms, and Slides to run smooth class operations, stating, "We also use Google Workspace daily, Docs for collaboration, Forms for check-ins, and Slides for presentations. I try to let the tech serve the thinking, not the other way around." These excerpts demonstrate that real-time digital probes amplify teachers' situational awareness, enabling immediate instructional adjustments that analogue methods rarely permit.

Subtheme 3: Collaborative Creation Environments. A third pattern involved digital spaces that let students co-author ideas in real time. The participants talked about valuing these platforms for democratizing participation and storing group thinking beyond class sessions. The collaboration layer deepened engagement without altering core content standards.

Participant 11 likened Padlet to a shared studio wall, Flip for reflections, Google Drive for collaboration, Descript or CapCut for video editing, and Notion for project planning, saying,

> Padlet is like my digital corkboard; I use it to kickstart brainstorming. Flip for reflections, Google Drive for collaboration, and Descript or CapCut for video editing. I've also started playing around with Notion this year for project planning. The kids actually love it once they get the hang of it.

Participant 9 noted the fluid teamwork that shared slides afford: "When we do group work, I like using collaborative slides or virtual whiteboards to let students contribute in real time." These excerpts demonstrated that cloud-based workspaces extend the reach of peer dialogue and idea generation, augmenting traditional group tasks with persistence and inclusivity.

Subtheme 4: Private, Individualized Feedback. The participants highlighted tools that deliver discreet, multimodal guidance to each learner. Video or audio replies and in-document comments were lauded for preserving student dignity and capturing essential details that margin notes miss. Such feedback maintains the familiar teacher-student conference but enriches it with time-shifted presence.

Participant 6 remarked on the efficiency of tools used, as the ability to provide instant, private feedback. The participant mentioned that there is a higher response rate without interruption to class flow, whether they are sending quick video replies or commenting on documents, stating:

> The ability to give instant, private feedback. Whether it's commenting on a doc or sending a quick video reply, I can be more responsive without interrupting the flow of class. It makes a big difference in how students respond and revise their work.

Participant 7 mentioned that tools help students in recording their thinking, redoing an activity, or hearing themselves back: "I love when students can revise and reflect. Tools that let them record their thinking, redo something, or hear themselves back, they're incredibly powerful. And voice feedback has been great for my ELL students." These excerpts demonstrate that private digital feedback mechanisms heighten personalization and tone, allowing teachers to mentor students asynchronously while sustaining rapport.

These findings revealed that augmentation adds functional richness without altering the assignment's core intent. Accessibility tools lower entry barriers, real-time probes surface understanding, collaborative platforms widen participation, and personalized feedback sharpens guidance. Rather than fundamentally redesigning tasks, the participants use technology to amplify clarity, inclusivity, and immediacy.

Research Question 3

The third research question was: *How do urban P-12 teachers describe modifying traditional methods and materials using technology in their classrooms?* One major theme, that is, urban P-12 teachers modify conventional tasks by redesigning them through technology to transform student learning experiences, and four subthemes emerged that addressed this research question. The four themes were (a) student-created multimedia productions, (b) agency and design thinking, (c) virtual simulations and role-plays, and (d) student autonomy and culturally responsive design.

Theme 3: Urban P-12 Teachers Modify Conventional Tasks by Redesigning Them Through Technology to Transform Student Learning Experiences

This theme showed that participants use technology to fundamentally redesign learning activities, creating new workflows, collaborations, or products that go beyond the traditional model. Modification surfaced when teachers re-engineered lessons so that technology made new kinds of work possible rather than simply swapping formats or adding convenience. Participants stressed student authorship, real-world authenticity, and culturally responsive choice as hallmarks of this deeper redesign. Four subthemes trace the main ways educators reshaped learning tasks.

Subtheme 1: Student-Created Multimedia Productions. The participants described lessons in which students became multimodal storytellers, blending images, narration, and interactivity in formats impossible on paper. These projects often connected academic standards to personal or community narratives, boosting engagement and audience awareness. The participants viewed the shift from static writing to dynamic media as a catalyst for voice and ownership.

Participant 17 recalled a family-history unit in which learners authored bilingual e-books by create short digital books using Book Creator, explaining:

> One of my most impactful lessons was during our "My Family, My Story" unit. I had students create short digital books using Book Creator. They included family photos, interviews with grandparents, recorded on their iPads, and typed text in both Spanish and

> English. For many of them, it was the first time their stories were honored in a classroom setting, and technology made that possible.

Participant 19 highlighted a documentary project that bridged generations. The participant mentioned that each student interviewed a family member or community elder and used WeVideo to produce mini-documentaries, stating:

> Earlier this semester, we tackled the Vietnam War era through a digital oral history project. Each student interviewed a family member or community elder and then used WeVideo to produce mini-documentaries. They included archival footage, layered voiceovers, even protest music from the time.

The excerpts demonstrate how multimedia production shifts students from consumers to producers, allowing them to intertwine curriculum content with lived experience.

Subtheme 2: Agency and Design Thinking. A second pattern involved design-thinking mindsets in which teachers ceded tool selection and creative direction to students. Participants said this openness cultivated iterative problem solving and mirrored professional design workflows. The participants also noted that relinquishing tight templates made lessons "messier but more meaningful."

Participant 13 emphasized learner tool choice, noting, "I try to let students choose their tools sometimes. One even used Canva to simulate an old newspaper after the Boston Tea Party." Participant 12 reflected on the facilitator role: "I create the space, set up the tools, and let students do the learning. It's messier, less predictable, but way more rewarding." These excerpts demonstrated how design autonomy encourages experimentation and positions technology as a medium for creative exploration rather than a preset pathway.

Subtheme 3: Virtual Simulations and Role-Plays. The participants used synchronous platforms and geospatial tools to stage immersive simulations that widened students' experiential horizons. By embodying roles or navigating virtual spaces, learners practiced disciplinary thinking that paper scenarios could only approximate. Educators reported heightened critical discourse and cross-disciplinary connections during these enactments.

Participant 1 recounted a remote mock-trial: "I used Google Meet for the 'courtroom,' and we had shared Google Docs for all the scripts, case briefs, and role responsibilities… It was kind of cool to see them connecting dots that way." Participant 4 described an ecological field trip built with mapping software: "We had them work in pairs to create digital 'ecosystem tours' using Google Earth and voice recordings. It felt like the kind of deep, authentic engagement we're always chasing." These excerpts demonstrate how virtual simulations move learning from description to enactment, fostering analytical skills within authentic contexts.

Subtheme 4: Student Autonomy and Culturally Responsive Design. The final subtheme centered on technology-supported choice that honors cultural and linguistic identities. The participants framed autonomy as both a motivational driver and an equity practice, allowing students to select formats, languages, and visual styles that resonate personally. These choices, teachers said, deepen relevance and empower marginalized voices.

Participant 17 articulated a decision rubric: "I ask three key questions: Will this tool lower a barrier? Will it amplify the student's voice? And can it reflect their cultural or linguistic identity in some way?" Participant 19 added that flexible output formats sustain engagement: "I build choice into units, students can demonstrate understanding via podcast, essay, or infographic." These excerpts reveal autonomy as a conduit for culturally responsive pedagogy, with technology affording diverse avenues for expression.

These findings show that modification thrusts technology into a transformational role. The participants talked about expanding tasks, amplifying student agency, and embedding learning in authentic, culturally rooted experiences. The participants mentioned that the redesigns made are efficient in enhancing student learning experiences.

Evaluation of the Findings

The study explored how urban P-12 teachers position technology along the SAMR model and, in so doing, address the problem of inefficient integration that depresses student readiness for an increasingly digital world. Analysis of the 20 interview transcripts data revealed a progression from pragmatic substitution to function-enhancing augmentation, to learning-redesigning modification. The findings obtained are synthesized with the findings from the literature.

Research Question 1

The participants' descriptions of Google Classroom hubs, interactive timelines, real-time Doc comments, and quiz-game platforms show that substitution is an entry point for digital instruction. This finding mirrors national reports that urban schools often adopt paper-saving tools without altering pedagogy (Perry, 2018; Stahl et al., 2018). The prevalence of convenience-driven choices also aligns with Rajasekaran and Casap's (2022) critique that low-level adoption can leave achievement gaps untouched, while corroborating Singun's (2025) warning that superficial use undermines college and career-readiness. The current study findings reinforce existing evidence that substitution alone is insufficient to meet 21st-century learning goals, thereby affirming the study's problem statement.

Research Question 2

Augmentation findings, barrier-reduction tools, live polls, collaborative whiteboards, and private multimedia feedback demonstrate how teachers layer functionality onto familiar tasks to widen access and responsiveness. These moves resonate with research showing that accessibility settings such as captions and voice typing, and gamified checks increase both engagement and learning performance, especially in heterogeneous classrooms (Bouchrika et al., 2021; Yu et al., 2021, 2022). Likewise, the emphasis on real-time analytics echoes studies linking timely formative data to improved differentiation (Bowman et al., 2022). Thus, the findings corroborate earlier work that sees augmentation as a bridge between logistical efficiency and pedagogical enhancement, consistent with the SAMR model's depiction of incremental functional improvement.

Research Question 3

Finally, teachers' accounts of student-produced documentaries, design-thinking choice boards, virtual mock trials, and culturally responsive multimedia projects illustrate technology's capacity to restructure learning tasks. This shift reflects Puentedura's assertion that modification unlocks learning experiences "otherwise inconceivable" with analog tools (Lacruz, 2018) and concurs with case-study evidence that SAMR-informed redesign bolsters creativity and learner agency (Bereczki & Kárpáti, 2021; Bicalho et al., 2023). Notably, participants linked tool choice to cultural relevance and students' voice, echoing calls in the literature for equity-minded technology integration in under-resourced schools (Kumar & Vijay, 2023).

Across the three research questions, the results track closely with the SAMR hierarchy: substitution dominates, augmentation adds measurable instructional value, and modification begins to reimagine tasks in culturally responsive ways. These patterns are consistent with and extend prior findings that urban teachers progress through technology levels as infrastructure stabilizes and professional development deepens (Blundell et al., 2022). Persistent substitution confirms the continuing relevance of the problem statement: without systemic supports, many classrooms plateau at entry-level use.

Summary

The purpose of this qualitative case study is to explore the effectiveness and impact of technology integration in urban P-12 classrooms using the SAMR model (Substitution, Augmentation, Modification, Redefinition) as a guiding framework. Twenty participants took part in the study. Data was analyzed using MAXQDA software. Three research questions guided the study. Three major themes and four subthemes were obtained that addressed the research questions.

The findings revealed a clear progression in how teachers employ technology. Under Research Question 1, substitution emerged as a pragmatic but low-level strategy: learning-management hubs, interactive timelines, in-document commenting, and game-style quizzes saved time and paper yet left instructional goals intact. Research Question 2 showed technology augmenting existing lessons by layering accessibility features, live formative feedback, collaborative workspaces, and individualized multimedia responses, enhancements that widened participation and sharpened guidance without changing the core task. Research Question 3 captured modification, where teachers redesigned learning experiences entirely: students authored multimedia documentaries, exercised design-thinking agency in tool choice, engaged in virtual role-plays, and expressed knowledge through culturally responsive formats, all of which stretched learning beyond the limits of traditional practice.

These findings trace a trajectory from logistical convenience to pedagogical enrichment and, finally, to authentic task redesign, confirming both the progress and the persisting constraints of technology integration in urban settings. The findings underscore the study’s phenomenon by showing that many classrooms still plateau at substitution, while also highlighting conditions, accessibility, real-time data, student autonomy, and cultural relevance that help propel instruction toward deeper transformation. Chapter 5 will build on this evidence to propose practical steps for moving practice beyond modification toward redefinition and to outline avenues for future research.

Chapter 5: Implications, Recommendations, and Conclusions

Schools in urban areas are increasingly being expected to incorporate technological tools to enhance learning instead of merely using them to digitize their day-to-day procedures and practices (Li et al., 2022; Lisi, 2021). The problem addressed in this study was that the inefficient integration of technology in urban P–12 classrooms, leading to suboptimal student achievements and inadequate preparedness for a digitizing world across the country. The purpose of this qualitative case study was to explore the effectiveness and impact of technology integration in urban P–12 classrooms using the Substitution, Augmentation, Modification, Redefinition (SAMR) model as a guiding framework. In total, 20 educators comprised the sample in this study, and were recruited through purposive sampling technique. The collection of data involved classroom observations and the use of semi-structured interviews aligned to the SAMR framework. I analyzed the collected data through Braun and Clarke's (2006) thematic analysis, which allowed me to identify patterns in teachers' descriptions of technology use across SAMR levels. The design choice reflected the study's aim to understand how and why technology was enacted in context rather than to test statistical relationships.

Ethical assurances included the use of participant pseudonyms, informed consent, as well as handling data securely. As a whole, these methods supported credible, contextually grounded conclusions appropriate for practice and policy in similar urban settings. The findings offered vital insights into best practices for the integration of technology in urban classrooms, highlighting strategies for bridging digital divides and enhancing the effectiveness of classroom instruction. In this chapter, the findings presented in the previous chapter are synthesized. I also describe the implications, limitations, and directions grounded in the evidence. The SAMR model served as the interpretive lens connecting the study's findings to the broader literature on access, training, and instructional change.

A concise synthesis of results is presented in the chapter that follows. Teachers described a progression in technology use consistent with the SAMR model: at Substitution, tools functioned as direct stand-ins for analog tasks (for example, digital hubs and game-based quizzes); at Augmentation, features such as captions, voice-typing, live polls, and collaborative boards enhanced accessibility and feedback; and at Modification, educators redesigned tasks so students authored multimedia productions, exercised design-thinking agency, engaged in simulations or role-plays, and demonstrated knowledge in culturally responsive formats. These patterns foreground both promise and constraint in urban P–12 environments where resource disparities, training gaps, and infrastructure decisions condition what is possible (Perry, 2018; Stahl et al., 2018). As a bounded qualitative case study, findings emphasized transferability to similar contexts rather than statistical generalization; anticipated limitations include reliance on self-report for portions of the corpus, site- and region-specific conditions, and the time-intensive nature of qualitative analysis (Merriam & Grenier, 2019; Yin, 2009). The remainder of Chapter 5 proceeds as follows: Interpretation of Findings relates the results to the SAMR framework and the proposal's literature; Implications for Practice translates evidence into actionable guidance for urban stakeholders; Limitations of the Study clarifies boundaries shaping interpretation; Recommendations for Future Research identifies warranted next inquiries; and the chapter closes with a succinct Summary and Conclusions.

Implications

The analysis below presents each research question, then explains how the corresponding results address the problem and purpose and align with or extend existing research and theory.

The implications for positive change at classroom, organizational, and community levels are also discussed. Throughout, interpretive claims are supported by explicit findings from Chapter 4 and by sources already cited in Chapters 1–3.

Research Question 1: How do urban P–12 Teachers Describe the use of Substituting Technology for Traditional Methods and Materials in Their Classrooms?

Study participants described technology most commonly as a pragmatic substitute for analog routines, learning-management hubs, interactive timelines, in-document commenting, and game-style quizzes that saved time and paper while leaving core tasks intact. This pattern confirmed that substitution functioned as an entry point to integration and helped stabilize classroom workflows, but it did not alone transform learning goals or outcomes. The prevalence of substitution was consistent with literature that documented how underfunded systems prioritize basic access and efficiency before deeper redesign, especially where infrastructure and training are uneven (Francom, 2020; Kormos & Wisdom, 2023; Perry, 2018; Syathroh, 2022). This distribution was anticipated by the SAMR framework: substitution is lowest on the hierarchy and maintains task fidelity rather than reimagining learning (Bicalho et al., 2023; Blundell et al., 2022; Lacruz, 2018). These results adequately addressed the purpose of this study by revealing the way in which instructors applied technology. In addition, the results demonstrated that targeted supports are necessary for the system to go beyond digitized versions of current practices.

A number of factors could have influenced the way in which the results for the first research question were interpreted. The variability of resources across schools, including reliability of bandwidth and availability of devices, could encourage low-risk substitutions that are resilient to outages and scheduling pressures within urban contexts (Stahl et al., 2018). In addition, the instructors' beliefs and confidence had an influence on what was possible; barriers such as training, time, and infrastructure, as well as teachers' perceived value and beliefs have been reported by other researchers and could limit utilization to entry-level routines even when devices are present (Francom, 2020; Lai et al., 2022; Perienen, 2020). Thus, considering these constraints, a probable implication entails enhancing logistical efficiency and basic access to materials, which could ultimately decrease administrative friction and support consistent participation. An improbable implication, absent systemwide investment, is a quick, quantifiable jump in achievement as a result of substitution alone. Therefore, the evidence of heavy learning management system (LMS) and quiz usage revealed in Chapter 4 is consistent with the literature's expectation that schools usually stabilize at this level before advancing, mostly in under-resourced contexts.

From a theoretical and empirical standpoint, these outcomes both confirmed and extended prior research. They confirmed SAMR's expectation that entry-level technology maintains the original task structure, while extending the urban-education literature by specifying the kinds of substitutions teachers actually choose under real resource and policy conditions. Placing these findings in the context of the problem and purpose showed that the study successfully captured how technology was being enacted, while clarifying why the system's instructional core remained largely unchanged at this level. For positive social change, the likely near-term benefit is more consistent access to basic materials for students who might otherwise face paper shortages or schedule disruptions; however, the societal promise of technology to reduce opportunity gaps will remain improbable at scale if use stays confined to substitution.

Research Question 2: How do Urban P–12 Teachers Describe Augmenting Traditional Methods and Materials Using Technology in Their Classrooms?

With regard to augmentation, the findings revealed that the participants added features that enhanced accessibility and feedback devoid of changing the core task: captioning and voice-typing supported diverse learners, personalized multimedia responses improved responsiveness, and live polls and collaborative boards offered real-time formative data. These results addressed the purpose of this study as they revealed how technology could increase participation and sharpen guidance within existing lessons. Moreover, the results addressed the problem by showing movement beyond mere digitization. The pattern aligns with literature associating targeted technology features with increased engagement and feedback cycles, especially when tools are utilized to scaffold universal design and student voice (T. An & Oliver, 2021; Bouchrika et al., 2021; Kormos, 2022; Yu et al., 2022). Within the SAMR model, such uses demonstrate functional improvement and could build momentum towards redesign when coupled with teacher learning communities and coherent professional development (PD) (Bicalho et al., 2023; Blundell et al., 2022; Bowman et al., 2022).

Factors common to urban schools could have influenced how the results for the second research question were interpreted. Teachers' time and assessment pressures may favor augmentative tools that deliver real-time insights aligned to accountability demands, which can explain why features like live polling and collaborative boards appear frequently in the data. Additionally, relying heavily upon convenient features risks shallow alignment with learning goals if pedagogical intent is not clear, a tension flagged in existing literature that warns about digital distraction and the need to anchor tool use in instructional design (Bagacina et al., 2024; Cheng et al., 2022; Dikmen & Demirer, 2022). A probable implication is improved access and more equitable participation for learners with disabilities and multilingual students through captions and voice input. An improbable implication would be system-wide gains in deep disciplinary thinking if augmentation is not paired with task redesign and teacher collaboration. These conclusions align with the theoretical expectation that augmentation, on the SAMR trajectory, is not an endpoint, but rather a waypoint.

The findings for the second research question were in line with existing research associating quality PD and teacher value beliefs with higher-quality technology use, and they extend this work by showing specific augmentative moves that instructors make in under-resourced urban contexts. In addition, the RQ2 findings refined understanding of the research problem by illustrating that even modest improvements could decrease participation barriers, which has practical importance for equity whilst schools build capacity for deeper redesign (Singun, 2025). The societal implications are therefore encouraging yet bounded: more students are likely to be seen and heard in class, but lasting changes in achievement or opportunity structures would probably require schools to sustain PD, improve infrastructure, and align augmentation with culturally responsive pedagogy that invites student agency.

Research Question 3: How do urban P–12 teachers describe modifying traditional methods and materials using technology in their classrooms?

Teachers also described instances of task redesign at the modification level: student-produced documentaries, design-thinking choice boards, virtual mock trials, and culturally responsive multimedia projects that reorganized roles, products, and audiences. These results directly addressed the study’s purpose by illustrating conditions under which technology reshapes learning rather than merely digitizing it; they also responded to the problem by showing pathways beyond plateaued substitution. The pattern aligned with research reporting that SAMR-informed redesign fosters creativity, agency, and collaborative problem-solving, and it is consistent with reviews noting movement toward higher SAMR levels when infrastructure stabilizes and PD deepens (Bereczki & Kárpáti, 2021; Bicalho et al., 2023; Blundell et al., 2022; Kormos, 2022). The study extended the literature by tying modification to culturally responsive design, teachers linked tool choice to voice, identity, and community relevance, thereby connecting SAMR to equity-minded practice in under-resourced schools (Kumar & Vijay, 2023; Lai et al., 2022).

Interpretation for RQ3 was influenced by contextual enablers and constraints. Redesign requires reliable devices, flexible classroom time, supportive leadership, and teachers' pedagogical content knowledge; the literature review emphasized how first- and second-order barriers shape these conditions in urban schools (Francom, 2020; Lai et al., 2022; Perienen, 2020). The data's virtual simulations and role-plays highlighted how synchronous platforms and geospatial tools can move learning from description to enactment, but they also underscored that not all classrooms can sustain such work without structural support (e.g., scheduling, co-planning, and technical coaching). A probable implication is increased student agency and authentic disciplinary talk in classrooms where these conditions are present; an improbable implication is rapid district-wide diffusion of such redesign absent coherent policy and investment. By anchoring modification to culturally responsive design, the findings also suggested that technology's contribution to positive social change is most likely when students' cultural and linguistic identities are centered in task design.

Placed within the Chapter 2 framework, the modification results were consistent with SAMR theory and with studies that connected technology-enhanced creativity and agency to meaningful learning gains (Bereczki & Kárpáti, 2021; Bicalho et al., 2023; Blundell et al., 2022;

Li et al., 2022). The results contributed to the literature by specifying how urban teachers leveraged student choice and community-relevant products to make learning consequential beyond the classroom. In terms of societal outcomes, the most significant probable consequence is improved digital fluency and civic voice among students who produce artifacts for authentic audiences, an outcome aligned with calls to prepare learners for a digitized world and to narrow opportunity gaps. A less probable consequence, without system supports, is a sustained move to "redefinition" across a school network; the Chapter 4 evidence indicates that many classrooms continue to operate at substitution and augmentation, suggesting that policy, PD, and infrastructure must be addressed concurrently to realize technology's broader promises.

Across RQ1–RQ3, the study mapped a realistic arc of technology use in urban schools: substitution was common, augmentation added instructional value, and modification emerged where conditions allow task redesign. This arc confirmed the dissertation's theoretical stance and clarifies how the problem persists in practice: absent system-level investment, many classrooms stabilize at lower SAMR levels despite educators' commitment and creativity. The findings were largely in agreement with the literature synthesized in Chapters 1–2, while extending it by documenting concrete practices and contextual drivers within urban P–12 settings (Bicalho et al., 2023; Blundell et al., 2022; Perry, 2018; Stahl et al., 2018). Factors influencing interpretation, resource disparities, PD access, teacher beliefs, and accountability pressures, should be kept in view when judging transferability to similar districts (Francom, 2020; Lai et al., 2022). The most significant probable implications included more equitable access to materials and feedback (via augmentation) and stronger student agency and cultural relevance (via modification). The most improbable implications, given current constraints, were rapid, system-wide transformations in achievement without aligned investments in infrastructure, teacher learning, and curriculum redesign. These conclusions set the stage for the subsequent sections on limitations, recommendations, and conclusions by showing exactly where the field stands and what it will take to move practice from digitization toward transformational learning.

Recommendations for Practice

The study's evidence supported a SAMR-aligned professional learning sequence focused on moving teachers from routine substitution toward purposeful augmentation and, where conditions allow, task modification. Findings showed that teachers reliably used learning-management systems and digital distribution as direct stand-ins for paper routines (e.g., Google Classroom postings and hub use; Teams distribution; OneDrive sharing), which stabilized workflow but kept the original tasks intact. These same data also captured intentional moves, reverse-engineering tasks from objectives and matching tools to "cognitive moves", that can be amplified through coaching cycles and peer demonstration (Blundell et al., 2022; Bowman et al., 2022; Francom, 2020). A practical implication is to organize job-embedded professional learning communities (PLCs) around short "SAMR sprints": co-plan one lesson at substitution, iterate to augmentation (added accessibility/feedback features), then co-teach a modification version, documenting impacts on participation and work quality. The SAMR literature indicated that such staged, supported shifts are more sustainable than leaps, and that clarity about the model improves teacher uptake (Bicalho et al., 2023; Blundell et al., 2022; Lacruz, 2018). In similar urban contexts, the near-term, probable benefit is more coherent technology use and gradual redesign of a subset of tasks; broader achievement effects remain improbable without concurrent infrastructure and curriculum support.

The second practice implication is to institutionalize accessibility and barrier-reduction features as standard, first-order expectations of lesson design rather than optional enhancements.

Chapter 4 documented frequent use of speech-to-text, captions, text-to-speech/highlighting, and embedded scaffolds, suggesting a workable foundation for universal design moves that broaden participation without changing core content (Bouchrika et al., 2021; Kormos & Wisdom, 2023; Yu et al., 2021). To translate that into routine practice, leaders could adopt concise protocols (e.g., “every video with captions; every writing task with voice typing available; every reading with read-aloud/highlight”) and audit a sample of lessons each quarter. Literature from Chapter 2 on digital divide and participation supported the expectation that such features improve access and feedback equity, particularly in under-resourced schools where connectivity and device experience vary (Kormos, 2022; Kormos & Wisdom, 2023). Teacher dashboards and feedback tools have also been shown to equalize feedback opportunities, reinforcing this direction (Knoop-van Campen et al., 2023). Appropriately bounded, the probable impact is more visible participation and reduced access friction; causal claims about achievement should be avoided at this stage.

Third, schools should formalize formative-assessment cycles that leverage the specific tools teachers already used for real-time checks and collaboration. The data show consistent use of low-stakes quizzing (e.g., Kahoot!, Blooket), shared-document monitoring, interactive questions in video (Edpuzzle), and check-ins (Google Forms), alongside collaborative brainstorming and scripting spaces (Bowman et al., 2022; Knoop-van Campen et al., 2023; Yu et al., 2022). A practice recommendation is to anchor a weekly “assessment minute” routine: select one live check (poll, form, in-video item), one collaborative prompt, and a plan for closing the feedback loop in the next lesson. This converts augmentation features into a predictable engine for instructional decisions and student self-monitoring. Researchers have indicated that when technology is aligned to formative purposes and teachers receive PD on interpreting the signals, participation and guidance improve, especially in mobile-first or mixed-access environments (Adu-Boateng & Goodnough, 2022; T. An & Oliver, 2021). In transfer-appropriate urban settings, the likely effect is timelier feedback and clearer next steps for students, while acknowledging that durable gains depend on fidelity and curricular alignment.

Fourth, to cultivate genuine task redesign, leaders should sponsor co-design cycles in which teachers and students develop culturally responsive, community-facing products using the collaborative creation environments documented in the findings. Evidence of shared scripting, Padlet brainstorming, collaborative slides/whiteboards, and student-authored multimedia indicates both interest and capacity for modification-level work when time and support are provided (Bereczki & Kárpáti, 2021; Bicalho et al., 2023). A practical structure is a "studio unit" each term where teams co-plan a product with an outside audience (e.g., local museum, board meeting, community group), align tool choice to disciplinary goals, and schedule critique/revision checkpoints. Chapter 2 literature on technology-enhanced creativity and agency suggests that such design can strengthen voice and disciplinary talk, provided the work is anchored to clear objectives and scaffolds (Bereczki & Kárpáti, 2021; Bicalho et al., 2023). In urban contexts, coupling design autonomy with equity-minded, culturally responsive aims helps amplify student voice and relevance, while mitigating persistent access barriers (Kormos, 2022; Kumar & Vijay, 2023; Lai et al., 2022). In comparable settings, the probable result is stronger student ownership and more authentic artifacts; district-wide redefinition remains improbable without calendar, coaching, and assessment structures that reward this work (Francom, 2020; Perry, 2018).

Finally, the study underscored that implementation quality would track the strength of infrastructure, time, and leadership signals; therefore, practice recommendations must include enabling conditions. Because many documented practices depend on cloud suites and stable connectivity (e.g., Google Suite reliance; LMS hubs; synchronous discussion), school leaders should prioritize bandwidth reliability, device cycling, and protected co-planning time before expecting sustained movement beyond substitution. Chapter 2 repeatedly linked progress to the mitigation of first-order barriers (infrastructure, time, training) and alignment with teacher beliefs through coherent PD (Francom, 2020; Lai et al., 2022; Perienen, 2020). Urban-context literature also noted resource disparities and policy constraints that shape what is feasible in the near term (Kormos & Wisdom, 2023; Perry, 2018; Power et al., 2020; Stahl et al., 2018). Practically, leaders should publish a one-page “enablers list” with service-level expectations for internet uptime, device-to-student ratios, and scheduled PLC time, so that teachers’ SAMR-aligned efforts are supported rather than improvised. These implications apply to contexts similar to the study sites; generalized claims beyond such settings should be avoided.

Recommendations for Future Research

Future research should extend this study’s SAMR-guided examination of technology integration in urban P–12 classrooms by tracing how teachers’ practices evolve over time and under different enabling conditions. Because the current findings showed a strong presence of Substitution and Augmentation with instances of Modification, scholars could design follow-on studies that document movement across SAMR levels within the same sites, explicitly linking changes to supports such as professional learning, planning time, and infrastructure improvements (Blundell et al., 2022; Francom, 2020; Yin, 2009). Anchoring these studies to the study’s stated problem, inefficient technology integration in urban schools, and its purpose kept the focus on the instructional core rather than on tools alone. A longitudinal, within-case design that observes the same teachers as they iterate lessons would reveal how design decisions accumulate into task redesign and where plateaus persist. Situating this work in the SAMR literature from Chapter 2 ensured conceptual continuity while clarifying when and how classrooms move beyond digitized routines. Such extensions remain bounded to contexts similar to those studied here, urban, under-resourced schools in the Southeastern United States, and should be framed as transferability rather than generalizability.

Methodologically, a mixed-methods or multi-phase qualitative design offers a justified next step to deepen what can be learned from the present study's case approach. Researchers can pair repeated observations, interview waves, and artifact analyses with targeted quantitative indicators (for example, counts of modification-level tasks per unit) to triangulate how teachers' lesson designs shift and why (Braun & Clarke, 2006; Dawadi et al., 2021). Moreover, future projects related to the topic of this study should continue to adopt thorough thematic analysis procedures and explain measures to enhance trustworthiness such as member checks. They should also explore saturation and sampling tradeoffs when tracking change over time. These choices follow the analytic procedures already utilized in this study and would reinforce claims with regard to how design features relate to SAMR movement. In future studies, researchers should consider using a larger sample of educators experimenting with redesign with the objective of capturing enough instances of modification for cross-case comparison. Across these methodological refinements, researchers need to continue documenting the analysis chain in a careful manner so others could be able to audit claims and determine transferability of the findings.

Additionally, researchers in future studies should conduct comparative studies across districts and grade bands with the aim of establishing how contextual conditions identified in Chapter 2, particularly device access, infrastructure reliability, and policy signals, affect the limit of technology utilization. Cross-site designs could alter device-to-student ratios, bandwidth stability, and LMS ecosystems to establish how each condition predicts plateaus at Substitution or progress to Augmentation and Modification. The literature summarized in Chapters 1–3 links resource disparities and infrastructure to uneven adoption, suggesting that examining these variables explicitly would clarify which constraints matter most in urban systems. Including schools that differ on poverty concentration or funding would help specify whether certain supports (for example, guaranteed co-planning time) compensate for weaker infrastructure. Findings from such comparisons would still be bounded to urban settings but would provide more granular hypotheses for practitioners about where to invest first. Replication in other regions would then help determine which patterns travel beyond the Southeastern U.S. sites.

A parallel line of work should experimentally or quasi-experimentally test professional learning models that, according to the Chapter 2 literature, interact with teachers' beliefs and school culture to influence technology adoption quality. Studies can compare coaching structures that sequence "SAMR sprints" against business-as-usual PD to see which approaches produce more frequent and higher-quality movement into Modification. Because beliefs and value perceptions are known second-order influences on adoption, measures of teacher beliefs and collaborative culture should be collected alongside observation data to explain variance in outcomes. Embedding these trials in learning communities would also allow researchers to examine how teacher-led norms sustain changes after formal PD ends. Justified by the earlier literature on PD, beliefs, and school culture, these designs would clarify the mechanisms that move augmentation toward redesign in urban contexts. As before, claims should be positioned as context-specific and tied to the study's problem and purpose rather than cast as universal.

Instrument development represents another concrete avenue: researchers should build and validate SAMR-aligned observation and artifact-rating rubrics that are sensitive to accessibility features, collaboration structures, and culturally responsive outputs. In Chapter 2, I indicated that assessment design aligned to SAMR could guide more intentional technology use; future studies could extend this by field-testing rubrics that differentiate well between Substitution, Augmentation, and Modification in real classrooms. Complementary measures should capture feedback dynamics, participation equity, and student voice to connect redesign to instructional quality indicators already discussed in the literature. Linking these measures to student-facing outcomes, engagement, persistence on tasks, or the quality of multimedia products, would test the claim that moving beyond digitization yields richer learning experiences in urban settings. As measurement tools mature, they would also support more precise comparisons across sites and over time. Any outcome claims should remain cautious and framed as emerging evidence while instruments gain reliability.

Lastly, future research should keep equity at the forefront by examining how SAMR-informed redesign interacts with participation barriers highlighted in Chapter 2, including language access, disability supports, and connectivity constraints. Studies can track whether consistent use of captions, voice-typing, read-aloud tools, and collaborative dashboards meaningfully changes who participates and how often students receive actionable feedback. Pairing these analyses with student focus groups would reveal whether culturally responsive, community-facing products at the Modification level strengthen motivation and perceived relevance, particularly for minoritized learners. Because the present study's sample and region were delimited, researchers should recruit across subject areas and grades to see whether equity gains hold in varied classrooms. Throughout, the emphasis should remain on transferability to similar urban schools rather than broad generalization. By aligning equity-focused questions to the SAMR framework and to the constraints documented in the literature, this line of inquiry would build directly on the dissertation's aims.

Next logical step: a multi-site, design-based research cycle in demographically similar urban schools that (a) co-designs one "studio" unit per term aimed at Modification, (b) guarantees enabling conditions identified in Chapters 1–3 (reliable bandwidth, device access, protected co-planning time), and (c) uses a validated SAMR-aligned rubric to track changes in lesson design, participation, and product quality across two to three iterations. This program would test whether predictable supports produce repeatable gains in redesign, while documenting when classrooms revert to substitution and why. Sampling should ensure representation across elementary, middle, and high school to examine developmental differences, and data should include observations, teacher interviews, student artifacts, and brief participation metrics. Ethical and trustworthiness procedures, member checks, audit trails, and careful delimitation, should mirror those already established in this dissertation to maintain consistency of claims. Positioned this way, the study would incrementally extend knowledge without overstating applicability beyond comparable urban settings.

Conclusions

This research involved examining the way in which urban P-12 educators enact technology through the SAMR model to address a recognized problem, namely inefficient integration that depresses student readiness in a digitizing world. The purpose of this qualitative case study was to explore the effectiveness and impact of technology integration in urban P-12 classrooms using the SAMR model as a guiding framework**.** The study was guided by three research questions aligned to Substitution, Augmentation, and Modification. Semi-structured interviews and classroom evidence were synthesized to establish a realistic progression of use. The findings revealed that educators often stabilized at Substitution for workflow efficiency, layered Augmentation features to widen access and feedback, and reached Modification where conditions enabled task redesign and student agency. These results effectively addressed the research problem by demonstrating where technology contributed value and where it did not contribute any value, and they affirmed the significance of context, infrastructure, time, training, and leadership in shaping what was possible in similar urban schools.

On the whole, technology in urban P-12 settings tends to be more meaningful for learning when it is not only utilized to digitize routines, but also to redesign tasks in ways that increase accessibility and amplify student voice, feedback, and cultural relevance. Although Substitution delivers organizational benefits, it is not possible for it to significantly shift outcomes on its own; Augmentation improves participation and guidance when utilized intentionally; and Modification, though less frequent, demonstrates the greatest instructional promise when supported by enough planning time, coherent professional learning, and stable infrastructure. The results of this study are consistent with previous research that associate teacher beliefs, PD quality, and resource conditions with the depth of technology integration. In addition, the results affirm the SAMR model as a useful theoretical framework for describing movement rather than an end in itself. For practice, the findings demonstrate that leaders need to invest first in enabling conditions and job-embedded collaboration so that teachers could incrementally shift from Substitution to Augmentation and, where possible, to task-level Modification. For the field, the study contributed tangible examples of how educators in urban schools actually utilize tools under real constraints and identified leverage points for progressing past digitization in contexts similar to those explored in this study. In combination, these conclusions underscored the importance of the study: they refine how SAMR-guided integration could serve equity and learning in under-resourced schools while setting realistic expectations for change and the supports it requires.

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Appendix A

Questionnaire

Interview Questions:

General Introduction…I am studying to better understand how teachers integrate technology into their teaching. I anticipate it will last 60 minutes. Everything you share will be confidential. You can exit the conversation at any time. I will be taking notes for this study. Please don't talk to each other. While answering the questions, you may choose not to answer any question you deem intrusive or uncomfortable with.

1) How do you implement/technology into the classroom?
Probe: Describe a specific lesson where technology played a key role.
Probe: What technology tools do you use (e.g., Smartboards, tablets, online platforms)?
Probe: How do you decide which technology to use for different lessons?

2) Describe your satisfaction or enjoyment levels using this technology method in detail.
Probe: What specific features of this technology do you find most useful or enjoyable?
Probe: Describe the aspects you find frustrating or difficult to use in the technology.
Probe: How does using this technology affect your interactions with students during lessons?

3) Please explain your levels of preparedness when using this type of technology.
Probe: How has the training or professional development on technology integration influenced your practices?
Probe: What barriers did you encounter when you first started using technology, and how have you overcome them?
Probe: In what ways, if any, has your confidence in using technology grown?
Probe: How does leadership in your school encourage or hinder technology use?

4) What challenges do you face when integrating technology into your classroom?
Probe: What specific technologies are more difficult to implement or use effectively?
Probe: How do issues like infrastructure, internet access, or tech support affect your use of technology?
Probe: How do you address technical difficulties when they arise during lessons?

5) What impact do you think technology has on student learning outcomes?
Probe: What changes did you notice in student performance or engagement due to using technology?
Probe: In what ways do students benefit from using technology in their lessons?
Probe: What are some of the downsides or challenges related to technology's impact on student learning?
Student response:
Probe: How engaged are your students when using technology during lessons?
Probe: Describe the types of technology that resonate more with your students.
Probe: How does technology impact students with different learning styles or needs?

6)? Kindly describe your student's levels of engagement with the technology.

7) How did the technology impact your other teaching methods?

8) In what ways are your students affected by this technology?

9) Kindly explain how the technology ensures equitable access for all students?

10) Kindly describe the availability of this technology for teachers and students.

11) What are some challenges related to student access to technology outside of the classroom (e.g. at home)?

12) How do you modify or adapt your lessons when using technology to better suit diverse student needs?
Probe: How do you incorporate language translation or accessibility tools into your technology?
Probe: What technologies have been most helpful for differentiated instruction?

13) What technology do you use in your lesson planning and/or classroom?

14) How does the availability of a smartboard affect class activities vs. individualized classroom instruction?
15) How would you implement this technology in your classroom?

16) Do you enjoy augmentative teaching? How would you implement this in your classroom?

17) How do you use the technology, when, and why? What does it add to your classroom instruction?

18) How do you use modifying methods for your general class lessons?

19) What are your thoughts on the redefinition of technology?
Probe: in your understanding, how would you define technology?
Probe: How would you integrate cooperating teaching in your definition of technology?

Appendix B.

Codebook

1 Describing modification of technology	0
1.1 Student-created multimedia experiences	0
1.1.1 Virtual courtroom simulation	2
1.1.2 Ecosystem tours	1
1.1.3 Tutorial Screencast videos	1
1.1.4 Podcast projects	1
1.2 Student-created video ads	0
1.2.1 Canva video ads	1
1.2.2 WeVideo editing	1
1.2.3 Multimedia persuasive stance	1
1.3 Digital poetry books	0
1.3.1 Book Creator poetry books	1
1.3.2 Visual enhancements	1
1.3.3 Student narration	1
1.4 Interactive brochures	0
1.4.1 Google Slides brochures	1
1.4.2 Hyperlinked content	1
1.4.3 Student creativity	1
1.5 Digital math environments	0
1.5.1 GeoGebra geometry exploration	1
1.5.2 Desmos visualizations	1
1.5.3 Collaborative slides for group work	1
1.6 Student agency & autonomy	0
1.6.1 Facilitator role adoption	1
1.6.2 Sense of ownership	1

1.6.3 Zero-template autonomy	1
1.6.4 Designing experiential learning	1
1.7 Student-created multimedia	0
1.7.1 Virtual Thinglink exhibits	1
1.7.2 Podcast debates	1
1.7.3 3D-printed prototypes & pitch videos	1
1.7.4 Digital family migration books	1
1.7.5 Weather report video	1
1.7.6 Digital therapy journals	1
1.7.7 Oral history mini-documentaries	1
1.7.8 Digital Valentine's cards	1
1.8 Agency & design thinking	0
1.8.1 Student choice of tools	1
1.8.2 Crisis debrief & redesign	1
1.8.3 Form inspired tool use	1
1.9 Student autonomy & culturally responsive design	0
1.9.1 Criteria-driven tool selection	1
1.9.2 Choice Boards	1
1.9.3 Multi-modal demonstration options	1
1.9.4 Mode of expression choice	1
2 Describing augmentation of technology	0
2.1 Real-time formative checks	0
2.1.1 Nearpod live polling	1
2.1.2 Edpuzzle interactive questions	1
2.1.3 Google Forms quizzes	1
2.2 Adaptive learning	0
2.2.1 Adaptive learning programs	1

2.2.2 ReadTheory practice	1
2.2.3 Quizlet study sets	1
2.2.4 Collaborative writing spaces	0
2.2.4.1 Google Docs peer feedback	1
2.2.4.2 Google Slides collaborative editing	1
2.2.4.3 Padlet shared collaboration	1
2.3 Video reflections	0
2.3.1 Flip student explanation	1
2.3.2 Flip video reflections	1
2.3.3 Video replies	1
2.4 Accessibility features	0
2.4.1 Captions	1
2.4.2 Text-to-speech	1
2.4.3 Translation features	1
2.5 Private feedback	0
2.5.1 Doc comments	1
2.5.2 Video replies	1
2.5.3 Voice feedback	1
2.6 Visual learning supports	0
2.6.1 Canva visual design	1
2.6.2 Padlet visual boards	1
2.6.3 Thinglink interactive images	1
2.7 Real-time formative checks	0
2.7.1 Formative quizzes	1
2.7.2 Shared doc monitoring	1
2.7.3 Real-time discussion	1
2.8 Collaborative creation environments	0

2.8.1 Shared Google Docs scripting	1
2.8.2 Padlet brainstorming	1
2.8.3 Collaborative slides/whiteboards	1
2.9 Intentional tool selection & scaffolding	0
2.9.1 Reverse-engineering from objectives	1
2.9.2 Objective-dynamic platform choice	1
2.9.3 Cognitive-move tool matching	1
2.10 Barrier reduction & accessibility	0
2.10.1 Speech-to-text & captions	1
2.10.2 Text-to-speech & highlighting	1
2.10.3 Embedded scaffolds	1
2.11 Real-time feedback & collaboration	0
2.11.1 Mid-process document comments	1
2.11.2 Comment banks & audio notes	1
2.11.3 Collaborative brainstorming	1
2.12 Barrier reduction & scaffolding	0
2.12.1 Voice typing & subtitles	1
2.12.2 Zones of Regulation & Calm Classroom apps	1
2.12.3 Login picture cards	1
2.13 Real-time formative & emotional feedback	0
2.13.1 Edpuzzle interactive questions	1
2.13.2 Google Forms check-ins	1
2.13.3 Flip weekly reflections	1
2.13.4 Kahoot! quick assessments	1
3 Describing substitution of technology	0
3.1 Replacing analog content with interactive tools	0
3.1.1 Interactive timeline	1

3.1.2 Digital flashcards	1
3.1.3 Digital animations	1
3.2 Digital assignment and content distribution	0
3.2.1 Google Classroom postings	1
3.2.2 Microsoft Teams distribution	1
3.2.3 OneDrive peer sharing	1
3.3 Digital drafting and feedback	0
3.3.1 Word Online drafting	1
3.3.2 Google Docs collaborative drafting	1
3.3.3 Instant Doc comments	1
3.4 Digital assignment hub	0
3.4.1 Google Classroom hub	1
3.4.2 Edmodo discussions	1
3.4.3 Google Suite reliance	1
3.5 Digital journals	0
3.5.1 Seesaw digital journal	1
3.5.2 Flip video reflections	1
3.5.3 Family Seesaw access	1
3.6 Online quiz platforms	1
3.6.1 Blooket game-based quizzes	1
3.6.2 Quizizz quick assessments	1
3.6.3 Edpuzzle comprehension checks	1
3.7 Multimedia content creation	1
3.7.1 Explainer videos with Canva & Spark	1
3.7.2 CapCut digital documentaries	1
3.7.3 WeVideo “Community Voices” films	1
3.8 Digital class hub & distribution	0

3.8.1 Google Classroom home base	1
3.8.2 Organizational backbone	1
3.8.3 Integrated Google Workspace	1
3.9 Digital creative substitutions	0
3.9.1 Interactive Sutori timelines & Flip debates	1
3.9.2 Scratch historical games	1
3.9.3 Digital art medium	1
3.9.4 Template-based drafting	1
3.10 Digital expression replacements	0
3.10.1 Bilingual video storytelling	1
3.10.2 Anonymous Jamboard check-ins	1
3.10.3 Interactive Tiki-Toki timelines	1
3.10.4 Google Drawings digital posters	1
3.11 Digital distribution & management	0
3.11.1 Seesaw digital journals	1
3.11.2 ClassDojo communication	1
3.11.3 Google Workspace integration	1
3.11.4 Google Classroom hub	1

Appendix C.

IRB Approval

Date: 5-23-2025

IRS#: IRB-FY24-25-874

Title: No Teacher Left Behind. Integrating Technology in Urban P-12 Classrooms Using the SAMR Model: A Qualitative Case Study of Urban Public Schools

Creation Date: 4-25-2025

End Date:

Status: Approved

Principal Investigator: Samita Mezger

Review Board: NU IRB

Sponsor:

Study History

Submission Type Initial

Key Study Contacts

Member Nancy Walker

Member Samita Mezger

Member Samita Mezger

Review Type Exempt

Role Co-Principal Investigator

Role Principal Investigator

Role Primary Contact

Decision Exempt

Contact nwalker@nu.edu

Contact

s.mezger4224@o365.ncu.edu

Contact

s.mezger4224@o365.ncu.edu

Initial Submission

General Info

Before you get started review and complete all steps outlined on our website.

*required

Acknowledge you have completed all of the following steps prior to starting this application:

All boxes must be checked to move on

✓ CITI Training

✓ Review institutional policies about research

✓ Consider the feasibility of your study

✓ Prepare supplemental documents

*Helpful Resources:

1. Attend Group Sessions for additional help with supplemental documents and/or IRB Application

2. Review the How to Complete an IRB Application video

3. Review the How to Submit and Certify your IRB Application video

3. Review IRB Process lnfographic

4. Review Submission Statuses Guide

*required

STUDENTS: Select yourself.

FACULTY: Select yourself as primary contact unless you have a Research Coordinator who will be making submissions on your behalf.

STAFF: Select yourself as primary contact unless you have a Research Coordinator who will be making submissions on your behalf.

Name: Samita Mezger

Organization: NCU-SCoE-Education-edd Address:

Phone:

Email: s.mezger4224@o365.ncu.edu

What is the full title of the research study?

*required

No Teacher Left Behind. Integrating Technology in Urban P-12 Classrooms Using the SAMR Model: A Qualitative Case Study of Urban Public Schools

Study Personnel

Study personnel refers to anyone who will be analyzing study data. Study personnel does NOT include transcription services or statisticians.

*required

Who is the Principal Investigator {Pl)?

STUDENTS! DO NOT LIST FACULTY SPONSOR HERE - enter your own name

For a quick tutorial video on how to enter the PJ's name using the Find People button, r.lir.k hArP.

The Pl is almost always the person responsible for collecting and analyzing data. There can be only one Pl listed on the study who is ultimately responsible for the conduct and oversight of the study including education of study staff, study management, and the protection of study participants.

Name: Samita Mezger

Organization: NCU-SCoE-Education-edd Address:

Phone:

Email: s.mezger4224@o365.ncu.edu

*required

Upload CITI certification

The current requirement for CITI training is the Social & Behavioral Educational (SBE) course (former NCU researchers)

or the Researchers- Social and Behavioral Focus course (researchers that have always been affiliated with NU or any study personnel that are not affiliated with NU).

Please ONLY upload the required CITI training certificate, we do not need to review any additional certificates you've completed.

Click here for CITI User Guide

thW,Please upload your CIT/ certification as a PDF. We are not able to view certifications uploaded as a link.

citiCompletionCertificate-Mezger, Sami.pdf

*required

At NU:

I am Faculty

✓ I am a student

*required

Student researchers must have a Faculty Sponsor/Chair certify their

Please insert your Faculty Sponsor/Chair's name by clicking the find people button below.

For a quick tutorial video on how to enter the Faculty Chair's name using the Find People button, click here

Name: Nancy Walker

Organization: NCU-Sanford College of Education Address:

Phone:

Email: nwalker@nu.edu

*required

It is the Pl's responsibility to ensure any person with access to data has completed required human subjects research training.

Confirm your Faculty Chair has completed the required CITI training by clicking "Yes".

✓ Yes

I am staff

*required

Do you have a Co-Investigator (Co-I)?

Co-Pis/Co-ls are key personnel who have responsibilities similar to that of a Pl on research projects. While the Pl has ultimate responsibility for the conduct of a research project, the Co-Pl/Co-I is also obligated to ensure the project is conducted in compliance with applicable laws and regulations and institutional policy governing the conduct of research.

Yes

✓ No

Do you have any additional study personnel?

Study personnel can include research assistants, or other individuals who may have access to your data (this does NOT include professional transcription services or statisticians).

TIP: For PJ's working with unaffiliated Co-Investigators, please select 'yes" here and list the name(s).

Yes

✓ No

*required

Is this project funded?

Yes

✓ No

Multi-Site IRB Research

- If you are using a research site that has an IRB click here for more information about

the ron11ir0m0nte!

- If your site is not registered with the U.S. Department of Health and Human Services (HHS), Office for Human Research Protections, the answer to this question should be No.

- Many K-12 school districts have an IRB/HRPP office, but they are not a registered IRB with the HHS. If your study will take place in a K-12 setting, the response to this question is No.

*required

Are you conducting your research at a site with an IRB or HRPP (Human Research Protection Program)?

Yes

✓ No

I need NU IRB approval first

*required

lntemational Research

*required

This study involves international research (i.e., research done outside the US)

International research can include collecting data from people outside· the US, or using data sets that did not originate in the US. For more information about conducting international research, click here.

Yes

*required

Projected Start Date

VERY IMPORTANT: In advance of initiating any involvement of human subjects in this study (i.e., contact, recruitment, and enrollment), the IRB must review and accept your response to all of the comments included in the preliminary review.

You may not advertise your study, recruit participants, or collect data until approval for the use of human subjects is obtained.

.If you've already started research activities (recruitment, consent, data collection, etc.), please email irb@nu.edu with guidance on how to move forward.

✓ I will wait until I have received IRB approval to initiate any involvement of human subjects in this study (i.e., contact, recruitment, and enrollment)

I have already started contacting participants and/or have collected data from my participants.

Study Objectives and Background

*required

What is/are your research question(s)?

TIP: The research question is the overall question your study is trying to address. It reflects the phenomenon you are studying, and what you are attempting to learn about it.

For more information and examples, click on the question mark icon on the right.

Research Questions

Three key research questions will be addressed in this study:

RQ1

How do urban P-12 teachers describe the use of substituting technology for traditional methods and materials in their classrooms?

RQ2

How do urban P-12 teachers describe augmenting traditional methods and materials using technology in their classrooms?

RQ3

How do urban P-12 teachers describe modifying traditional methods and materials using technology in their classrooms?

*required

In 2-3 sentences describe your research design.

For more information and examples, click on the question mark icon on the right.

A qualitative research method and a case study design will be used to gain insights into the effectiveness and influence of technology integration in urban P-12 classrooms, with a specific focus on the application of the SAMR model (Substitution, Augmentation, Modification, Redefinition) as a guiding framework.

Employing this method will facilitate an exploration of the perspectives, experiences, and viewpoints of educators with extensive expertise in the relatively underexplored subject. A case study design will be utilized to investigate the optimal practices integrating technology in urban P-12 classrooms to contribute to suboptimal student achievements and inadequate preparedness for a rapidly digitizing world. This design is particularly advantageous when the intent is to explore the "how·· and "why" questions of a study and delve into the intricacies of a phenomenon, aligning well with the objectives of the proposed research (Basar et al., 2021; Yin, 2009).

*required

Check all that apply

Archival data

Archival data may have been collected for research purposes or non-research purposes, and from publicly available sources (such as websites), or non-public sources (such as hospital or school records). Researchers often analyze data that were previously collected by someone else. For additional information on using archival, secondary or existing data sets, click here.

✓ Interaction and/or intervention with human subjects

Intervention

Common forms of data collection that involve intervention with human subjects include:

- Physical procedures (e.g.: fatigue stress tests)
- Manipulations of the subject's environment that are performed for research purposes (e.g.: response induction techniques)

Interaction

Common forms of data collection that involve interaction with human subjects include:

- Observing (in places where an individual could reasonably expect not to be)
- Surveying (by instrument or questionnaire)
- Interviewing (systematically across all participants)

*required

Are you conducting observations ONLY?

Yes

✓ No

*required

Are you conducting an online anonymous survey ONLY?

Yes

*By selecting 'yes' the Pl is verifying this project only involves the collection of original/new data by means of online, anonymous survey, and will not be coupled with any other data collection methods.

For clarification on the difference between anonymity and

confidentiality, click the question mark icon on the right.

For more information and guidance regarding Confidentiality vs. Anonymity, click here

✓ No

Study Design

Language

•required

Will the study involve any language besides English?

For information regarding requirements for translators, interpreters and confidentiality agreements, click here.

Yes

REQUIREMENT: The Pl must ensure that all lRB approved documents (e.g., consent, recruitment, data collection instruments, etc.) are properly translated.

✓ No

Population

*required

My study population will include

Check all that apply

Adults 18 and older NOT in an educational setting

✓ Adults 18 and over in an educational setting

Minors (individuals under the age of 18) in an educational setting Minors (individuals under the age of 18) NOT in an educational setting Prisoners

Pregnant Women

Current Department of Defense/Military personnel (not Veterans) American Indian/Alaska Natives

Protected health information (medical records, clinic logs, health information obtained from medical records, laboratory reports, mental health records, etc.)

Participants

The /RB is required to evaluate whether participant selection for a given research study are fair to ensure the burdens of research participation are distributed equitably across groups of people. Therefore, information regarding the characteristics of subjects that will be involved in the proposed study are needed to conduct an adequate /RB review.

*required

List the eligibility criteria.

List all criteria that potential participants must meet in order to be eligible to be in the study. If the groups of your study have different populations, you may need to·define separate eligibility criteria for each group.

REQUIREMENT: List each criterion on a separate line. Click this link for more information about how to write your eligibility criteria.

Example:

Women

age range: 25-35

live in the NJ area

For more help consider attending a group session on how to write your eligibility criteria.

Current P-12 Teacher

Reside in the Northeastern United States Work in an urban public school

Age Range: 18 years or older

Have taught at your current school for at least 3 years

You are knowledgeable about classroom technology use and have experience using the SAMR framework

*required

How many potential participants do you plan to recruit?

Example: I will be recruiting 35 participants.

20 maximum participants

Research Activities

*required

List all activities that participants will be asked to complete, how long each activity will take, and where each activity will take place.

Participate in a one-on-one semi-structured interview conducted via Zoom or another secure video conferencing platform.

Answer open-ended questions about their use of technology in the classroom. Review and confirm their interview transcript for accuracy (member checking).

Procedures

For information about data collection instruments click here.

For data collection instrument samples click here.

*required

This study will include:

Check all that apply

Audio/video recordings or photographs

Behavioral observations and/or behavioral experimentation

Interventions - Interventions typically involve manipulation of participant's environment in addition to having a control group for comparison- e.g., playing music while students do homework, or modifying the temperature in a classroom while students work.

✓ Interview

*required

Upload interview protocol and questions

Data Collection Instruments 4-20-25.docx

Focus group Surveys/questionnaires Venipuncture

Journals Other

Study Location and Site Permission

You may need to upload written permission/documentation from the sites and websites you want to use for collecting data. For information and templates for site permission click here.

*required

Data collection will take place in the following spaces (check all that apply):

Public spaces (NOTE: Public schools are NOT considered public spaces. Examples of public spaces are parks, coffee shops, mall, grocery store, etc.)

Private spaces (University campus, public k-12 school, office building, listservs, moderated forums, etc.)

NU/NCU

Social media sites

Phone Email

Online survey platform

ADULTS-Recruitment

Recruitment is considered part of the informed consent process. It is the first opportunity a potential participant learns about your study and what is involved. Methods for recruitment are reviewed by the /RB to ensure the procedures proposed for informing potential participants are not coercive and do not state or imply an outcome or other benefit beyond what is outlined in the consent documents and the protocol.

For information and resources regarding recruitment click here.

For further guidance regarding recruitment, consider attending a Recruitment Materials Group Session.

Pre-screening

Pre-screening, for /RB purposes, is the term used to describe activities before obtaining informed consent (i.e., such as screening to see if the potential participant meets inclusion criteria for this study). Pre-screening may not include any research procedures.

Screening is the term used to describe activities performed after obtaining consent to ensure subjects are qualified for the study.

*required

Will the Pl need to pre-screen participants for study eligibility?

Yes

✓ No

Recruitment Location

The followin.a auestions are about the soecific location where recruitment activities will take

You may need to upload written permission/documentation from the sites and websites you want to use for recruitment. For information and templates for site permission click here.

*required

Will your recruitment take place in the same location as data collection?

For example, you may be recruiting participants from a Facebook group and then collecting data over Zoom during an interview. This means that recruitment and data collection happen in two different spaces.

Yes

✓ No

*required

Recruitment will take place in:

Check all that apply

Public spaces (parks, coffee shops, mall, grocery store, etc.)

Private spaces (University campus, public k-12 school. office building, listservs, moderated forums, etc.)

Social media sites NU or JFKU

Phone or mail

✓ Email

*required

Email addresses for potential participants are publicly available

✓ Yes No

*required

Describe where email addresses are listed. Include links or URLs, if applicable.

The email addresses of teachers are listed under the staff directories on

the c:r-hnnl \Mohc:itoc:

*required

Recruitment

*required

I will use the following recruitment method(s):

Check all that apply

✓ Post recruitment information on social media or other online platform

✓ Email a recruitment message to potential participants Physical advertisements, flyers, and/or notices

Phone / Random digit dialing (using a recruitment script) Approach people (using a recruitment script)

Snowball sampling

I am using a recruitment method that does not fit into the above categories

*required

Upload recruitment document(s)

For information and templates, click here.

NOTE: Recruitment documents in any format besides NU /RB-approved templates will not be accepted. Please click the link provided above to find the template most appropriate for your recruitment method.

Recruitment Flyer 4-20-25 11.pdf

Costs and Incentives

Costs to Participants

*required

Will there be any costs associated with participating in the study?

Example: parking, travel, etc.

Yes

✓ No

Compensation and Incentives

To assist in subject recruitment, an incentive and/or compensation may be offered. The /RB considers the appropriateness of study compensation/incentives when reviewing protocols. The incentive should be reasonable compared to the burden or inconvenience incurred by study participants, and compensation should be equal to the projected expenses to be incurred by the participant. Incentives must not be so compelling that they would cause a person to go against their better judgement in making the decision to participate in your study. What constitutes an excessive incentive is relative to the financial status of the potential participants.

*required

Will there be any incentives or compensation offered for participation?

Example: $10 gift card, cash, checks, etc.

Yes

✓ No

Will extra credit be offered to students for participation?

Yes

✓ No

Informed Consent

The purpose of consent is to ensure that the participants understand what is being asked of them before they agree to participate.

For information and resources regarding consent, click here.

For further guidance regarding recruitment, consider attending a Consent Letters Group Session.

Informed Consent

*required

In 2-3 sentences describe where and when you will obtain consent from adult participants.

I plan to contact P-12 teachers immediately after I am approved by the IRB. I will be sending out the consent forms electronically via email to P-12 teachers in urban districts in the Northeast US.

*required

From the list below indicate how consent will be obtained for this study.

Check all that apply.

For additional guidance and templates for consent, click here.

NOTE: Consent documents in any format besides NU !RB-approved templates will not be accepted. Please click the link provided above to find the template most appropriate for your study.

Waiver of signed informed consent (consent document or an online check box will be provided to participants, but signatures are not required)

✓ person)

*required

Upload all consent documents here.

Consent Form 5-6-25.docx

Written/signed consent by a Legally Authorized Representative (for adults incapable of consenting)

*required

Who will be obtaining informed consent?

CIT/ certificates must be uploaded in the General Information section for all individuals selected.

✓ Principal Investigator Co-Investigator Faculty Sponsor

Study Personnel Other

Consent Process

*required

Verify that after participants finish reading the consent document, you will ask them if they have any questions about participation. You will allow them to ask as many questions as they have before having them sign the consent document.

✓ Yes - I will provide ample opportunity for questions and clarification.

*required

Will participants need to be consented on more than one occasion?

This may include reconsent for longitudinal studies or if there are multiple stages to a project over time.

Yes

✓ No

Risks and Benefits

'

Study Risks

Risk is inherent to research with human subjects, and even if you consider the risks small and unlikely, they must be included.

*required

Describe the risks associated with each research intervention. Include consideration of physical, psychological, social, and other factors. (check all that apply)

Some of the questions may make the participant feel embarrassed.

✓ There is a small risk that people who are not connected with this study will learn a participant's identity or their personal information.

The participants are providing highly sensitive, personal information in this study. If people not connected with the study learn this information, they could have problems getting a new job, keeping their current job, finding housing, or getting insurance (health, disability, or life insurance). In highly unlikely situations, they could be charged with a crime.

Some of the questions may make the participant feel uneasy (e.g., questions about victimization, bullying, past trauma).

The research includes the risk or disclosure that a participant may engage in self-harm or attempt suicide.

Other

*required

Describe the precautions that will be taken to minimize risks/harms. (check all that apply)

✓ I will use my best efforts to keep the findings in this study as confidential as possible.

✓ Subjects can choose to skip or stop answering any questions that make them uncomfortable or opt out of the study at any time.

Identifying information will be coded and stored separate from data. Data will be collected anonymously.

Potential Benefits

If there are no benefits, then your use of human subjects may not be justified. However, even if your research isn't likely to bring immediate benefits to your subjects, it still might benefit society or the literature.

*required

Describe any potential for direct benefits to participants or society in the study: (check all that apply)

✓ There are no direct benefits to research participants Improvement in some or all of participants' symptoms

✓ The advancement of knowledge

Gain validation, normalization, or insight regarding past experiences Other

Privacy and Confidentiality

Privacy

Privacy is a participant's ability to control how other people see, touch, or obtain information about one's self Violations of privacy can involve circumstances such as being photographed or videotaped without consent, being asked personal questions in a public setting, or being observed while conducting personal behavior.

required

Select the provisions to protect the privacy of the individual during screening, consenting, and conduct of the research:

Check all that apply

Research procedures will be conducted in person in a private setting.

✓ Data will be captured and reviewed in a private setting.

Only authorized research study personnel will be present during research related activities.

✓ The collection of information about participants is limited to the amount necessary to achieve aims of the research.

✓ Participants will not be approached in a setting or location that may constitute an invasion of privacy or could potentially stigmatize them.

Other

Confidentiality

Confidentiality is an extension of the concept of privacy; it refers to the participant's understanding of, and agreement to, the ways identifiable information will be collected, stored, and shared. Identifiable information can be printed information, electronic information, or visual information such as photographs.

*required

How will the research data be stored?

Physically

✓ Electronically

*required

Which devices will have study data:

Check all that apply

✓ Local computers/laptops

✓ Removable drives (USB, external drives) Local Server(s)

External Servers (including cloud based services)

*required

How will the research data be labeled?

Check all that apply

✓ Data will be directly labeled with personal identifying information. (Identifiable)

Data will be labeled with a code that the research team can link to personal identifying information. (Coded)

Data will not be labeled with any personal identifying information, nor with a code that the research team can link to personal identifying information. (Anonymous)

*required

Identifiable Data

Example: Names/signature on consent document, email address, phone number, etc.

*required

Please confirm that, at a minimum, the following measures will be taken and enforced:

1. Electronic data will be stored with appropriate electronic safeguards, such as unique usernames/passwords, and limited to authorized study personnel. Dual factor authentication will be used, if feasible.

2. Security software (firewall, antivirus, anti-intrusion) will be installed and regularly updated in all servers, workstations, laptops, and other devices used in the study

3. All computers with access to study data will be scanned regularly (for viruses and spyware, etc.) and problems will be resolved

4. Data transfer will be encrypted

✓ Yes

*required

Confirm all indMduals who have access to identifiable data are listed under Study Personnel in the General Info section.

NOTE: Transcription services or a statisticians do not need to be listed on your protocol.

✓ Yes

*required

Confirm that all identifiers and links will be destroyed at the earliest opportunity.

✓ Yes

Investigator Experience

*required

Describe the Principal Investigator's experience

Provide a brief summary of your relevant research experience/training specific to your responsibilities for this protocol. This may include classes taken that address human subjects issues, such as a research methods class.

REQUIREMENT: If you are working with federally designated vulnerable populations (prisoners, pregnant women, and/or children), or other potentially protected populations (e.g.,

, active duty military service personnel, cognitively impaired, etc.), or collecting data that could be sensitive in nature, your description MUST include your qualifications to work with these populations.

Example: I will be collecting data about children with autism. I have worked with this population for the last 3 years as a school counselor. I have completed several courses in my program about maintaining confidentiality of data, protection of human subjects in research, and I have completed my CIT/ training. Additionally, my faculty sponsor is a clinical psychologist specializing in children with autism.

I am collecting data about P-12 teachers who integrate technology into their classroom teaching. I have taken a Research Methods class (EDR-8203) and Advanced Quantitative Methodology and Designs (EDR-8500), earning an A in both courses, which has made me extremely knowledgeable in conducting research. I have also completed my CITI training. In addition, work in the Department of Teaching and

Learning at the institution I work for. I am surrounded by teachers and have opportunities to gain access to this population with caution.

ADULTS - Educational Practices

Studies related to normal educational practices in normal educational settings, and reviewed under Exempt category 1, allow parents/guardians, or adult participants, to opt their child's, or their, data out of the study via an Information Letter.

According to CFR 45 part 46.104.d(1), exemption can be applied to the following:

Research, conducted in established or commonly accepted educational settings, that specifically involves normal educational practices that are not likely to adversely impact students' opportunity to learn required educational content or the assessment of educators who provide instruction. This includes most research on regular and special education instructional strategies, and research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.?

To qualify for exemption under normal educational practice, the Principal Investigator must demonstrate that the study is conducted in a commonly accepted educational setting, that the topic of the study involves normal education practices, and that the study won't impact students? and/or educators? ability to learn or provide instruction. The information letter is typically sent to parents/guardians, or adult participants, via internal communication channels within a school or through email.

The questions in this section will help the IRB Analyst to determine whether your study can be reviewed under Exempt category 1.

If you are unsure if your study qualifies for review under Exempt category 1, refer to our Research in a Normal Educational Setting Decision Tree here.

*required

Is the research happening in a commonly accepted educational setting?

A commonly accepted educational setting is a location where people typically go to learn.

✓ Yes No

*required

Does the research involve collecting privileged information (e.g.: socioeconomic status, sexual orientation, abuse, etc.)?

Yes No

Appendix D.

Recruitment Flyer

Study Purpose: The purpose of this qualitative case study is to explore the effectiveness and impact of technology integration in urban P-12 classrooms using the SAMR model (Substitution, Augmentation, Modification, Redefinition) as a guiding framework.

You are eligible for this study if you meet all of the following criteria:

1. • You are a current P-12 teacher
2. • Reside in the Northeastern United States
3. • Work in an urban public school
4. • Be aged 18 years or older
5. • Have taught at your current school for at least three years, and
6. • You are knowledgeable about classroom technology use and have experience using the SAMR framework

SHARE YOUR VOICE!

In this study, participants will:

1. Participate in a one-on-one semi-structured interview conducted via Zoom or another secure video conferencing platform.
2. Answer open-ended questions about their use of technology in the classroom.
3. Review and confirm their interview transcript for accuracy (member checking).

Participants will be asked questions about:

1. Their experiences using technology in classroom instruction.
2. How they implement technology across the SAMR model levels (Substitution, Augmentation, Modification, Redefinition).
3. The challenges and barriers they face when integrating technology in urban P-12 settings.
4. The effectiveness of technology in supporting student learning and engagement.
5. Their professional background, including years of teaching experience and training received in educational technology.

Scan Me

To participate in this study, please contact:
SAMITA MEZGER, Doctoral Student at National University

Thank you for considering participating in this voluntary research!