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Reimagining Learning: Overcoming Barriers to Effective EdTech Tools Adoption in K-12 Schools

Nunzia Del Vento
Lynn University

REIMAGINING LEARNING: OVERCOMING BARRIERS TO EFFECTIVE EDTECH TOOLS ADOPTION IN K-12 SCHOOLS

by

Nunzia Del Vento, Ed.D

M.B.A., Lynn University, 2017

B.S.C.S., Universita' degli studi di Bari, 2004

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Reimagining Learning:
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By

Nunzia Del Vento

[redacted] August 29, 2024

Date

Chair, Dissertation in Practice Committee

[redacted] August 28, 2024

Date

Member, Dissertation in Practice Committee

[redacted] August 28, 2024

Richard D. Jones

External Member, Dissertation in Practice Committee

[redacted]

Abstract

NUNZIA DEL VENTO: Reimagining learning: Overcoming barriers to effective edtech tools adoption in K-12 schools.

Teaching in K-12 education faces significant challenges in effectively integrating Educational Technology (EdTech) tools into classrooms. Despite the transformative potential of EdTech for enhancing student engagement, personalizing instruction, and developing critical skills, educators encounter barriers such as inadequate training, overwhelming choice, and uncertainty about tool effectiveness. This study investigated the criteria used by K-12 teachers in selecting EdTech tools, the support and training they receive, and their perceptions of tool effectiveness. Employing a mixed-methods approach combining quantitative surveys and qualitative responses, data was gathered from educators in Florida, highlighting their diverse roles, preferences, and challenges in adopting EdTech tools. Findings underscored the critical need for a comprehensive support system to aid educators in navigating the complexities of EdTech integration. Educators expressed a strong desire for EdTech tools that not only align with educational standards and enhance learning outcomes but also simplify the selection process and provide clear evidence of effectiveness. The data also revealed a widespread interest among educators in additional training, best practices, and insights from successful EdTech coaches to optimize the integration of technology into teaching practices. The study contributed insights into enhancing teacher preparedness, fostering effective EdTech integration, and improving educational outcomes through informed decision-making and targeted professional development initiatives.

Acknowledgments

This dissertation marks the culmination of a long and challenging journey, one that has taught me resilience, perseverance, and the power of support. I have learned to face and overcome numerous obstacles, emerging stronger and more determined. Though I may not be good with words, I want to ensure my gratitude is clearly conveyed.

I extend my deepest gratitude to my dissertation chair, Dr. Lancaster, whose unwavering support and encouragement have been a pillar of strength throughout this process. I am also grateful to my committee members, Dr. Lesh and Dr. Jones, for their invaluable feedback and guidance, which have been instrumental in shaping this work.

Dr. Lesh, your feedback on my assignment, 'Step out on faith,' which I wrote on a sticky note and attached in front of me, will always serve as a lasting reminder of the courage and determination required to pursue this path and face life. Your words were a beacon of inspiration that guided me through challenging times.

To my husband, my fountain of inspiration, I offer heartfelt thanks for your steadfast support, unwavering encouragement, and belief in my abilities, even during times of self-doubt. Your love and support have been my anchor.

I would also like to acknowledge my three wonderful cats, whose constant presence beside my computer provided much-needed relaxation and comfort. Their companionship brought joy and tranquility during the most stressful periods. Thank you Micio, Micia and Birillo!

A special acknowledgment goes to my late father, whose guidance I felt from above. His memory has been a source of motivation and strength throughout this journey.

Finally, I extend my sincere thanks to my classmate Jackie who became a cherished friend. Her companionship and support were invaluable and made this journey much more meaningful.

I am deeply grateful to have reached this milestone. This journey was not easy, but I persevered and achieved my goal. Overcoming this barrier has been a testament to the support and encouragement of those around me.

Dedication

For my husband

This dissertation is dedicated to my husband, whose unwavering support and belief in my aspirations have been instrumental throughout this journey. He has been my steadfast companion, and together, we have made many sacrifices to achieve this goal, which we proudly celebrate. His encouragement and sense of humor provided solace during challenging times. I deeply appreciate your patience in driving me to university for every class, especially since I was dealing with my biggest fear: driving. This journey and your support helped me overcome this fear during the doctoral program. I am grateful for the strength gained through his companionship and his love for animals, which has enriched our lives with our beloved three cats. This work is a tribute to his enduring love, guidance, and unwavering belief in my potential.

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Chapter I: Introduction

Background

Teaching is a profession that needs to adapt to the contemporary needs of society, technological developments, and the types of students we are teaching (Dursun, 2019). The COVID-19 pandemic led to a rapid rise in districts' reliance on educational technology and the need for digital instructional products. Educators across districts, grade levels, and subjects expanded their use of educational technology as they adapted to school shutdowns caused by the Coronavirus. Educational technology (EdTech) tools are any technology-based content, apps, software, extension, website, or platform intentionally selected to promote student learning regarding accessibility, creativity, critical thinking, communication, collaboration, engagement, and assessment (Mississippi Department of Education, 2022).

The use of EdTech tools in K-12 continued to grow after the pandemic's peak. According to LearnPlatform, which has been tracking educational technology usage since 2017, during the 2020–2021 school year, districts in the United States used about 1,450 different digital tools on average per month. EdTech usage is up 52% over 2019–2020 pre-pandemic levels and 9% over the spring of 2020 during the exodus to remote learning as schools shut down for in-person instruction nationwide. The study measured 8,616 individual EdTech tools, about 250,000 educators, and 2 million students (LearnPlatform, 2022).

With the increased use of EdTech tools in schools, it is essential to analyze the benefits they bring to teaching and learning experiences and the challenges educators face in integrating them into the classroom. EdTech tools are integral to teaching and learning; they are effective across a broad range of learning activities and used for different instructional purposes, such as engaging students, providing collaborative learning experiences, remote learning, personalizing

instruction, developing essential 21st century skills, diagnosing student learning needs, and connecting learning to future jobs and careers. However, despite educators seeing value in using EdTech tools, they face several challenges due mainly to the huge array presence in the market. Teachers need access to professional learning solutions that deliver engaging content with flexible options that fit their busy schedules. Although significant progress has been made in incorporating educational technology in recent decades, the incorporation of technology by teachers has been a slow process (Herold, 2016; McDiarmid & Zhao, 2023). Educators need support in incorporating digital tools effectively in the classroom.

This dissertation explored the importance of using EdTech tools in the classroom and the challenges teachers face in integrating them. It showed how to address the issues involved in selecting and incorporating digital tools in the classroom while improving education.

Statement of the Problem

This study addresses the teachers' challenges of selecting and incorporating EdTech tools in the classroom, the need for improved EdTech training in K-12 Education, and more information about EdTech tools' effectiveness. Also, it addresses the gaps in EdTech literacy in K12 Education by analyzing the benefits of using EdTech tools and how professional development can support teachers in integrating technology in the classroom. The educational landscape is jam-packed with EdTech options, leading to educators falling into the 'paradox' of choice. This paradox often keeps educators from integrating any available options because they are paralyzed by the options rather than liberated by them (Miller, 2022).

It is challenging to know which are safe, which are compatible with other systems, which are compliant with standards and policies, which are eligible to be purchased using funds, which have features that make them accessible to students with learning needs, and overall, which will

have the most impact on which students and in which context, mainly in terms of engagement and academic achievement.

Selecting and curating digital content appropriate to each subject is time-consuming and requires technical expertise (Bashir & Miyamoto, 2020). Before the pandemic, many teachers already expressed the need for more and better training in using digital tools, educational platforms, and more. A National Center for Education Statistics survey during the 2019–2020 school year found that 49% of schools felt teachers wanted to use technology for teaching, 18% agreed that teachers in their school are sufficiently trained to integrate technology into instruction, and 34% felt that technical support for technology in the school is good enough (Gray & Lewis, 2021). Given the unforeseen impact of the pandemic on educational systems and the closure of schools, education technology became a lifeline, and the demand for professional training became even more urgent. An Education Week Research Center survey found that in 2020, almost half of teachers interviewed reported that their ability to use education technology during the pandemic effectively had improved "a lot," and 41 percent responded that it improved "a little" (Bushweller, 2020).

Although the use of EdTech tools has increased over the years, few educators believe there is valuable information about which resources will be effective in the classroom. They are continuously looking for assistance, resources, and teaching tools for their classroom (Bill & Melinda Gates Foundation, 2015; Gallup & New Schools Venture Fund, 2019; Klein, 2019).

Teachers need support in incorporating digital tools effectively in the classroom. The pandemic showed random and uneven incorporation of digital tools into remote learning. Digital solutions often depend on one school principal's dedication or one teacher's ingenuity. A more

global approach is needed to incorporate digital tools and content into the curriculum (Artal et al., 2021).

Significance of the Study

Over the years, technology has evolved; people may now share their photos, videos, drawings, or views in virtual settings such as social media and collaborate on projects with individuals worldwide (Fingal, 2020). During the COVID-19 pandemic, the use of EdTech tools has become necessary, and students have started to use them extensively both in their lessons and at home (Ranchordas, 2020).

EdTech tools meet needs in many ways to engage students, support schools in aligning content with state standards and district initiatives, and personalize instruction (Gallup & New Schools Venture Fund, 2019). Teachers surveyed in the Bill & Melinda Gates Foundation's report in 2015 identified six instructional purposes for which digital tools are useful:

- Delivering instruction directly to students.
- Diagnosing student learning needs.
- Varying the delivery method of teaching.
- Tailoring the learning experience to meet individual students' needs.
- Supporting student collaboration and interactive experiences.
- Fostering the independent practice of specific skills.

According to the latest EdTech Top 40 list from LearnPlatform by Instructure, in the 2021–2022 school year, nearly 60% of the EdTech tools were learner-focused, aimed at increasing student engagement and enhancing the learning experience (LearnPlatform, 2022). A study conducted by Gallup & New Schools Venture Fund (2019) reported that students surveyed (2,696 public school students in 3rd through 12th grade) say digital learning tools are

fun (96%), let them learn at their own pace (88%), make school more interesting (86%) and 91% say they help them learn things on their own (91%). Technology as a tool helps teachers create and present content and instruction that is relevant and interesting to students. Students become engaged, active learners when learning is relevant (Yarbro et al., 2016).

According to a study about the role of digital collaboration in student engagement enhancing student participation during COVID-19, digital collaborative tools support student engagement. Digital collaborative tools are platforms to assist the practice of people working together remotely or online. Tools such as Padlet, electronic whiteboards, Slido, and Kahoot are quick-to-use and simple digital collaborative tools that can be used to enhance student engagement (Gopinathan et al., 2022).

Technology provides the infrastructure to communicate and share resources within or beyond the classroom confines. Electronic communication using electronic mail (E-mail), bulletin boards, wikis, blogs, and other web-based asynchronous, including synchronous discussion and multimedia tools, facilitates collaboration not only among students and teachers but among students themselves during class time or outside the classroom anytime and anywhere (Arano-Ocuaman, 2010).

According to research by GoGuardian (2020), two key factors influence a school's ability to deliver an engaging learning experience: the delivery of professional development focused on the effective use of instructional technology and the presence of robust processes and protocols for selecting and implementing instructional tools. This allows for consistency of instructional technology across a school—enabling administrators to provide the necessary support, facilitating clear guidelines on what technology to use, and optimizing the selection of tools that complement each other (Aguilar et al., 2020).

Teachers have the most impact on student growth and learning; they cannot be alone and feel overwhelmed in selecting any technology for the classroom (Promethean, 2020). High-quality teaching is still one of the leading factors in student success nationwide (Instructure, 2022). Investing in immersive, ongoing professional development is critical to supporting teacher preparedness, promoting teacher efficacy, and building and deepening skill sets. Student engagement is one of the most important metrics when measuring student success (Gallup, 2019; Instructure, 2022). EdTech tools are a great way to boost student engagement (LearnPlatform, 2022).

Rationale

Theoretical and/or Conceptual Framework

This study extended theories based on Bloom's taxonomy (1956) . The theoretical framework of this study is based on Bloom's taxonomy with focus on Bloom's digital taxonomy. Bloom's taxonomy was developed in 1956 by Benjamin Bloom to facilitate the exchange of assessments among professors at various universities and create a group of items, each measuring the same educational objective or goal (Marley, 2014). Bloom's taxonomy included six categories of cognitive processes, ranging from lower to higher-level classroom practices: knowledge, comprehension, application, analysis, synthesis, and evaluation (Agarwal, 2019).

In 2001, a group of curriculum theorists, testing and assessment specialists, cognitive psychologists, and instructional researchers joined forces to publish a revised version of Bloom's taxonomy. Bloom's revised taxonomy uses verbs rather than nouns for each category and rearranges the sequence within the taxonomy. The thinking skills are arranged in increasing order, from lower to higher: remembering, understanding, applying, analyzing, evaluating, and creating (Ray, 2021).

The elements and actions cover many activities and objectives undertaken in classroom practice. However, they do not address the newer objectives, processes, and actions offered by the emergence and integration of ICT or information and communication technologies into the classroom and their impact on the students' lives (Churches, 2008).

A revised edition of Bloom's taxonomy, called Bloom's digital taxonomy, illustrates how various digital exercises map onto the traditional tiers of Bloom's taxonomy. Bloom's digital taxonomy aims to support educators using technology and digital tools to facilitate outcomes and student learning experiences. Each level is paired with a description of its importance and examples of the digital tools that connect with this taxonomy framework (Sneed, 2016).

The expansion of technology presents an opportunity for students to exercise these higher levels of Bloom's taxonomy using digital tools and driving higher engagement. This opportunity relies upon implementing instructional practices that elicit higher levels of thinking while using the technology (Ray, 2021).

Purpose of the Study

This study enhanced the knowledge of digital tools used in K-12 schools. It also analyzed their benefits to teaching and learning experiences and educators' challenges in integrating them into the classroom. It showed how to address the issues involved in selecting and incorporating digital tools in the classroom and have information about their effectiveness. The target population for this study was K-12 public school teachers in the State of Florida. A need assessment was conducted through a survey to evaluate the need for a product aimed to support teachers in selecting the right digital tools and have information about their effectiveness.

Research Questions

Four research questions helped guide this study:

1. What criteria are used by K-12 teachers to select EdTech tools?
2. To what extent are K-12 teachers receiving support and training in selecting EdTech tools?
3. What are the perceptions and attitudes of the teachers towards EdTech tools?
4. What determines an effective EdTech tool?

Assumptions

The research assumed that participants completing the survey would answer the survey questions honestly and accurately in response to their teaching experience, so that their unique perspectives and opinions could be captured, and that teachers understand the terminology and nature of the questions asked in the survey.

Definitions of Terms

21st-century learning skills: Critical thinking, problem-solving, communication collaboration, creativity, and innovation (Partnership for 21st Century Learning Skills, 2011).

Adaptive learning: A methodology that permits identifying the level of students' knowledge and their learning styles and adapting learning contents and methods of their delivery according to the needs of participants in the learning process (Morze et al., 2021).

Augmented reality or AR: The technology involves projecting digital elements, such as information, images, graphics, or animation, into the real world so that the superposed digital content looks like it is part of the physical world, whether using specially designed glasses or a basic smartphone (Marr, 2021).

Artificial intelligence: A machine-based system that may generate recommendations, predictions, or decisions influencing real or virtual environments in response to a given set of human-defined objectives (Hummelholm, 2023).

Blended learning: A learning approach that combines online and in-person learning (National Education Association, 2021).

Chatbot: AI-based computer program that simulates human conversation, providing instant responses to the end user (Okonkwo & Ade-Ibijola, 2021).

ChatGPT: *A*dvanced language model built on the generative pre-trained transformer (GPT) architecture developed by OpenAI. It generates human-like text responses based on input it receives. Trained on a vast array of internet text, and fine-tuned for specific applications, ChatGPT can handle a variety of language-related tasks, such as answering queries, creating content, and aiding research. Its effectiveness stems from deep learning methodologies and comprehensive training datasets, positioning it as a significant tool in natural language processing (Brown et al., 2020; OpenAI, 2023).

Communities of practice: A group of like-minded people who work together regularly to continually improve in their chosen focus area (Farnsworth et al., 2016).

Digital native: A term coined by Marc Prensky in 2001 to describe the generation of people who grew up in the era of ubiquitous technology, including computers and the Internet.

Digital citizenship: The ability to use digital technology and media safely, responsibly, and ethically (Park, 2019).

Digital literacy: The ability to find, evaluate, create, and share information through information and communication technologies, which requires both cognitive and technical skills (American Library Association, n.d.).

Digital intelligence: A comprehensive set of technical, cognitive, meta-cognitive, and socio-emotional competencies grounded in universal moral values to enable individuals to face the challenges of digital life and adapt to its demands (Park, 2019).

Educational technology or EdTech: The process of integrating technology into education to improve teaching and learning experiences and students' education outcomes (Kurt, 2015).

EdTech tools: Any technology-based content, apps, software, extension, website, or platform intentionally selected to promote student learning regarding accessibility, creativity, critical thinking, communication, collaboration, engagement, and assessment (Mississippi Department of Education, 2022).

Gamification: The use of game design elements in non-game contexts (Deterding et al., 2011).

Information and communication technology or ICT: A broad range of technological tools and resources utilized to create, store, share, or exchange information. Computers, the internet, live broadcasting technologies, recorded broadcasting technologies, and telephony are some of these technical resources and tools (UNESCO, 2009).

International society for technology in education or ISTE: A nonprofit organization that aims to help educators use technology to revolutionize learning (ISTE, n.d.).

Instructional technology coach: A professional who engages in learning about technology and the content areas of the teachers they support, works side-by-side with teachers in classrooms, uses technology for teaching to meet learning goals, takes a leadership role in the school around using technology, and focus on the digital citizenship of the students and teachers (Sheehy et al., 2018).

Framework for 21st century learning: A model developed with input from education experts, business leaders, and educators to define and illustrate the knowledge, expertise, support systems, and skills students need to succeed in work, life, and citizenship (The Partnership for 21st Century Learning, 2019).

Mixed reality or MR: A combination of virtual and augmented reality that blends components of the digital world with the real world in real time to the extent that you can interact with the digital elements as if they were real objects (Marr, 2021).

Personalized professional learning: Ongoing, job-embedded, and relevant professional learning designed and led by teachers with support from other experts (U.S. Department of Education, 2017).

Professional development: A process that professionals undertake to acquire and improve the knowledge and skills essential to advance in their jobs and careers (Indeed Editorial Team, 2023).

Social and emotional learning or SEL: The process through which all young people and adults acquire and apply the knowledge, skills, and attitudes to develop healthy identities, manage emotions and achieve personal and collective goals, feel and show empathy for others, establish and maintain supportive relationships, and make responsible and caring decisions (CASEL, n.d.).

Teacher educator technology competencies or TETCs: A set of standards that define the competencies (skills, knowledge, and attitudes) all teachers and educators need to support teacher candidates to become technology-using teachers. The teacher educator technology competencies shed light on the responsibilities and roles of teacher educators who address technology within their courses (U.S. Department of Education, 2017).

Virtual reality or VR: The use of computer modeling and simulation that creates a 3D, 360-degree experience of an artificial, computer-simulated ecosystem. It requires technology and infrastructure, such as a VR helmet or gloves fitted with sensors (Marr, 2021).

Generative modeling artificial intelligence, or GAI: An unsupervised or semi-supervised machine learning framework that generates artificial relics using existing digital content such as but not limited to video, images/graphics, text, audio, and video by examining training examples and learning their patterns and distribution (Hu, 2022).

Organization of the Dissertation

This chapter presents a background on EdTech tools, their use over time, and the benefits and challenges teachers face in integrating them into the classroom. This chapter also explains in detail the statement of the problem, significance of the study, theoretical framework, purpose of the study, research questions, assumptions, and definition of terms.

Chapter II will include the literature on the EdTech tools and their use in the classroom. This chapter will begin by exploring the instructional purposes for which digital tools are helpful, the selection process, the barriers to EdTech tools integration, what is essential to consider in today's educational field, and the educational technology trends in the following years. Then, it will examine technology integration frameworks that can support teachers in integrating technology in the classroom. The final section will explore how professional development can support teachers in integrating technology into the classroom.

Chapter III will describe the research design and data collection method used; details will be provided on why these methods were chosen and how the data will be collected. The researcher used a quantitative research approach and action research with surveys to collect data from teachers at the research site and answer the research questions. A need assessment was conducted through a survey to evaluate the need for a product to support teachers in selecting EdTech tools and effectively integrating them in the classroom.

Summary

Given the growing usage of EdTech tools in K-12 settings, it is crucial to analyze the advantages that EdTech tools bring to teaching and learning experiences and the challenges teachers face in integrating them into the classroom. This chapter introduced what EdTech tools are, why they are important, and the integration barriers to using them in the classroom. Also, it went in-depth on the purpose of the study, the assumptions, the research questions, and the theoretical framework that guided the study.

Chapter II: Literature Review

Introduction

The world of technology is constantly evolving and changing due to daily innovations and advancements. In recent years, the pace of technological growth has been unprecedented, leading to a rapidly changing landscape that impacts almost every aspect of our lives (Hillary, 2023). In the past few decades, the growth of education technology as an industry has rocketed, and the EdTech market is expected to continue expanding rapidly over the next several years (GlobeNewswire, 2023). Before the pandemic, online education was already on the rise, and some teachers had begun to use various new technologies such as digital devices, flipped classrooms, and class management systems (McDiarmid & Zhao, 2023).

The COVID-19 pandemic prompted a major infusion of technology into the US K-12 education system with the forced shift to remote learning (EY-Parthenon, 2022). The pandemic has triggered a global rush toward the digital transformation of almost all facets of daily life. Given the pace of these changes, digital skills and literacy have become a mandatory part of education and training for all people. It is crucial for countries to rapidly develop and incorporate training programs and high-quality digital literacy and digital skills education across all age groups (Park et al., 2020).

The COVID-19 pandemic has rushed the worldwide digitalization of multiple unprepared sectors. One of the most impacted groups has been K-12 students, who mostly switched to online schooling. The rapid change has been challenging and characterized by problems such as limited digital skills, technology access, inequality, and systemic racism. The sudden introduction of new forms of digital education raised concerns, especially regarding learning effectiveness and cybersecurity. School systems, teachers, and students need to become more knowledgeable about

the digital learning environment and online teaching approaches to address the challenges brought about by the pandemic. Online learning will play an increasingly critical role in the K-12 education system; Educators must support student success in the digital world to empower them with a core set of digital skills necessary to thrive in the digital age. Also, all individuals need support with digital skills education and training programs that address this societal need (Jackman et al., 2021).

This study enhanced the knowledge of digital tools used in the K-12 Florida public schools. It also analyzed their benefits to teaching and learning experiences and educators' challenges in integrating them into the classroom. Still, it showed how to address the issues involved in selecting and incorporating digital tools and have information about their effectiveness.

Chapter II will include the literature on the EdTech tools and their use in the classroom. This chapter will begin by exploring the instructional purposes for which digital tools are helpful, the selection process, the barriers to EdTech tools integration, what is essential to consider in today's educational field, and the educational technology trends in the next years. Then, it will examine technology integration frameworks that can support teachers in integrating technology in the classroom. The final section will explore how professional development can support teachers in integrating technology into the classroom.

Theoretical framework

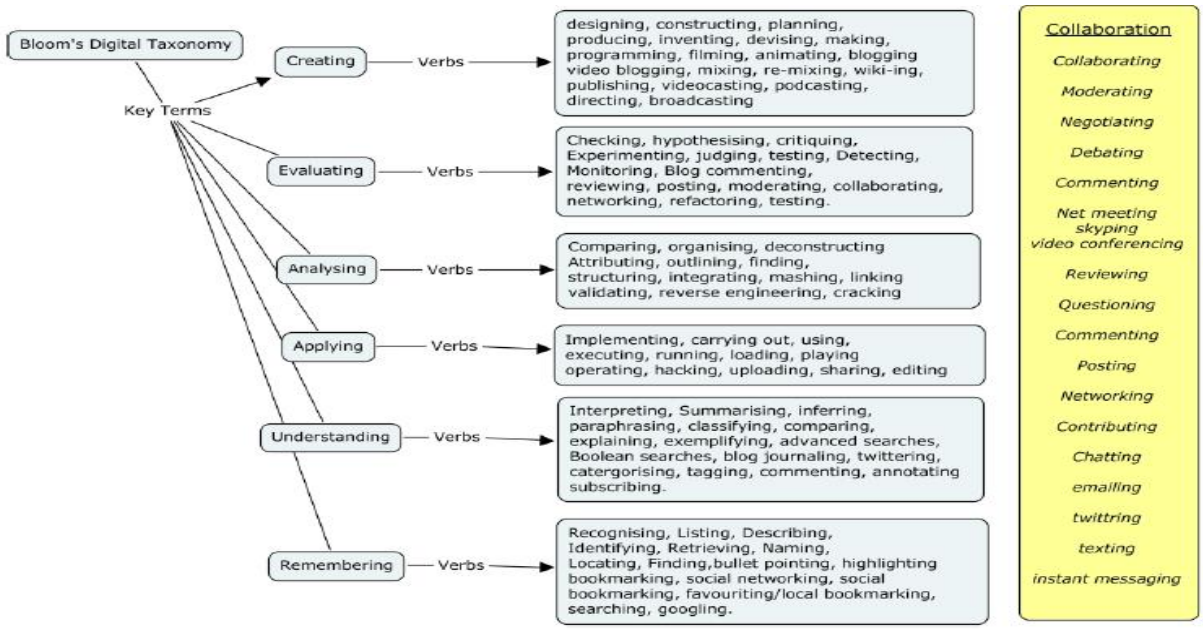
This study extended theories based on Bloom's taxonomy. The theoretical framework of this study is based on Bloom's taxonomy with focus on Bloom's digital taxonomy. A revised edition of Bloom's taxonomy, called Bloom's digital taxonomy, illustrates how various digital exercises map onto the traditional tiers of Bloom's taxonomy. Bloom's digital taxonomy aims to

support educators using technology and digital tools to facilitate outcomes and student learning experiences. Each level is paired with a description of its importance and examples of the digital tools that connect with this taxonomy framework (Sneed, 2016).

Andrew Churches's mind map of Bloom's revised digital taxonomy (see figure 1) shows the key terms for each category: remembering, understanding, applying, analyzing, evaluating, and creating. Collaboration is included as a separate element since it is not an integral part of the learning process for the individual; to learn is not necessary to collaborate, but often, collaboration enhances learning. Collaboration is a 21st-century skill of increasing importance used to facilitate higher-order thinking and learning (Churches, 2008).

Figure 1

Mind Map of Bloom's Revised Digital Taxonomy



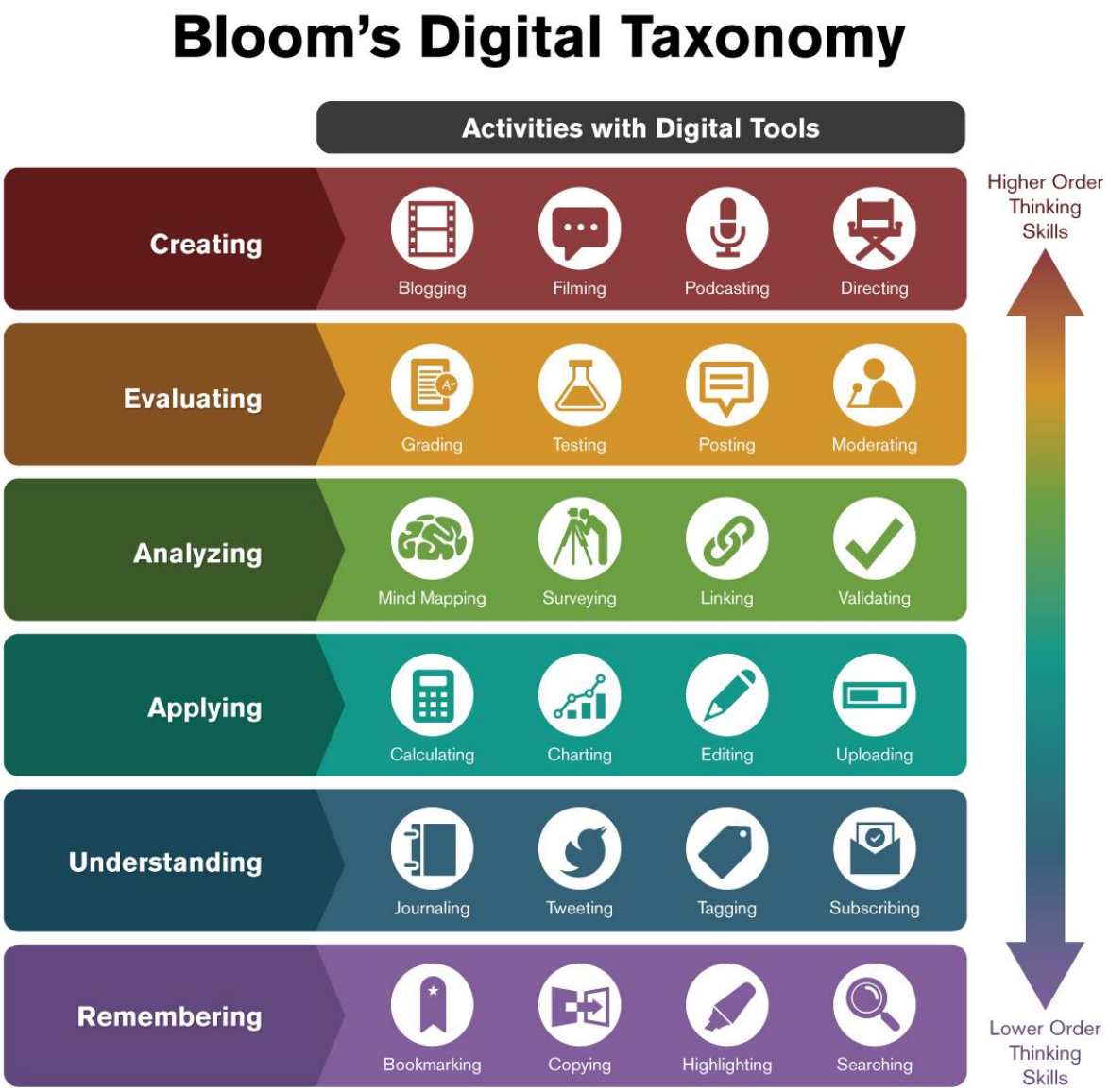
Note. This figure presents a mind map of Bloom's Revised Digital Taxonomy. Bloom's digital taxonomy [Drawing by Andrew Churches created using C-Map Tools] in 2008. From *Bloom's Digital Taxonomy*, by A. Churches, 2008, https://www.researchgate.net/publication/228381038_Bloom's_Digital_Taxonomy.

Bloom's digital taxonomy helps navigate the myriad of EdTech tools and make choices based on the learning experiences teachers want students to engage in. Selecting the most appropriate digital learning activity will depend on the level of difficulty of the activity connected to the cognitive levels expressed within Bloom's revised taxonomy (Sneed, 2016).

Sneed's (2016) infographics (see figure 2) outline the levels featured within Bloom's revised taxonomy, accompanied by examples of EdTech tools that connect with this taxonomy framework. "Creating" refers to producing new or original work and relates to the tools to animate, blog, film, podcast, publish, simulate, video blog, program, and direct. "Evaluating" relates to tools used for grading, networking, rating, testing, reflecting, reviewing, blog commenting, posting, and moderating. It is used to justify a stand or decision to make judgments based on criteria and standards through checking and critiquing. "Analyzing" refers to drawing connections among ideas and concepts or determining how each part interrelates to an overall structure or purpose. Mashing, mind mapping, surveying, linking, and validating are the related tools. The activities with digital tools for "applying" are calculating, charting, editing, hacking, presenting, uploading, operating, and sharing with a group. All these activities aim to use the information in new situations, such as presentations, models, and diagrams. "Understanding" refers to explaining ideas and concepts or constructing meaning from written material or graphics. The digital tools related can be used for advanced searching, annotating, blog journaling, tweeting, tagging, commenting, and subscribing. Finally, "remembering," used to recall facts, basic concepts, or material retrieval, refers to the following digital activities: bookmarking, copying, googling, bullet-pointing, highlighting, group networking, and searching.

Figure 2

Bloom's Digital Taxonomy Infographics



Note. This figure illustrates the integration of technology with Bloom's Taxonomy. From *Integrating Technology with Bloom's Taxonomy* [Infographic], by O. Sneed, 2016, https://teachonline.asu.edu/2016/05/integrating-technology-blooms-taxonomy/. Copyright 2016 by O. Sneed.

The expansion of technology presents an opportunity for students to exercise these higher levels of Bloom's taxonomy using digital tools and driving higher engagement. This opportunity relies upon implementing instructional practices that elicit higher levels of thinking while using the technology (Ray, 2021).

EdTech Tools

EdTech tools are any technology-based content, app, software, extension, website, or platform intentionally selected to promote student learning in multiple ways. (e.g., accessibility, creativity, critical thinking, communication, collaboration, engagement, assessment, etc.) (Mississippi Department of Education, 2022).

The use of digital learning tools in K–12 continued to grow after the pandemic's peak. According to LearnPlatform, which has been tracking ed tech usage since 2017, during the 2020–2021 school year, districts in the United States used about 1,450 different digital tools on average per month, 9% over the spring 2020 EdTech adoption surge during the shift to remote learning as schools shut down for in-person instruction nationwide. Moreover, it is up 52% over 2019–2020 pre-pandemic levels. The study measured 8,616 individual digital tools, about 250,000 educators, and 2 million students (LearnPlatform, 2022). During the COVID-19 pandemic, the use of digital tools has become necessary, and students have started to use digital tools extensively both in their lessons and at home (Ranchordas, 2020).

Purpose and Utility

EdTech tools meet needs in many ways to engage students, support schools in aligning content with state standards and district initiatives, and personalize instruction (Gallup & New Schools Venture Fund, 2019). Teachers surveyed in the Bill & Melinda Gates Foundation's report in 2015 identified six instructional purposes for which EdTech tools are useful:

- Delivering instruction directly to students.
- Diagnosing student learning needs.
- Varying the delivery method of teaching.
- Tailoring the learning experience to meet individual students' needs.
- Supporting student collaboration.
- Providing interactive experiences.
- Fostering the independent practice of specific skills.

According to the latest EdTech Top 40 list from LearnPlatform by Instructure, in the 2021–2022 school year, nearly 60% of the tools were learner-focused, aimed at increasing student engagement and enhancing the learning experience (LearnPlatform, 2022).

A study conducted by Gallup & New Schools Venture Fund in 2019 reported that students surveyed (2,696 public school students in 3rd through 12th grade) say digital learning tools are fun (96%), let them learn at their own pace (88%), make school more interesting (86%) and 91% say they help them learn things on their own (91%).

Students choose to use digital tools to enable exploration, maximize retention, and collaborate with peers. The deliberate use of digital tools to maximize learning and collaborate with peers signals student engagement in the learning process (Aguilar et al., 2021).

EdTech tools are integral to teaching and learning in and out of school. Many teachers and students would like to use them more often to teach and learn (Gallup & New Schools Venture Fund Study, 2019). Teachers and students are interested in using digital tools for teaching and learning. Using those media technologies makes teachers feel confident to teach, and their creativity is also improved. Furthermore, EdTech tools can help them create a better learning experience for the students, increasing students' motivation and making them focus on

the material given. Media technologies also help teachers assess the student's abilities and deliver materials (Fatimah & Santiana, 2017).

Using technology for education boosts students' curiosity and engagement and leads to better learning (Tucker et al., 2017). These aspects are a priority for every effective teacher, and today, they can be achieved by using digital tools in the classroom (Thanavathi, 2020). LearnPlatform, in the "EdTech Top 40 - Fall 2022 Report," analyzed the EdTech solutions accessed during the 2021–2022 School Year by K-12 students and educators across the United States. The report highlights that an individual educator accessed an average of 148 unique edtech tools. Classroom engagement and instruction was the most represented category of tools, 22.5% of the top 40 tools. Also, the report highlighted the need to better analyze how districts can effectively manage all their technology use in a way that maximizes value for students and educators, ensures safety, and advances equity and how they can begin exploring whether the tools they are using are having a positive impact on student outcomes.

Students who are provided with student agency, defined as opportunities to make choices within the classroom, become actively involved in the learning process and experience higher levels of engagement. With digital tools, educators can design learning experiences that foster student agency by exploring their individual interests, developing and utilizing creativity, critical thinking, collaboration, and communication skills, and providing flexibility to demonstrate learning in multiple ways (Mississippi Department of Education, 2022).

Integrating technology into the classroom presents a unique opportunity for students to independently dive deeper into their learning and use digital tools to create a more effective and collaborative learning experience (U.S. Department of education, 2016). Using digital tools provides more personalized learning and differentiation and opportunities for students to become

leaders and creators in the classroom. When students are given choices in showing what they have learned, they are more likely to be excited and engaged about learning. They will feel valued. With digital tools, the learning environment can be anywhere, at any time, and at a comfortable pace for students. Learning is no longer restricted to the traditional setting and time of the classroom (Ottenbreit-Leftwich & Kimmons, 2022).

Digital learning tools allow students more control over learning and a sense of ownership of and accountability for the learning methodologies that fit their particular learning styles, the processes that best fit their styles, and the content areas that spark their interests. They can also help students absorb and effectively demonstrate 21st-century skills through creating, consuming, manipulating, and sharing digital content. These skills are vital for today's students to flourish in tomorrow's job market (Grant & Basye, 2014).

Technology may be leveraged to provide students with a more meaningful learning environment that is active, authentic, creative, collaborative, and intentional. It better prepares them for the world beyond their classroom walls (Arano-Ocuaman, 2010). When implementing technology with students or other educators, many teachers learn best from their peers rather than external innovators. Teachers observe other teachers or students, build relationships, and expose themselves to innovative ideas (Fisher & White, 2016; Tucker et al., 2017). Teaching without technology is impossible nowadays because technology is part of our everyday lives and because digital tools can improve learning if used effectively. For example, live-polling tools increase attention and engagement, discussion boards facilitate collaborative learning, and videos effectively engage students and support their understanding (Meriaux, 2019).

According to the Mississippi Department of Education, digital tools create opportunities for students to receive timely, personalized, and relevant feedback from educators and peers,

leading to a deeper understanding of skills or concepts. Educators regularly use various digital tools to provide formative assessments and practice opportunities throughout the lesson (e.g., online quizzes, discussion boards, video reflections, etc.) (Mississippi Department of Education, 2022). Digital learning tools are meeting needs in many ways to engage students, personalize instruction, and support schools in their requirements to align content with state standards and district initiatives (Gallup &New Schools Venture Fund, 2019).

The COVID-19 pandemic led to a rapid rise in districts' reliance on educational technology and the need for digital instructional products. Educators across districts, grade levels, and subjects expanded their use of educational technology as they adapted to school shutdowns caused by the coronavirus.

The EdWeek Research Center surveyed a nationally representative sample of 888 K-12 educators in January and February of 2022 to learn more about the opportunities and tensions that arise as new technologies are incorporated into daily instruction. According to the survey, more than two-thirds of educators said their use of technology "increased a lot" since the start of the pandemic. Online quizzes have become a popular tool, with 69 percent of educators surveyed saying they use them almost daily, mainly because they allow teachers to focus on the curriculum and then quiz students outside the classroom. Educators also often use video, software for remedial lessons, programs that help personalize learning, software that accelerates learning, learning-management systems (such as Schoology or Google Classroom), and video-conferencing platforms (such as Zoom or Microsoft Teams) (Education Week Research Center, 2022).

According to Brian Robert Cook and Andrea Babon's study, online quizzes are an effective mechanism for incentivizing student completion of preparatory work, enhancing active

learning (such as through in-class discussions), and are relatively time efficient from the educator's perspective (Cook & Babon, 2016). An online quiz platform is a unique way to conduct flexible and open learning experiences, provide critical feedback to students, and effectively monitor assessment activities and student performance frequently (Shaik et al., 2023). Video greatly benefits teachers and learners, stimulating stronger course performance in many contexts and positively affecting student motivations, confidence, and attitudes. Video has advantages for engagement in some specific ways, notably in widening participation, emotional engagement, and overall course engagement (Carmichael et al., 2018).

Classroom integration of technology requires teachers to understand how technology tools can support the instructional goals of their curriculum. Educators have always used a variety of activities to help students further their understanding of curricular content: shared reading, experiments, writing, field trips, making posters, simulations, discussion, building dioramas, drawing, role-playing, singing, kinesthetic movement, manipulatives, and so many others. Most of these activities can now be accomplished as effectively and, in some cases, more effectively with digital tools. In addition, teachers need to adapt to the changes that digital technologies bring to the classroom. Using technology effectively takes longer than lectures and worksheets, but the payoff is increased student engagement, work quality, and depth of learning (Hamilton, 2018).

Educators can be facilitators, guides, and motivators of learners. Educators can use digital tools to help students create spaces to experiment and take intellectual risks with all the information they need easily accessible. Also, they can help students make connections across subjects and contribute to activities such as online forums, webinars, or publishing their findings on relevant websites. The availability of technology-based learning tools allows educators to be

co-learners alongside their students and peers. Educators should be able to leverage available digital tools to engage content with curiosity and a mindset inclined toward problem-solving and how to be co-creators of knowledge (U.S. Department of Education, 2017).

Integration Barriers

Every day, modern technologies create new ways to communicate. It can be challenging to keep up with it all, understand how new tools and technology impact students, and design the most impactful lesson plan possible (GoGuardian, 2016). Educators at all levels have been challenged in recent decades by a plethora of technology tools to assist in teaching, learning, and supporting the curriculum in the classroom (Gallup-New Schools Venture Fund, 2019).

> The educational landscape is jam-packed with EdTech options, leading to educators falling into the 'paradox' of choice. This paradox often keeps educators from integrating any available options because they are paralyzed by the options rather than liberated by. them. (Miller, 2022, para. 7)

Since many digital tools are used by school systems, many of which are redundant, there is a prevalent perception that educators are overwhelmed by the current EdTech landscape (LearnPlatform, 2022).

A huge array of products exists; 964 student-facing digital products, used directly by students for learning were available on the market in 2014 (Bill & Melinda Gates Foundation, 2014). "There are so many digital tools out there, I am lost as to which ones are good," … "I am excited to learn about new technology but overwhelmed by the huge array available. Finding time to research it all is tough, especially all the new education apps (Bill & Melinda Gates Foundation, 2015, pp. 21, 28). These are some of the teacher's voices surveyed by Bill &

Melinda Gates Foundation, 2015. There are thousands of edtech solutions; LearnPlatform has cataloged over 11,000 in 2022.

> With so many tools in the market, it is challenging to know which are safe, which "play nice" with other systems, which are compliant with regulations and policies, which are eligible to be purchased using federal funds, and which will have the most impact for which students in which context. (LearnPlatform, 2023a, para.1)

With the pressures of accountability testing, many teachers struggle to find time and support to take the risk of introducing technology into their teaching days. Initially, teaching with digital tools takes longer than traditional styles of teaching. Teachers struggle to balance accountability demands and students' needs for differentiated digital-age learning (Hamilton, 2018). The demands of accountability with assessment and curricular standards limit many teachers from finding the necessary time to understand and research the latest technological tools (Alaniz & Wilson, 2015). Educators often feel overwhelmed and unsure of where to start since there are so many EdTech tools available and little time to learn them (Miller, 2022). Teachers are stressed about time, and if they do not see actual results in how students are learning, they do not want to invest the effort necessary to learn and implement emerging technologies. A technology's worth will be questionable in the eyes of a teacher or principal if it does not significantly or measurably boost students' capacity for learning (Ottenbreit-Leftwich & Kimmons, 2020). Even when teachers agree with the ideas and philosophies of digital-age learning, many find it difficult to change the comfortable practices they've used successfully for years. Teachers are confident about the level of students' achievement related to their current teaching methods (Hamilton, 2018).

Educators used digital tools to boost students learning more than ever during the pandemic time. However, few believe valuable information about which resources will be effective in the classroom is available. They are constantly seeking support, resources, and tools for the classroom (Klein, 2019). Despite the enthusiasm for technology (65 percent of U.S. public school teachers said they used digital tools every day, and 85 percent saw "great value" in using them in the future), teachers and administrators reported that they don't have as much information as they would like about digital tools' effectiveness (Gallup-New Schools Venture Fund, 2019). Teachers are trying hard to engage and challenge their students, but they don't have sufficient options for effective digital tools that truly meet their needs (Bill & Melinda Gates Foundation, 2015).

The use of digital learning tools in K–12 continued to grow after the pandemic's peak. According to LearnPlatform, which has been tracking ed tech usage since 2017, during the 2020–2021 school year, districts in the United States used about 1,450 different digital tools on average per month, 9% over the spring 2020 EdTech adoption surge during the switch to remote learning as schools shut down for in-person instruction across the entire country. Moreover, it is up 52% over 2019–2020 pre-pandemic levels. The study measured 8,616 individual digital tools, about 250,000 educators, and 2 million students (LearnPlatform, 2023b). The rapid rise of technology may represent a massive shift for educators who may be tied to more traditional methods of teaching because it can be especially difficult for educators to adapt to change due to limited knowledge, training, or a supporting system (Winter et al., 2021).

During the fall of 2021, the EY-Parthenon research team conducted about 30 interviews and classroom observations and surveyed nearly 900 teachers in K-12 schools to analyze the use of education technology during and post-pandemic. The findings showed that teachers are more

comfortable with digital tools and use them more frequently in their classrooms. However, they want more guidance from their districts on effectively leveraging digital tools since they relied primarily on their peers during the pandemic for advice. When schools shifted to remote learning in 2020, teachers had quick access to a plethora of digital tools to support continued engagement and student learning. Given the abundance of options, teachers turned to products recommended by other teachers, using each other as markers of quality and effectiveness. Now, teachers are seeking more guidance about how to use digital learning tools not just to engage with students but also to drive learning acceleration and remediation.

> Professional learning from districts that goes beyond "how to sign" to "how to instruct differently" is necessary to reimagine classrooms, the way teachers teach, and improve learning experiences. (EY-Parthenon, 2021, p. 18)

Principals, administrators, and students see great value in using EdTech tools now and in the future, but insufficient training and cost are among the top reasons teachers think some may choose not to use digital learning tools (Gallup-New Schools Venture Fund, 2019). The main external barriers to technology integration in the classroom are a lack of in-service training, available technology, and a restricted curriculum (Ruggiero & Mong, 2015). Many teachers face a dual challenge working with digital tools in their classrooms. They do not choose most of the products they use, yet they are still often responsible for finding ways to incorporate them into their teaching. When they select their digital tools, most follow the recommendations of other teachers and school leaders. Far fewer rely on education-specific online resources. When teachers look for digital tools on their own, cost-effectiveness and ease of integration were cited as the most critical factors in their decisions. They also seek tools that allow them and their students to continually tailor tasks and instruction based on each student's skills and progress

(Bill & Melinda Gates Foundation, 2015). There are so many wonderful ways to integrate tech tools into your teaching that you may find it hard to decide where to start (Hamilton, 2018). Sometimes, schools and districts have dedicated staff to select and integrate technology, but usually, teachers have all the responsibility for that, and they often struggle to find information about digital tools (Gallup-New Schools Venture Fund, 2019).

Teachers need support in incorporating digital tools effectively in the classroom. The pandemic showed random and uneven incorporation of digital tools into remote learning. Digital solutions often depend on one school principal's dedication or one teacher's ingenuity. A more global approach is needed to incorporate digital tools and content into the curriculum (Artal et al., 2021).

All individuals need access to digital tools, devices, and skills training to fully participate in today's rapidly changing economy and society. However, communities nationwide have long faced challenges in achieving digital equity. According to the U.S. Department of Education, in 2019, 19 million households struggled to access reliable, high-speed broadband. In addition, despite efforts to expand affordable access, limited awareness and availability of digital literacy development opportunities remain a barrier to adoption. Existing disparities in the adoption, affordability, and availability of broadband and digital tools for learning have been accentuated and aggravated by COVID-19 and other societal factors, such as school, work, and essential services, such as healthcare (U.S. Department of Education, 2021).

> No matter the key focus of the technology, we've seen a steady increase in the number of digital tools used in classrooms, whether virtual or in-person. Tech-enabled learning is here to stay, and now is the time to ensure that ed tech is effective in supporting teaching

> and driving student outcomes and focus on improving the safety, equity, efficiency, and effectiveness of the learning environments. (LearnPlatform, 2022, para. 4)
>
> In a post-COVID world, the classrooms are no longer contained within four walls, and EdTech will be the key to expanding beyond them. Teachers will need to understand technology better, and administrators should make ongoing training a priority. (Promethean, 2020, p. 10)

Integrating digital technology into teaching is far more complex than providing "stand-alone" digital skills training at the basic level of proficiency. It is ideal if the school has a plan for the use of technology and a heavy emphasis on teacher development and continuous support is required. Careful selection and curation of digital content appropriate to each subject is time-consuming and requires technical expertise (Bashir & Miyamoto, 2020). Insufficient training and support about digital tools, lack of knowledge on digital learning tool effectiveness, and lack of knowledge on criteria to use in the digital learning tools selection process are problems that this study addresses.

Selection Process

Scholars and educators report that integrating technology into classroom practices is not easy or innately achieved (Abdalhadi, 2016). When technology is utilized meaningfully, it creates a promising atmosphere where students and researchers can collaborate and learn successfully (Alaniz & Wilson, 2015). Technology decisions and planning must be purposeful, collaborative, and strategic from their conception through implementation and on to sustainability to reduce the difficulties associated with using technology in the classroom (Schrum & Levin, 2015).

Deciding how to use digital tools best can be challenging, but a good place to start is to hear directly from the students. Educators should involve students in classroom decisions and ask for reflections on their experience using the tool to understand if and how technology enhances their learning process (Ottenbreit-Leftwich & Kimmons, 2022).

Classroom integration of technology requires a different level of thinking from personal tech use. First, teachers need to understand how technology tools can support the instructional goals of their curriculum. Then, teachers must adapt to the changes that digital technologies bring to the classroom (Hamilton, 2018) Teachers should use technology to support learning objectives that are clearly identified first when they need to decide on a final product that will give students the best way to demonstrate their learning (Burns, 2018). It is important to go beyond apps' technological features to consider practices or apps that focus on linking relationships between students and their learning goals (O'Rourke, 2021). It is essential to determine the purpose of the task before choosing the tool, as the novelty of any application will wear off. A meaningful task and a clear purpose create a sustainable practice, help learners develop into productive, contributing, and ethical digital citizens, and propel learners into the digital world as global citizens. These will help learners develop critical competencies (Erkens et al., 2018).

EdTech tools that teachers utilize should meet instructional needs with a purpose geared toward student learning (Tucker et al., 2017). Educators mainly select digital learning tools that support student learning and meet state or district learning standards (Gallup-New Schools Venture Fund, 2019). An EdTech tool can improve teaching if it helps teachers meet their goals. Knowing the content, the pedagogy, and, most importantly, the learners allow teachers to set goals, select a tool for meeting those goals, use that tool to achieve those goals, and, as a result,

be a better teacher. When great EdTech tools are combined with outstanding pedagogy, the result will be enhanced outcomes for the students and educators (Miller, 2022).

There are so many wonderful ways to integrate tech tools into your teaching that you may find it hard to decide where to start. Be assured that there is no "right tool." Teachers begin with tools that best fit their styles, classroom contexts, level of confidence, and students' abilities. Almost any idea can be an entry point for increasing the presence of technology in the classroom. No teacher is an expert in all technologies. As individuals, we gravitate toward what interests us. Within a classroom, students may be interested in several different aspects of technology—and a teacher cannot possibly use them all in one year (Hamilton, 2018).

> You can't—and shouldn't—use all of the EdTech tools out there, or, worse yet, learn about all of them. So, how do you choose which ones to use? Ask yourself what your goals, needs, and problems are for your learning environment or for a given lesson. Then, identify the tools that meet a goal, address a need, or solve a problem for you. Those are the only ones you need to consider. Once you identify that subset of tools, which one do you want to start with? Which one will benefit you and your learners the most right now? Take it one at a time. (Miller, 2022, para. 27)

Checklist and Evaluation Rubric. A typical approach to selecting educational software is the use of checklists. The checklist is not intended to be used to deliver a numeric score that provides a definitive evaluation of the courseware. Rather, it is intended to reflect and indicate areas of the materials that are pedagogically strong and identify weaknesses that need further attention (Hosie et al., 2005).

A checklist involves a process of listing a task or a process that can be used as guidance to evaluate the presence or absence of the individual listed item. The listed items can be grouped

by comparing specific factors by category, format, or characteristics (Norzila et al., 2022). A rubric, instead, is an assessment tool used to evaluate performance, a product, or a project (The University of Texas at Austin, 2017). Rubrics consist of four parameters: a task description, dimensions that lay out the parts of the task simply and ultimately, a scale level that describes how well or poorly any given task has been performed, and dimension criteria that should contain a description of each dimension at each level of scale (Stevens & Levi, 2005). A rubric can facilitate an evaluation of digital tools. The rubric examines digital tools' functional, technical, and instructional features. It offers insight into a digital tool's relative strengths and weaknesses as evaluated against a set of criteria (Mississippi Department of Education, 2022).

The Future of Education and Skill

Technology can be a potent tool for transforming learning. It can help improve relationships between educators and students, shrink long-standing equity and accessibility gaps, adapt learning experiences to meet the necessities of all learners, and reinvent approaches to learning and collaboration (U.S. Department of Education, 2016). The U.S. Department of Education, in partnership with the American Institutes for Research (AIR), launched "future ready" in November 2014. The goal was to help leaders create the necessary technical infrastructure and human capacity to implement a vision for technology-enabled transformative learning.

The four focus areas of future ready leaders are collaborative leadership, personalized student learning, robust infrastructure, and personalized professional learning. Strong leadership abilities, developing the vision, securing continued funding, building a district-wide leadership team, and garnering broad-based support are essential for a successful digital learning transition for students and teachers. Technology enables personalized paths for student learning through

active and collaborative learning activities. They must be aligned with standards and supported by the use and development of rich content and robust tools. A strong technology infrastructure is essential to future ready learning environments, and leaders must take ownership of infrastructure development and maintenance. Finally, providing ongoing, job-embedded, and relevant professional learning is fundamental to support personnel in making the digital transition (U.S. Department of Education, 2016).

Future ready schools help educators ensure that each student graduates from high school with the passion, agency (the feeling of control over actions and their consequences), and skills to be a productive, compassionate, and responsible citizen (All4Ed, n.d.). The skills required to thrive in the workplace and life are evolving as quickly as the environment around us. A key goal is to ensure that all students graduate from high school "future ready" with the skills, knowledge, and attitudes to successfully navigate their careers and lives. The key to succeed in a rapidly changing world is the integration of SEL (social and emotional learning) with CWD (career and workforce development) (Collaborative for Academic, Social, and Emotional Learning [CASEL], 2022).

SEL deepens students' ability for future success by giving them the social and emotional skills necessary for success in work and life. SEL supports personal attitudes and skills that contribute to a larger sense of "success": a sense of purpose and belonging, an ability to develop and sustain relationships with mentors and others who can support them in their career paths and lives, mental and physical health, an ability to communicate and collaborate effectively with supervisors and co-workers and civic engagement.

CWD engages students in developing their own path to future success, allowing students to apply classroom learning to future courses of study or career paths. These "real-world"

experiences vary widely from job shadowing, career days, internships, etc. PreK-12 education must provide an education that develops students' academic and cognitive abilities, nourishes their social and emotional skills, gives opportunities to apply these skills in real-world situations, and finds future pathways that ignite their passions (CASEL), 2022).

Education must evolve to teach children the skills they need to succeed in our changing world. Primary and secondary school systems have a crucial role in preparing the global citizens and workforce of the future. Education models must adapt to prepare children with the skills to create a more cohesive, inclusive, and productive world, considering that in-demand skills of the future will be very different from what has been taught in the past (Marr, 2022).

21st Century Skills

The Partnership for 21st Century Skills has developed a framework for 21st Century Learning. The framework defines the skills, knowledge, and expertise students must learn to succeed in work and life; it is a combination of content knowledge, specific skills, expertise, and literacies (Partnership for 21st Century Skills, 2009). In addition to core academic knowledge, students must learn to think critically, problem-solve, collaborate, and communicate effectively to succeed in 21st-century careers. Developing 21st-century skills motivates educators to effectively incorporate technology into their classrooms.

The 21st-century learning environment represents the new trend in today’s educational field (Abdalhadi, 2016). Twenty-first-century learning incorporates technology with 4Cs: critical thinking, communication, collaboration, and creativity (The Partnership for 21st Century Learning, 2019). A modern teacher can use technology tools to design illuminating lessons that encourage students to learn in a flexible environment and think critically with their peers on web-based technology tools or programs (Petty, 2019).

The 21st-century learners now access education in an environment where a set of broad courses with highly qualified teachers in specific subject areas are available through various learning platforms or technology tools (Horn & Staker, 2014). Students are 21st-century learners; it is essential that teachers actively teach students the skills they need to communicate, collaborate, and create using technology and the internet because technology-based skills focus on creating a well-rounded student who is academically ready for college and survival in the 21st-century society. Teaching students how to use technology productively and adequately is critical for student success in the ever-changing 21st century (Aguilar et al., 2020).

Top Educational Technology Trends in the Next Years

Technology's rapid evolution over the course of months is a reminder of how important it is to keep our goals for student learning front and center (Burns, 2018). When integrating technology in the classroom, teachers must always be knowledgeable about the new technology trends in education. After the COVID-19 pandemic, institutions are shifting from "emergency" to "long-term" planning for new technologies that enable more adaptive decision-making and more flexible teaching and learning experiences (Pelletier et al., 2022).

Personalized and adaptive learning, blended learning, artificial intelligence, gamification, and chatbots are the new technology trends in education (Barnes, 2021).

> Personalized learning refers to instruction in which the pace of learning and the instructional approach are optimized for the needs of each learner. Learning objectives, instructional approaches, and instructional content (and its sequencing) may vary based on learner needs. In addition, learning activities are meaningful and relevant to learners, driven by their interests, and often self-initiated. (U.S. Department of Education, 2017, p. 9)

Personalization encourages educators to be more open and flexible so that students can become more invested in designing their own personal learning pathways. Students who are engaged in personalized learning at their various paces can access tools and feedback that motivate them to maximize their unique skills and potential (Grant & Basye, 2014).

Adaptive learning refers to technologies that monitor student progress and use data to modify instruction anytime. From a student perspective, these technologies adapt to their needs by providing real-time feedback and learning paths to help them advance, no matter the level at which they begin. Because adaptive learning can leverage machine learning and artificial Intelligence, instructors no longer need to pick through mountains of content around every area of potential remediation in their courses. Adaptive learning can help faculty balance their workload by offloading content dispersion to dynamic means of consumption, saving time for interacting with their students and getting them to dig deeper and apply concepts (Alexander et al., 2019). Addressing the demands of each individual learner is a critical part of education. Adaptive learning provides students with the required reading material based on their skill and level of knowledge on a particular topic. Adaptive learning makes it easier to identify and solve challenges. Online learning platforms are now responding to learners' needs with tailor-made solutions to recognize and address their decline and enable more tailor-made learning (Barnes, 2021).

Blended learning is a formal education program in which a student learns, at least in part, through online learning with some element of student control over time, place, path, and or pace (Aldalalah & Gasaymeh, 2014; Tucker et al., 2017). Blended learning combines classroom learning with online learning. The blended learning approach can facilitate collaborative learning, creating a more dynamic environment for learners (Barnes, 2021).

K-12 learning experience affects students' postsecondary educational experiences and their ability to enter the workforce. Knowing the trends that will shape the future of postsecondary teaching and learning is essential to building the content of the K-12 curriculum and understanding how digital learning tools can enforce the learning experience to provide students with foundational knowledge and skills, which are then built up at the postsecondary level (McQuarrie, 2016).

In 2022, Educase, which is a technology association and the largest community of IT professionals and leaders committed to advancing higher education, in the "Educause Horizon Report: Teaching and Learning Edition 2022" (Pelletier et al., 2022), provided inputs on the macro trends they believe will shape the future of postsecondary teaching and learning. The Horizon panelists identified several AI for learning tool key areas where institutions may need to focus their attention: improving student performance and learning experiences. “The term' artificial intelligence' means a machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations or decisions influencing real or virtual environments” (Hummelholm, 2023, p. 1).

In Educause (n.d.), "Artificial intelligence or AI refers to computer systems that undertake tasks usually thought to require human cognitive processes and decision-making capabilities" (para. 1). AI offers potential benefits through tools that provide automated and responsive feedback to students as they study and complete tasks and course assignments. Virtual writing assistants, for example, can provide students with real-time feedback on the quality of their writing and offer comments and suggestions based on the instructor's guidelines and the goals of the course. These tools also provide customized learning experiences and pathways for students, adjusting curricula, materials, and assessments based on each student's

academic performance, needs, and preferences. On the other hand, as these and other functions become increasingly automated and less dependent on faculty time and effort, educators might experience benefits in the form of more time to focus on higher-order tasks and dedicate attention to individual students in need of additional support or tutoring. Educators can leverage AI to improve and build on existing learning tools and experiences, particularly where learning technologies and tools already in use require further enhancement. Integrating AI capabilities with reality technologies, such as virtual, augmented, and mixed reality, can help create more realistic environments and experiences and improve learning outcomes (Pelletier et al., 2022).

Whether using specially designed glasses or a simple smartphone, augmented reality or AR involves projecting digital elements, such as information, images, graphics, or animation, into the real world so that the digital content being superposed looks like it is part of the physical world. Virtual reality or VR offers a far more immersive experience than augmented reality, but to do that, it requires more technology and infrastructure, such as a VR headset. While AR is rooted in the real world, VR creates a 3D, 360-degree experience of an artificial, computer-simulated ecosystem. Mixed reality, or MR, combines VR and AR; it blends components of the digital world with the real world in real time to the extent that you can interact with the digital elements as if they were real objects (Marr, 2021). A 2022 National Research Group report on VR technologies, based on a study of 2,500 consumers ages 18–64 in the United States, revealed that just over 60 percent of consumers who participated in the study think VR and AR will be useful learning tools for children (Navaratnam-Blair et al., 2022).

AR/VR solutions can enhance classroom experiences, share information in new and engaging ways, offer virtual experiences that can mitigate barriers from distance or cost, and expand opportunities at all levels of learning. These solutions are gaining popularity among K-12

educators and administrators. The most common use in K-12 settings is enhancing classroom experiences; teachers can walk students through immersive virtual field trips or allow them to interact with 3D models (Ellysse, 2021). Artificial Intelligence helps determine what a student does and does not know, building a personalized study schedule for each learner considering the knowledge gaps. In such a way, AI tailors studies according to student's specific needs, increasing their efficiency (Plitnichenko, 2020).

One of the most popular generative AI technologies used to support teaching and learning activities is the Chatbot system. Generative modeling artificial intelligence, or GAI, is an unsupervised or semi-supervised machine learning framework that generates artificial relics using existing digital content such as but not limited to video, images/graphics, text, audio, and video by examining training examples and learning their patterns and distribution (Hu, 2022). Chatbots are conversational or interactive agents that provide instant responses to the user (Okonkwo & Ade-Ibijola, 2021). The aim of using chatbots in education is not to replace the teacher but to reduce the burden of repetitive and low cognitive level tasks carried out by the teacher and thus increase their efficiency. Chatbots could perform various tasks like designing textbooks, delivering course content, developing test questions and evaluating the answers, monitoring online discussions, and tutoring students. Chatbots' effectiveness depends on their developer's ability, creativity, and imagination. However, there is a strong need to explore more in this area to understand the impact of using chatbots in education (Yanduri, & Majid, 2022).

> Our future education and workforce skilling discussion should not focus on how to teach individuals to compete against machines. Technology is only meaningful when it enhances humanity. A horse is faster than a human. However, we do not compete against

> a horse. We ride a horse. We should focus on how to ride and drive AI and technology, not to run against it. (Park, 2019, p. 5)

Gamification is another trend that has already started and will continue in the future of education. Gamification is the use of game design elements in non-game contexts (Deterding et al., 2011). Game elements are, for example, levels, points, badges, leaderboards, avatars, quests, social graphs, or certificates (Zainuddin et al., 2020). A game refers to a structured play with rules, goals, and challenges for the purpose of entertainment (Cheng et al., 2015). Games are crucial to human culture and society and promote motivation and engagement (Bozkurt & Durak, 2018). This is why gaming mechanics are increasingly transferred to generally game-free contexts, such as primary and secondary school education (Ioannou, 2019), to promote desired motivational, behavioral, and learning outcomes (Zainuddin et al., 2020).

In contrast to games, gamification is characterized by its serious purpose; it is linked to effects on affect and motivation (Albertazzi et al., 2019) and on behavior, e.g., academic achievement and engagement (Chen et al., 2018; Putz et al., 2020). Gamification can illustrate goals and relevance, prompt users through guided paths, give users immediate feedback, reinforce good performance, and simplify content to manageable tasks. Gamification mechanics can allow students to pursue individual goals and choose between different progress paths, while the system can adapt complexity to the student's abilities. Social gamification elements may enable social comparison and connect students to support each other and work towards a common goal (Krath & Von Korflesch, 2021).

Standard

International Society for Technology in Education (ISTE) Standard

Students use digital tools to enrich their learning and to broaden their perspectives by collaborating with others and working effectively in teams locally and globally. Teachers need to consider the ISTE standard to meet the needs of students who live, work, and play in a globally connected world. Teachers must keep these standards in mind when they select digital tools to use in the classroom (Brooks-Young, 2017).

The International Society for Technology in Education (ISTE) is a nonprofit organization that concentrates on accelerating innovation in education through the effective use of technology in education. The mission is to inspire educators globally to use technology to innovate learning and teaching, accelerate positive behavior, and solve challenging problems in education by providing knowledge, community, professional learning, and the ISTE Standards. The seven standards (see figure 3) created a focus on individual skills that students can build while using technology to learn. The students' standards are knowledge constructor, innovative designer, computational thinker, creative communicator, global collaborator, digital citizen and empowered learner (ISTE, n.d.).

Figure 3

ISTE Standard for Students

Note. This figure illustrates the ISTE Standards, which define the competencies for learning, teaching, and leading in the digital age. From *ISTE Standards*, by International Society for Technology in Education [ISTE], (n.d.-d), https://iste.org. Copyright n.d. by International Society for Technology in Education.

By leveraging technology, the empowered learner standard requires students to actively select, achieve, and demonstrate competencies in their learning goals. Every student must be a good digital citizen, understanding the rights and responsibilities of living, learning, and working in a digital world. The standard requires to act ethically, legally, and safely online.

Knowledge constructor standard requires students to critically curate, understand, and contextualize information online since they use various resources using digital tools. An innovative designer must understand the basics of problem-solving basics to create new, useful, or imaginative solutions. A computational thinker develops and employs strategies for understanding and solving problems that leverage technological methods' power to develop and test solutions. Creative communicator standard requires students to communicate clearly and express themselves creatively for various purposes using the tools, platforms, formats, styles, and digital media appropriate to their goals. Finally, as global collaborators, students must

understand how their perspectives differ from others and work together to achieve a common goal locally and globally (Brooks-Young, 2017).

Students are at the center of everything educators do. The student ISTE Standards describe the skills and knowledge students need to prosper, expand, and contribute in an interconnected, global, and continually changing society (ISTE, n.d.). In today's age of digital learning, it is the collective responsibility of educators to understand the value of teaching digital citizenship at all grade levels. Teachers can train students to be good digital citizens using these tips and technology tools (GoGuardian, 2022).

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Global Standard for Digital Intelligence (DQ)

Governments, companies, and organizations are spending millions of dollars on "digital literacy," "digital skills," and "digital readiness" programs across different sectors and countries to empower individuals with the digital competencies needed to become ready for the rapid advance of AI and other digital technologies. However, there is no shared, global understanding of what terms such as "digital literacy," "digital skills," and "digital readiness" mean. The Coalition for Digital Intelligence (CDI), composed of the Organization for Economic Co-operation and Development (OECD), IEEE Standards Association (IEEE SA), and DQ Institute in association with the World Economic Forum (WEF), launched the DQ Global Standards Report in 2019 which was the world's first attempt to define a global standard for digital skills, literacy, and readiness across the education and technology sectors. DQ global standard was then approved by the IEEE Standards Board in 2020. (Park et al., 2020). The United Nations, the

WEF, the World Bank, and the OECD have all identified these digital competencies as fundamental for future readiness. The digital intelligence (DQ) framework (see figure 4) contains a set of cognitive, meta-cognitive, technical, and socio-emotional competencies grounded in universal moral values to allow individuals to face the challenges of digital life and adapt to its demands. The framework has three levels, eight areas, and twenty-four competencies composed of knowledge, skills, attitudes, and values (Park, 2019). The DQ framework has three levels (see figure 5).

Figure 4

Digital Intelligence (DQ) Framework

Note. The figure presents the Digital Intelligence (DQ) Framework,and competencies for digital literacy, skills, and readiness. From *DQ Global Standards Report 2019: Common Framework for Digital Literacy, Skills and Readiness*, by Y. Park, 2019, https://www.dqinstitute.org/wp-content/uploads/2019/10/DQGlobalStandardsReport2019.pdf. Copyright 2019 by DQ Institute.

Figure 5

Levels of DQ

Note. This figure shows the levels of Digital Intelligence (DQ), progression of digital literacy, skills, and readiness. From *DQ Global Standards Report 2019: Common Framework for Digital Literacy, Skills and Readiness*, by Y. Park, 2019, https://www.dqinstitute.org/wp-content/uploads/2019/10/DQGlobalStandardsReport2019.pdf. Copyright 2019 by DQ Institute.

Digital citizenship is a set of fundamental digital life skills everyone needs. Digital creativity covers more advanced digital literacy, skills, and readiness competencies as individuals become active members of the digital ecosystem and create economic and societal values through participation, creation, and innovation. Digital competitiveness is a higher-order capability for individuals to perform effectively as members of the digital economy who fuel entrepreneurship, create jobs, produce social impact, and spur economic growth.

Teachers might assume students know how to use digital learning tools when teaching with technology. Most students are growing up using various technologies at home but mostly use these tools for messaging, social media, and entertainment. Many students do not know how to use technology ethically, legally, and safely to support their learning and can use technology in harmful ways that harm their and others' lives. Educators must role model and teach digital literacy and Safety when using digital learning tools (Barrett et al., 2020).

DQ institute aims to cover all areas of individuals' digital lives that range from personal and social identities of individuals to their use of technology, including devices and media, their online communication and collaboration at work or at leisure, their practical, operational, and technical capabilities that are critical for daily digital lives and professional careers, potential Safety and security issues related to technology, emotional and relational aspects, and human rights in the digital age. This approach results in the following eight areas: digital literacy, digital identity, digital use, digital safety, digital security, digital emotional intelligence, digital communication, and digital rights. Figure 6 summarizes each of the eight areas of DQ, its definition, and its guiding principles (Park, 2019).

Figure 6

Areas of DQ

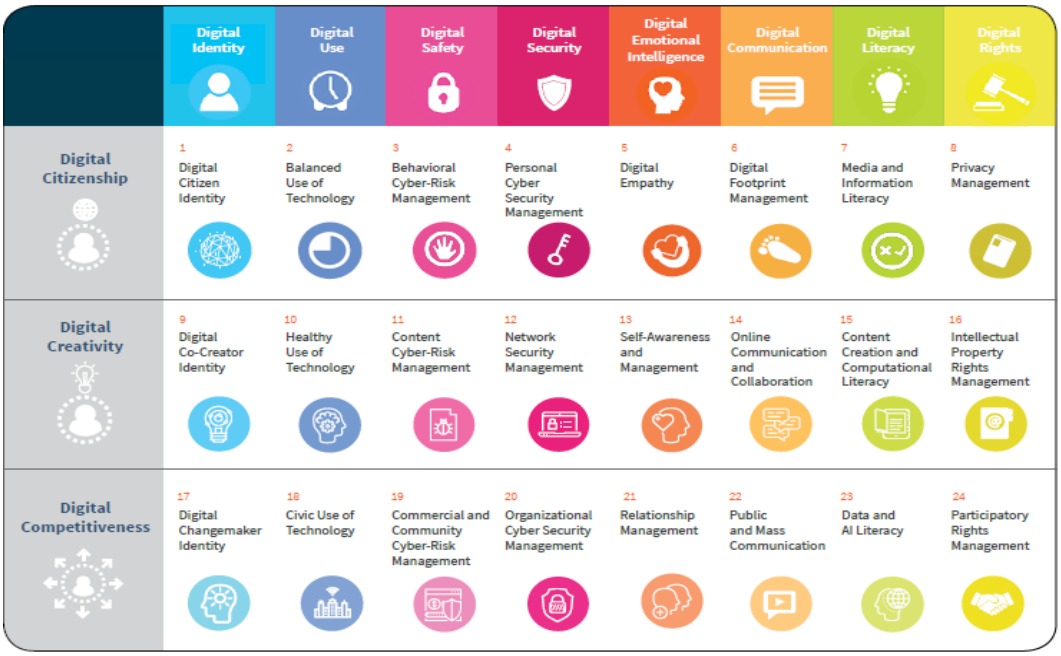
Note. This figure shows the areas of Digital Intelligence (DQ), detailing key competencies in digital literacy, skills, and readiness. From *DQ Global Standards Report 2019: Common Framework for Digital Literacy, Skills and Readiness*, by Y. Park, 2019, https://www.dqinstitute.org/wp-content/uploads/2019/10/DQGlobalStandardsReport2019.pdf. Copyright 2019 by DQ Institute.

Teachers should aim to allow students to develop one or more of these areas when teaching using digital learning tools to empower and encourage them to use technology to impact their learning and lives positively. Also, incorporating the areas of individuals' digital life into student learning experiences will support their growth, long-term learning, growth, and success in an ever-changing technological landscape (Barrett et al., 2020).

With three levels of DQ across eight areas, the following twenty-four competencies have been identified based on an aggregation of twenty-five existing frameworks (see figure 7, figure 8, and figure 9).

Figure 7

24 DQ Competencies



Note. This figure shows the 24 competencies that comprise Digital Intelligence (DQ). Adapted from *DQ Global Standards Report 2019*, by Y. Park, 2019, https://www.dqinstitute.org/wp-content/uploads/2019/10/DQGlobalStandardsReport2019.pdf. Copyright © 2019 by DQ Institute.

Figure 8

24 DQ Competencies – Details Part 1

Note. This figure shows the 24 competencies that comprise Digital Intelligence (DQ). Adapted from *DQ Global Standards Report 2019*, by Y. Park, 2019, https://www.dqinstitute.org/wp-content/uploads/2019/10/DQGlobalStandardsReport2019.pdf. Copyright © 2019 by DQ Institute.

Figure 9

24 DQ Competencies – Details Part 2

Note. This figure shows the 24 competencies that comprise Digital Intelligence (DQ). Adapted from *DQ Global Standards Report 2019*, by Y. Park, 2019, https://www.dqinstitute.org/wp-content/uploads/2019/10/DQGlobalStandardsReport2019.pdf. Copyright © 2019 by DQ Institute.

The OECD Education 2030 suggests that the development of a "competency" involves the mobilization of disciplinary, epistemic, and procedural knowledge; cognitive, social, emotional, practical, and physical skills to apply knowledge in unknown and evolving

circumstances; attitudes and values that guide how knowledge and skills are used at personal, local, societal, and global levels to meet challenges and opportunities. Individuals need knowledge, skills, attitudes, and values. The OECD Education 2030 Framework has identified three categories of competencies that empower individuals to transform their communities and shape their futures: taking responsibility, creating new value, and reconciling tensions and dilemmas. These competencies connect with other future-readiness competencies that other organizations have identified (OECD, 2018).

In the “Future of Jobs 2018 Report,” the World Economic Forum (2018) predicted "trending skills" essential for the workforce by 2022. These skills include complex problem-solving, analytical thinking, innovation, creativity, critical thinking and analysis, originality, initiative, active learning and learning strategies, technology design and programming, emotional intelligence, leadership and social influence, reasoning, systems analysis, evaluation, problem-solving, and ideation (World Economic Forum WEF, 2018).

The final goal of the DQ Framework is to direct digital practices toward achieving societal and individual well-being across all aspects of one's life. The Organization for Economic Co-operation and Development or OECD identified eleven areas of well-being: jobs, income, housing, work-life balance, safety, life satisfaction, health, civic engagement, environment, education, and community. These areas of well-being, in turn, contribute to achieving the seventeen UN sustainable development goals: Zero hunger; no poverty; quality education; good health and well-being; gender equality; reduced inequalities; clean water and sanitation; responsible consumption and production; affordable and clean energy; industry, decent work, and economic growth; innovation and infrastructure; sustainable cities and communities;

partnerships for the goals; climate action; life below water; and life on land; peace, justice, and strong institutions (OECD, 2021).

One of the responsibilities of schools, from primary to higher education, is to help students develop, responsibly and sustainably, their digital intelligence to adapt quickly to changes and cope with potential technological threats. Digital intelligence will allow students to have the necessary preparation for future skills they will need and a healthy, active life in a digitized and hyperconnected world (Boughzala, 2019).

> Schools are facing increasing demands to equip students for technologies that have not yet been invented, jobs that have not yet been created, to solve social problems that have not yet been anticipated, and for rapid economic, environmental, and social changes. Education can equip learners with agency, competencies, and a sense of purpose to shape and contribute to others' lives. (OECD, 2018, p. 22)

Educators, when selecting digital learning tools, should think about what knowledge, skills, attitudes, and values today's students need to shape and thrive in their world in the following years and how digital learning tools can effectively develop these knowledge, skills, attitudes, and values.

Technology Integration Framework

Having models or frameworks for technology integration is crucial since technology integration in the classroom is becoming increasingly popular (Lacruz, 2018).

> Teaching and learning frameworks are research-informed models for course design that help instructors align learning goals with classroom activities, create motivating and inclusive environments, and integrate assessment into learning. (Yale Poorvu Center for Teaching and Learning, n.d., para. 1)

When educators begin to consider what constitutes effective technology integration, they must acknowledge that different groups and people with different assumptions about how students learn will view technology integration differently. Thus, in defining effective technology integration, teachers need to consider how they define learning and what constitutes evidence of learning to understand and accept learning theories and the technology integration models that guide their thinking (Ottenbreit-Leftwich & Kimmons, 2018).

Integrating technology into the curriculum can be challenging since it requires teachers to align content and technology so that students can accomplish meaningful goals. Teachers must keep up with technological advancements and have the necessary abilities to incorporate them into the classroom since students are becoming increasingly tech-savvy. Education will not be an exception to the 'net generation's' expectations and demands for innovation in all areas of their lives. It is essential to measure the quality of integration and not the number of technologies used to evaluate teachers' level of technology integration into the classroom (Lacruz, 2018).

The educator aims to teach students by transferring knowledge and creating meaningful learning experiences that support their skill development and knowledge. Digital learning tools can help create these meaningful learning experiences. Educators must keep instructional goals and sound pedagogical principles front and center when looking for a new digital learning tool. A digital learning tool must offer improved efficiencies, enhance communication, increase engagement, and/or the opportunity to do something that would not even be possible without the new tool (Barrett et al., 2020).

The following section presents technology integration models that educators can use to evaluate and inform how they teach with digital tools: The SAMR model, the RAT PICRAT model, the TPACK framework, and the TIM matrix. SAMR centers on how educators can use

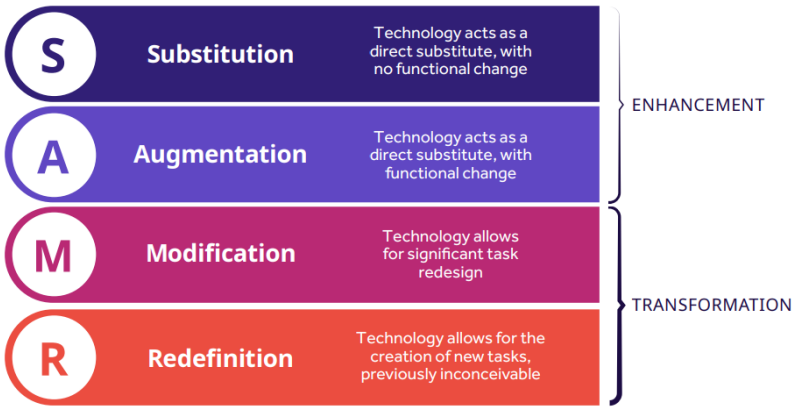
technology to improve and transform teaching activities; RAT allows teachers to assess their technology literacy in terms of replacement, amplification, and transformation; The interaction between teachers' technological, pedagogical, and content knowledge is the emphasis of TPACK; TIM focuses on how educators and learners use technology to create relevant learning environments; PICRAT: PIC (passive, interactive, creative) refers to the student's relationship to technology in a particular scenario. RAT (replacement, amplification, transformation) describes technology's impact on a teacher's previous practice (Wang, 2023).

SAMR Model

Puentedura's SAMR model focuses on identifying the role technology has in a learning activity (Puentedura, 2009). The SAMR model helps reflect on classroom and institutional, technological integration, and it plans and assesses the levels of technologies utilized in the classroom (Jacobs-Israel & Moorefield-Lang, 2013). "The SAMR model allows the educators to evaluate the level at which the students use technology and become creators of their knowledge" (Green, 2014, p. 18). The model encourages curriculum creation in such a way that permits students to learn the technological skills required in the 21st century (Hilton, 2016). The model can guide the evaluation and selection of digital tools to create meaningful teaching and learning experiences. The key consideration is not to expend time and money on a new tool that does not add value to the technique it replaces (Barrett et al., 2020). The model has four levels of integration: substitution, augmentation, modification, and redefinition (see figure 10). They provide a framework for educators to gauge their technology integration levels (Lacruz, 2018). The substitution and augmentation levels are enhancement categories, while modification and redefinition categories of transformation.

Figure 10

SAMR Model



Note. This figure illustrates the SAMR Model and different levels of technology integration in education. Adapted from *SAMR: A Contextualized Introduction*, by R. Puentedura, 2009, http://www.hippasus.com/rrpweblog/archives/2013/10/25/SAMRAContextualizedIntroduction.pdf. This work is licensed under a Creative Commons Attribution-Noncommercial-Share Alike 3.0 License https://creativecommons.org/licenses/by-nc-sa/3.0/. The original image was modified in color and text.

The enhancement category refers to technological adoptions that make small or no changes to a task (Hilton, 2016). The technology is replaced with one level of technology for another at the substitution level (Puentedura, 2009). A typical example of this level is providing lecture notes online instead of photocopies, as the content does not change. At the augmentation level, the technology replaces, with slight enhancements, the previous technology. For example, the teacher does not read stories to the class at the augmentation level, but students read and listen to digital stories individually (Hamilton et al., 2016). The transformation category refers to technological adoptions that substantially modify learning activities (Hilton, 2016). In the modification stage, technology is used to change a preexisting task in a way that could not be accomplished without the use of technology; having a writing assignment take the form of a blog where students can receive feedback and comments from a global audience to improve their writing is an example (Hilton, 2016). The redefinition stage is the highest transformation level of the SAMR model. Redefinition is creating a new learning task that was previously inconceivable

(Puentedura, 2010), such as using Google Tour Builder and Google Virtual Reality to create and share virtual field trips and digital stories that allow students to reach previously inaccessible locations. This model may be helpful for teachers to reflect on their current practices with technology (Harris & Hofer, 2017).

RAT and PICRAT

The replace, amplify, and transform, or RAT model, developed by Dr. Joan Hughes, allows teachers to reflect on and self-assess their technology integration in the classroom. Technology in a teaching setting can be used either to replace a traditional approach to teaching (with no tangible difference in student outcomes and no changes to instructional practices), to amplify the learning that was occurring (the task remains fundamentally identical, but the use of technology increases effectiveness, efficiency, and productivity), or to transform learning in manners that were not possible without the technology (reinvents aspects of curriculum, learning, or instruction in a new and inventive way) (Hughes et al., 2006).

PIC-RAT (Kimmons et al., 2020) considers that there are two key questions that educators must ask about any technology use in their classrooms:

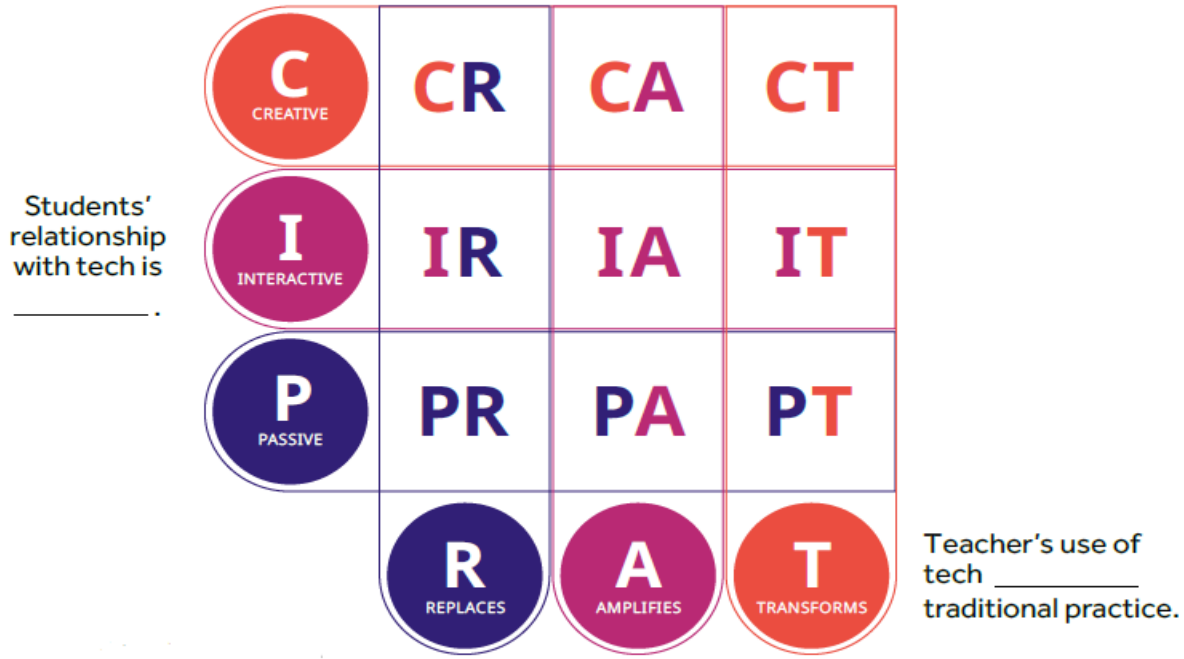
1. What is the student's relationship to technology?
2. How is the teachers' use of technology influencing traditional practice?

The PIC part responds to the first question with one of three answers: Passive, interactive, or creative. The RAT part responds to the second question with one of three answers: Replacement, amplification, or transformation. Responses to these inquiries are organized into a 3x3 visual matrix, with PR on the bottom left and CT on the top right (see figure 11). When teachers begin using technologies in their classrooms, they typically do so in a way closer to the bottom-left of PICRAT. Instead, many of the most exciting and valuable uses of technology for

teaching remain firmly in the top-most and right-most sections of PICRAT. Teachers must evolve their practices to continually move from PR (bottom-left) to CT (the top-right) of the grid (Kimmons, 2016).

Figure 11

PICRAT Model



Note. This figure represents the PICRAT Model, used to assess technology integration in K-12 education. Adapted from *K-12 Technology Integration*, by R. Kimmons, 2016, https://edtechbooks.org/k12handbook. Licensed under a Creative Commons Attribution 3.0 License https://creativecommons.org/licenses/by/3.0/us/. The original image was changed in color, and text was added.

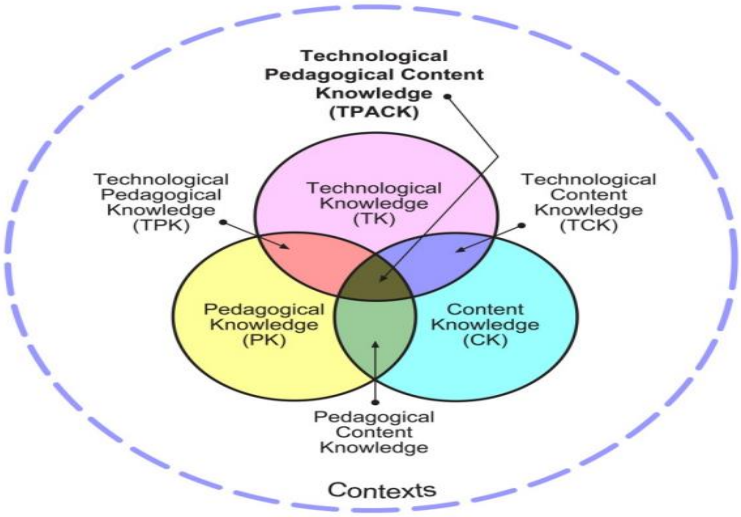
TPACK Framework

The technological pedagogical and content knowledge framework or TPACK focuses on examining the relationship among three core knowledge domains for educators: Pedagogy (PK), content (CK), and technology (TK). The framework (see figure 12) displays intersections among these three domains to describe new types of knowledge required of educators: Technological

pedagogical knowledge (TPK), technological content knowledge (TCK), pedagogical content knowledge (PCK), and Technological pedagogical content knowledge (TPACK) (Koehler & Mishra, 2013).

Figure 12

TPACK



Note. This figure illustrates the TPACK framework, which combines technology, pedagogy, and content knowledge. From *TPACK*, by TPACK, 2012, http://tpack.org. Copyright © 2012 by TPACK.

TPACK has prospered in university-based teacher education and research. K-12 schools and districts have also used TPACK in their professional development efforts (Harris & Hofer, 2017).

Teachers must be ready to tap students into 21st-century learning but teaching with technology adds a new layer of knowledge and expertise. The model supports teachers in considering how their knowledge domains intersect to effectively teach and engage students with technology. It is an approach that examines the combination of what teachers know, how they teach, and technology's role in improving student learning. The three first domains are content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK). CK

represents the "what": the teachers' understanding and expertise of their subject area (Barrett et al., 2020). CK refers to any discipline's facts, concepts, and theories. PK represents the "how"; it includes teaching and assessment methods like project-based learning and instructional strategies to understand how students learn, lesson planning, general classroom management skills, and student assessment (Koehler & Mishra, 2013). PCK is the intersection of the pedagogical and content areas; the knowledge teachers have of effectively engaging students in learning concepts and skills. It includes approaches for addressing different learning styles and scaffolding content for a deeper understanding. TK represents the knowledge about the tools, including how to select, use, and integrate technology into the curriculum. It does not refer only to devices but also to the quality of content that students access through digital learning tools such as apps, websites, and games for learning. TCK refers to using technology in a subject area for deep and lasting learning. For example, scientists can use sophisticated tools to collect evidence, make observations, and document findings to understand a topic better. Using interactive software, they can see data represented in various ways. TPK is the understanding of how to choose and manage technology for the students, for instance, what technology will best ease students' workflow throughout their exploration of a topic and how teachers can use collaboration tools to have students share their learning with others (Barrett et al., 2020). It refers to understanding how learning and teaching can change when teachers use specific technologies in particular ways (Koehler & Mishra, 2013).

TPACK refers to understanding how tools can enhance teaching and support student learning more deeply and effectively. For example, when learning about water pollution, students could explore 3D models of bacteria's cellular structure and then create animated images to analyze local water sources; they could then share their findings virtually with a prominent

field expert. This dynamic interplay of all three components is TPACK, the heart of innovative teaching; teachers can use the TPACK framework to assess their knowledge of content, pedagogy, and technology. Teachers should consider which areas they feel confident about and which areas they can improve. They should also consider how they can collaborate with others at school or in professional learning communities to combine their strengths. The dotted line around the frameworks symbolizes the context that affects how a TPACK is applied practically. TPACK considers every classroom context unique due to variations in professional development, school climate, and available resources. TPACK reminds teachers to start with content and pedagogy and then layer technology (Barrett et al., 2020). Effective technology integration for pedagogy around specific topics requires developing sensitivity to the transactional, dynamic relationship between the components of knowledge situated in unique contexts. Demographics, culture, school-specific factors, individual teachers, grade level, and other aspects ensure that every case is unique; no single combination of content, technology, and pedagogy will apply to every teacher, every view of teaching, or every course (Koehler, 2012).

Sometimes, teachers get excited about new technology and design a lesson around that particular tool, but in doing so, they lose sight of goals and objectives for student learning. TPACK reminds educators that technology is just part of excellent teaching; it is an intricate combination of content pedagogy and technology that makes teaching and learning innovative. The TPACK Framework helps evaluate digital learning tools that provide content information to students, such as virtual tours and games, digital tutorials and animations, wikis, interactive simulations, blogs, videos, and podcasts. When evaluating these types of tools, teachers need to examine how the tool presents the information to teach to students (pedagogical characteristics), what information the tool describes (content knowledge), and how and why they influence

pedagogy and content knowledge (technology). In the evaluation process of digital learning tools, the intersection of technology, pedagogy, and content helps uncover the tools' purpose and impact on teaching and learning and decide which tools are the most appropriate, supportive, and effective for learners (Barrett et al., 2020).

An approach that considers teaching as an interaction between what teachers know and how they apply what they know in their classrooms' unique circumstances or contexts is needed to integrate technology into teaching. There is no "one best way" to integrate technology into the curriculum: integration efforts should be creatively designed for particular subject matter ideas in specific classroom contexts. Considering that teaching with technology is a complex, ill-structured task, the framework proposes that understanding approaches to successful technology integration requires teachers to develop new ways of comprehending and accommodating this complexity. At the core of good teaching with technology are three core components: content, pedagogy, technology, and the relationships among and between them (Koehler & Mishra, 2013).

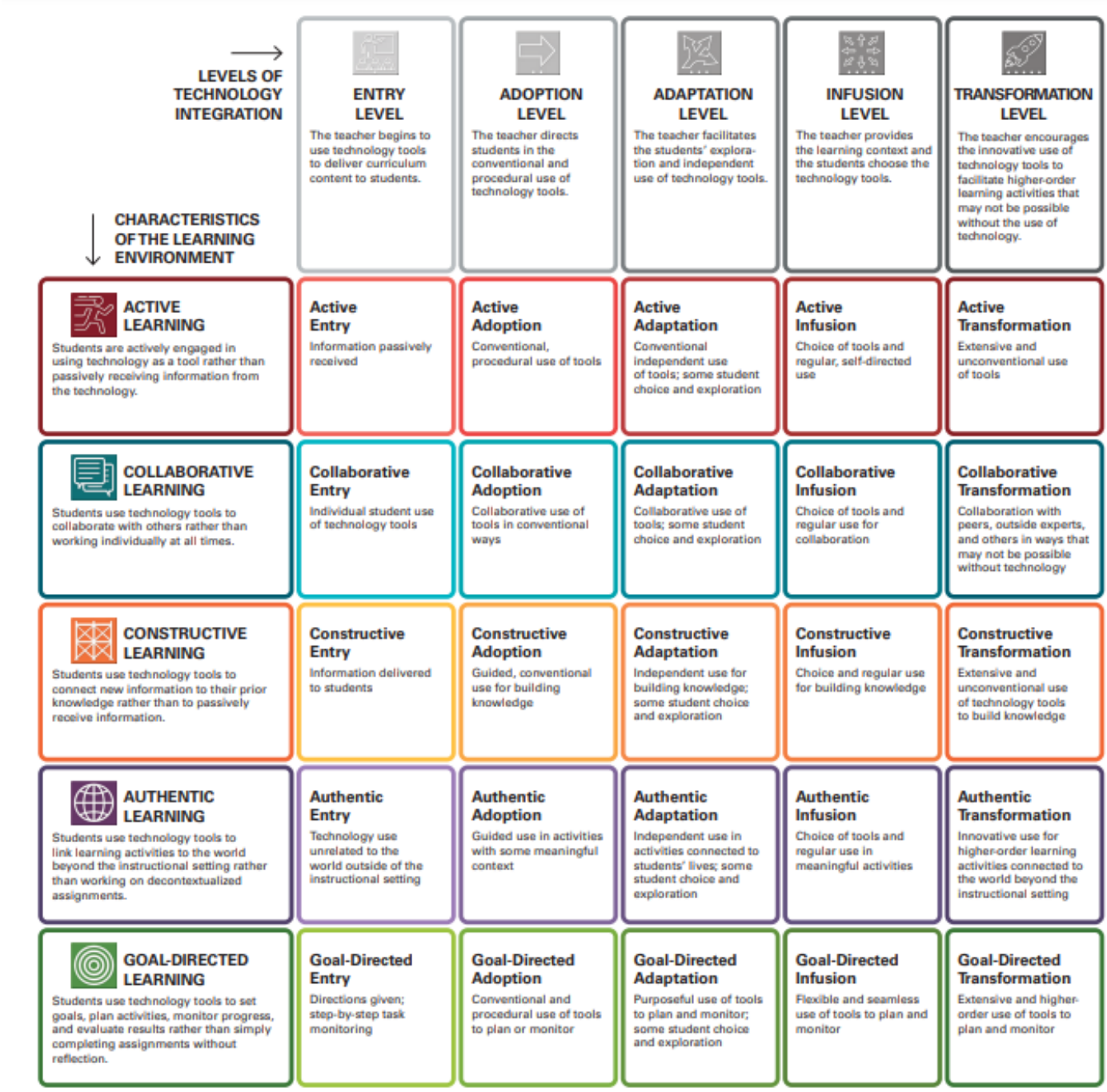
The Technology Integration Matrix (TIM)

The various technology integration models provide a lens through which we can examine the effectiveness and application of technology in the learning process and, subsequently, its effect on outcomes and learning experiences. These theoretical constructs empower educators to promote critical inquiry and support an understanding of technology integration possibilities. Models such as the technology integration matrix can guide curriculum design and delivery, aiming to enhance the learning experience, provide inclusive education, and promote durable skills and competencies required for 21st-century graduates (Kimmons & Hall, 2016).

The technology integration matrix, or TIM, describes and targets through a framework the use of technology to improve learning. Developed by the Florida Center for Instructional Technology (FCIT) in 2005, the TIM is in its third edition (Florida Center for Instructional Technology, 2019). The TIM model incorporates five interdependent characteristics of effective, meaningful learning environments, which in turn are associated with five levels of technology integration: active, constructive, goal-directed, authentic, and collaborative, and associates each characteristic with five levels of technology integration; entry, adoption, adaptation, infusion, and transformation. This creates the twenty-five cells matrix (see figure 13), the foundation for organizing technology planning and integration. The matrix model is interactive, with each cell linking to four classroom videos to provide examples to educators of the context of applications. All TIM descriptors apply well both to online and face-to-face instruction. As you move across any row from left to right, the level of integration increases as more active and collaborative learning practices are embedded. As well as the shift of responsibility for learning, there is a transition from procedural understanding to conceptual understanding of technology and a progression to innovative use of digital tools (Florida Center for Instructional Technology, 2019).

Figure 13

Technology Integration Matrix



Note. This figure presents the Technology Integration Matrix, which outlines levels of technology integration in education. Adapted from *The Technology Integration Matrix*, by Florida Center for Instructional Technology, University of South Florida, 2005-2019, http://mytechmatrix.org. Copyright © 2005-2019 by University of South Florida.

The goal of the matrix was to give a common language to technology integration in schools while focusing on instructional strategies and pedagogy rather than the technology tools themselves. The FCIT did a literature review of thousands of research studies while seeking that common language. They found that the same five characteristics appeared in research over and over that effectively increased student learning. They are active, collaborative, constructive, authentic, and goal-directed learning. TIM focuses on teaching and learning practices, not the technology itself. In the TIM model, the goal is to use technology as a tool to increase these five characteristics. Technology integration is split into five levels for each characteristic. Moving to the right of the matrix, there is an increase in student-centered learning, and students will move from a procedural, conventional understanding of the content to conceptual learning and higher-order thinking. When looking at the characteristics, there is no hierarchy between the rows. Those lenses often overlap, but one is not necessarily better. Moving these characteristics to higher levels will result in more meaningful student learning. The five characteristics of a meaningful learning environment listed above are associated with five levels of technology integration: Entry, adoption, adaptation, infusion, and transformation. As the level of technology integration increases, the emphasis goes from teachers showing students when and how to use technology to students taking ownership of their learning. Students begin focusing on the content and innovative uses of technology. When the five characteristics of meaningful learning environments are evaluated using the five levels of technology integration, the technology integration matrix (TIM) framework is created. Educators can use this matrix to evaluate and reflect upon their lessons, as well as a planning tool to improve student engagement and achievement (Feldmann, 2021). The technology integration matrix was not designed simply to

promote the use of technology but rather to encourage the use of whatever technology is available to promote effective, researched-based pedagogy (Winkleman, n.d., para. 1).

Professional Development

Professional development is a process that professionals undertake to acquire and improve the knowledge and skills essential to advance in their jobs and careers (Indeed Editorial Team, 2023). The integration of information and communications technology, or ICT, has become increasingly dominant in K-12 education, and how educators are prepared to purposely adapt their teaching approaches to incorporate ICT has become the topic of research and discussions (Albion et al., 2015; Dall'Alba & Sandberg, 2006; Fishman et al., 2014; Hill et al., 2013; Moon et al., 2014). One unquestionable point is the need for an increase in high-quality professional development (PD) to meet ICT's rapid expansion and evolution to enhance learning experiences and outcomes (Albion et al., 2015; Borko, 2004).

It is important to train successful teachers and promote growth while providing them with technologically rich learning environments to be modeled with students in the classroom. Teachers' attitudes, perceptions, and views change in the classroom when they play a key role in facilitating the academic development of their students, especially when providing ways to make content more meaningful. When teachers are not provided with the right type of coaching strategies for new development and high-quality knowledge, teachers tend to have little or no positive attitude toward the profession (Dursun, 2019).

Personalized Professional Learning (PPL)

Personalized learning is the individualization of learning through the use and knowledge of contemporary digital tools and collaborative approaches among peers, students, and teachers who use the unique opportunities of the digital environment (Grant & Basye, 2014).

"Professional learning is an ongoing process: learn with and from others" (U.S. Department of education, 2021, p. 28). Learning to teach with digital technologies changes the classroom system and requires time and support from school and district leaders. Requesting and investing in professional self-development is essential to empower teachers and benefit students. Sharing ideas with colleagues, capitalizing on available tools, and co-creating resources can lessen the burden of transitioning to digital learning. Collaborating with peers provides information and resources that support inquiry and reflection (U.S. Department of Education, 2021). Personalized professional learning is the relevant, ongoing, and job-embedded professional learning designed and led by teachers with support from other experts (U.S. Department of Education, 2017).

Spires et al. (2012) specifically studied the need to adapt teachers' professional development to accommodate the pedagogical changes accompanying one-to-one technology implementations. Teachers' professional learning and preparation programs should reflect the shift from instructor-centered to student-centered learning environments (Attwell, 2007). Caution is necessary when training teachers to use technology: recommended addressing individual differences and supplementing individual strengths approach should be preferred against the 'one size fits all' approach (Brand, 1998). No two people will engage in the same learning process at the same time, and as such, professional learning needs to be highly adaptive to the needs of the individual.

The core of PPL allows teachers to identify their own learning goals and develop technological skills within the context of their content area and classroom. By building upon the framework of personalized professional learning, educational technology coaches can accommodate the vast diversity of technology experience in the teaching staff (Hall, 2019). Allowing for the development of personalized learning plans has been demonstrated to improve

teacher self-efficacy toward technology use (Mouza & Barrett-Greenly, 2015). Teachers felt the learning was dictated rather than led by them when they had limited voice or choice in developing learning plans, which impacted their effectiveness in implementing them (Janssen et al., 2013).

Professional development experiences that are 'one-shot,' 'sit-and-get' experiences do not improve participants' teaching and learning experiences. PPL allows teachers to choose how they invest their professional learning time. By creating learner-centered models of PL, teachers can focus on how their learning can be utilized to improve and support student learning experiences (Spires et al., 2012).

Teacher Educator Technology Competencies (TETCs)

Researchers in teacher education continue to state that teacher candidates are ill-prepared to teach with technology when they enter classrooms (Ertmer et al., 2012; Sang et al., 2010; Tondeur et al., 2013). The U.S. National Educational Technology Plan recommend having a common set of technology competencies for who prepare teacher candidates to teach with technology (U.S. Department of Education, 2017).

The teacher educator technology competencies (TETCs) define the competencies (skills, knowledge, and attitudes) all teacher educators need, to support teacher candidates to become technology-using teachers. The teacher educator technology competencies shed light on the responsibilities and roles of teacher educators who address technology within their courses. The U.S. Department of Education, Educational Technology Office, recommend teachers to have the following TETCs:

- Teacher educators will design instruction that utilizes content-specific technologies to enhance teaching and learning.

- Teacher educators will incorporate pedagogical approaches that prepare teacher candidates to effectively use technology.
- Teacher educators will support the development of the knowledge, skills, and attitudes of teacher candidates as related to teaching with technology in their content area.
- Teacher educators will use online tools to enhance teaching and learning.
- Teacher educators will use technology to differentiate instruction to meet diverse learning needs.
- Teacher educators will use appropriate technology tools for assessment.
- Teacher educators will use effective strategies for teaching online and/or blended/hybrid learning environments.
- Teacher educators will use technology to connect globally with a variety of regions and cultures.
- Teacher educators will address the legal, ethical, and socially responsible use of technology in education.
- Teacher educators will engage in ongoing professional development and networking activities to improve the integration of technology in teaching.
- Teacher educators will engage in leadership and advocacy for using technology.
- Teacher educators will apply basic troubleshooting skills to resolve technology issues. (SITE Society for Information Technology and Teacher Education, n.d., para. 3)

Communities of Practice (COP)

Communities of practice consist of people with similar interests who regularly work together to improve their chosen focus area (Farnsworth et al., 2016; Wenger, 2011). The domain, the community, and the practice are the model's three components. The domain is a specialty that ties a group together in a way that is exclusive to them, for example, content area or experience (Wenger, 2011). The community creates an environment for regular interactions or activities that allow the members to learn from each other. The practice is the work the members engage in as they offer solutions, test, and share results of their experiences implementing the solutions (Farnsworth et al., 2016).

Oliver and Townsend (2013) reported that many professional development plans are available to prepare teachers for the complex technology integration process. However, educators require a comprehensive and consistent approach to reform learning venues. Face-to-face and computer-generated training can be a framework to form smaller communities of practice where educators can work together in coursework on integration training. Professional development in the form of CoPs should result in renewed skills and vet information for proficient application of those abilities in the classroom (Davis &Callihan, 2012).

Teachers who prefer active learning participate in various training formats, adjust methods to accommodate varied learning styles, and address factors to acquire the skills needed to facilitate comprehensive technology integration for classroom application (Kablan & Kaya, 2014; Oliver & Townsend, 2013). Communities of practice have the potential to promote teacher competence in ICT integration. Unlike the traditional workshops and seminars, teachers in the community of practice learn about technology integration in teaching processes, pedagogy and instructional design, and curriculum (re)design. Professional development programs that

consider communities of practice and are characterized by school-based training blended with workshops or seminars and allow virtual or physical collaboration among teachers have the potential to contribute to teacher learning on ICT integration in education (Kassimu et al., 2014).

Instructional Technology Coach

The pandemic has challenged schools and districts worldwide to keep students engaged in learning while staying at home and using technology in new ways. In response, many schools and districts have turned to their instructional technology coaches for support. They supported administrators in designing useful learning continuity plans, teachers in minimizing teaching disruption, helped teachers use appropriate technology tools and strategies to teach asynchronous online lessons, and families in fostering a home environment that supports remote learning (Bakhshaei et al., 2020).

Students need technology that will allow them to meet their existing learning goals. They do not need new learning goals that rely on a new technology tool the coaches or teachers want to use. What teachers need most from coaches is not adding more tools but meeting all students' needs. Instructional coaches should engage in learning about technology and the content areas of the teachers they support, work side-by-side with teachers in classrooms, use technology for teaching to meet learning goals, take a leadership role in the school around using technology, and focus on the digital citizenship of the students and teachers (Sheehy & Ceballos, 2018). Coaching for technology integration should be based on the understanding that technology serves specific contents and sustains developing effective teaching practices and higher-order skills (Ehsanipour & Zaccarelli, 2017). Instructional coaches should engage in learning about technology and the content areas of the teachers they support, work side-by-side with teachers in classrooms, use technology for teaching to meet learning goals, take a leadership role in the

school around using technology, and focus on the digital citizenship of the students and teachers (Sheehy & Ceballos, 2018).

Digital Promise, Google, and EdTechTeam partnered with coaches in fifty schools across the United States to provide a dynamic learning project (DLP). The project was thought to make the case that classroom-based coaching is a better way to help teachers integrate new technology tools. Classrooms have expanded access to technology, but that doesn't mean apps and devices are always being used correctly (Bakhshaei et al., 2018). Teachers frequently ask for more professional development in using the available tools. However, workshops aren't the most effective way to get teachers to integrate technology into their classrooms in ways that shift learning. Even when teachers are thrilled about something they've learned in professional development, it can be tough for them to put it into practice when confronted with the daily challenges of the classroom (Coons, 2019).

Teachers surveyed during the dynamic learning project (DLP) reported considerable progress in developing their technology skills, selection, and use of technology to teach specific content and improve teaching approaches. The study finding shows that staff, teachers, principals, and coaches believe instructional technology coaching provides an engaging, impactful professional development experience to help close the digital use divide and ultimately increase student achievement. Also, data shows teachers use technology more frequently and in more powerful ways after one year of working with their DLP coach. Teachers outline significant increases in using technology for both teaching pedagogy and content. Most teachers agreed that they could use technology in powerful ways in terms of creativity, student collaboration, communication, agency, and critical thinking and that students are better at selecting appropriate technology tools. The coach is the bridge to effective practices in research,

and the introduction and adoption of those practices in the classroom, and the coach can provide the needed consistent follow-up to ensure that effective strategies are implemented (Bakhshaei, et al., 2018).

Digital programs are recommended as an important component of comprehensive professional development strategies (Alaniz & Wilson, 2015). Having a digital coach who is nonjudging and nonevaluative creates an atmosphere of professional growth, such as more formalized teacher appraisal methods (Alaniz & Wilson, 2015). Digital or technology-supportive teams are organized to address problems or tasks successfully (Horn & Staker, 2014). An instructional technology team ensures that the school or district is equipped with the technology infrastructure to handle the school's growing tech needs; they also work to quickly solve critical issues that hinder technology learning in the classroom (Tucker et al., 2017). Teachers and students must receive seminars, interactive workshops, student-led presentations, group discussions, and practice replacing traditional structural professional developments (Vickers et al., 2015).

Professional Learning Networks

One of the top reasons teachers think some may choose not to use digital learning tools is insufficient training. Sometimes, schools and districts have dedicated staff to select and integrate technology. However, teachers are usually responsible for that and often struggle to find information about EdTech tools. Teachers rely primarily on recommendations from other teachers to choose technology (Gallup & New Schools Venture Fund, 2019). The number of online communities focused on digital tools rating is growing and helping teachers to select the right digital tools. A professional learning network or PLN can be defined as a system of interpersonal connections and resources that support informal learning (Trust, 2012).

In the last few years, educators have chosen PLNs, professional learning networks, to grow in their craft with peers who are more accessible online because of reduced temporal and spatial constraints (Trust et al., 2016). LinkedIn Learning, for example, is a premium educational platform LinkedIn offers. It features more than 16,000 courses in seven languages, taught by industry experts to help users advance in their chosen fields. The video courses offered on the LinkedIn Learning platform are available in specialist subjects within the business, technology, and creative fields and feature personalized recommendations based on the user's profile. Since the courses are online, users can access them on any device, mobile or desktop. LinkedIn believes that community drives learner engagement, so LinkedIn Learning has built new and innovative ways to learn together, including connecting with LinkedIn Learning instructors and other subject matter experts across the online learning platform (LinkedIn Learning, n.d.). According to U.S. News & World Report Education, in 2020, LinkedIn Learning had 27 million users, and 78 fortune 100 companies used the platform (Trent-Gurbuz, 2020).

Professional learning networks provide new spaces in which educators can learn and grow as professionals while receiving support from a diverse network of people and resources. Educators can extend their web of connections outside their face-to-face networks, seek emotional support and help, and aggregate vast quantities of professional knowledge anytime and anywhere, thanks to recent technological advancements and widespread internet access (Hur & Brush, 2009; Trust, 2012).

PLNs and their capacity to respond to educators' diverse needs and interests appear to offer possibilities for supporting the professional growth of all teachers. Focusing on technology, teachers described the EdTech tools they used and/or online communities they engaged in and using new/more technologies in the classroom as part of their PLNs (Trust et al., 2016).

> The most important thing I learned from my PLN is that there is a community of enthusiastic, amazing educators who are lifelong learners, always evolving their practice and learning from each other and from me. I wanted to be that kind of teacher, but I didn't have the best role models around me. Once I found these communities online, especially on Twitter, I started being that force in person as well. I encourage my colleagues to share with me, and I share with them. Together, we are better. (Trust et al., 2016, p. 15)

Summary

The use of technology in the classroom is increasingly spreading, yet there is still a gap between how teachers are expected to enhance their teaching with technology and how they are prepared to teach with technology (Ertmer et al., 2012). The majority of educators are ready and motivated to drive education with technology but need the right training and resources. To ensure that teachers are proficient in the latest advancements in classroom technology, educational institutions must provide opportunities for ongoing professional development with EdTech. Instructors must develop a deeper understanding of technology, and administrators should prioritize ongoing training (Promethean, 2020).

The literature provides several models that can support teachers in selecting digital tools. There are so many wonderful ways to integrate tech tools into teaching that you may find it hard to decide where to start. Be assured that there is no "right tool." Teachers begin with tools that best fit their styles, classroom contexts, level of confidence, and students' abilities. Almost any idea can be an entry point for increasing the presence of technology in the classroom. No teacher is an expert in all technologies. As individuals, we gravitate toward what interests us. Within a classroom, students may be interested in several different aspects of technology—and a teacher cannot possibly use them all in one year (Hamilton, 2018).

First, teachers need to understand how technology tools can support the instructional goals of their curriculum. Then, teachers must adapt to the changes that digital technologies bring to the classroom. Using technology effectively takes longer than lectures and worksheets, but the payoff is increased student engagement, work quality, and depth of learning (Hamilton, 2018). Educators mainly select EdTech tools that support student learning and meet state or district learning standards. Despite the enthusiasm for technology, teachers and administrators also reported that they don't have as much information as they would like about digital tools' effectiveness (Gallup-New Schools Venture Fund,2019).

The literature confirms that even if considerable progress in the development of teacher's technology skills has been made over the years, teachers still need support and training to integrate technology in the classroom. They are overwhelmed by the huge array of digital tools available in the market and need directions to follow to successfully integrate technology in the classroom. Personalized professional learning, professional learning networks, community of practice, and instructional coaches are essential means in teacher's professional development to guarantee technology integration effectively, and they can contribute to the right selection of EdTech tools.

Chapter III: Methodology

Introduction

Educators have used EdTech tools to boost students learning more than ever during the pandemic time. But few believe there is valuable information available about which resources will be effective in the classroom. They are constantly seeking support, resources, and tools for the classroom (Klein, 2019). "I am excited to learn about new technology but overwhelmed by the wide array available. It is difficult to find time to research it all, especially all the new education apps." … "There are so many digital tools out there; I am lost as to which ones are good." (Bill & Melinda Gates Foundation, 2015, pp. 21, 28). These are some of the teacher's voices surveyed by Bill & Melinda Gates Foundation, 2015.

The demands of accountability with assessment and curricular standards limit many teachers from finding the necessary time to understand and research the latest technological tools (Alaniz & Wilson, 2015). Insufficient training and cost are among the top reasons teachers think some may choose not to use digital learning tools (Gallup-New Schools Venture Fund, 2019). Many teachers face a dual challenge working with digital tools in their classrooms. They do not choose most of the products they use, yet they are still often responsible for finding ways to incorporate them into their teaching. When they do select their digital tools, most follow the recommendations of other teachers and school leaders. Far fewer rely on education-specific online resources. When teachers look for digital tools on their own, cost-effectiveness and ease of integration were cited as the most critical factors in their decisions. They also seek tools that allow them and their students to continually tailor tasks and instruction based on each student's skills and progress (Bill & Melinda Gates Foundation, 2015).

Schools and districts occasionally have dedicated staff to select and integrate technology, but most of the time teachers have all responsibility for that, and they often struggle to find information about digital tools (Gallup-New Schools Venture Fund, 2019). Insufficient training and support about digital tools, lack of knowledge on digital learning tool effectiveness, and lack of knowledge on criteria to use in digital learning tools selecting process are problems that this study addresses. The researcher used a quantitative research design and action research with a survey to investigate the digital tools selection criteria, persons in charge of the selection, level of support and training that teachers receive, and level of knowledge about tools effectiveness. The research methods was used to conduct this study will be discussed in detail in this section. Specifically, this section will include details about the research design, setting and sample of thestudy, instruments and measures, data collection and analysis processes, limitations, delimitations, and ethical considerations.

Research Questions

The overall focus of this project study was to examine how EdTech tools are selected, who oversees this selection, and understand if teachers receive enough support in the selection process and are able to judge digital tools' effectiveness. Four research questions helped me guide this study toward that focus:

1. What criteria are used by K-12 teachers to select EdTech tools?
2. To what extent are K-12 teachers receiving support and training in selecting EdTech tools?
3. What are the perceptions and attitudes of the teachers towards EdTech tools?
4. What determines an effective EdTech tool?

The independent variables for Research Questions 1–4 (descriptive) are reported EdTech tools

selection criteria, level of support and training, level of knowledge about tools effectiveness and perceptions and attitudes of the teachers towards EdTech tools, criteria to determine EdTech tool effectiveness.

Research Design

In order to investigate the digital tools selection criteria, persons in charge of the selection, level of support and training that teachers receive, and level of knowledge about tools effectiveness, the researcher used a quantitative survey research approach and action research with surveys to electronically collect data from teachers at the research site. A quantitative survey research design is typically used when a researcher wants to explain a trend or a phenomenon and may be beneficial when a researcher's goal is to "measure a community's need of educational services as related to program and courses (Creswell & Creswell, 2018). Because this study aims to explain the conditions associated with digital tools integration in Florida, a quantitative study design is appropriate. Descriptive statistics were used to answer the research questions. Action research is a process that improves education, in general, by incorporating change (Mertler, 2017). Because the purpose of the study was to evaluate the need for a product aimed to help teachers to select the right digital tools and have information about their effectiveness, with the final goal to improve education, action research was appropriate. A need assessment was conducted through a survey to evaluate the need for the product. A needs assessment is the process of identifying and prioritizing needs to develop strategies to address them (Altschuld & Kumar, 2010).

Context/Setting of the Study

The aim of this study was to acquire knowledge on digital tools used in K-12 Florida public schools, how they are selected, who oversees this selection, and understand if teachers

receive enough support in the selection process and judge their effectiveness. The purpose of the study was to evaluate the need for a product aimed to help teachers to select the right digital tools and have information about their effectiveness. The focus was on free digital tools available on the market. The product was designed to share tools, strategies, and insights that teachers can use, regardless of grade level or subject, to effectively incorporate digital tools in the K-12 classroom. The product included:

- Criteria to use to select digital tools.
- Best practices.
- Successful digital learning coaches' experiences.
- Examples of networks where to share opinions with other teachers.
- Information about their effectiveness from teachers' point of view.

A need assessment was conducted through a survey to evaluate the need for the product.

Description of Population and/or Sample

The setting for this study was K-12 Florida public schools. According to the Florida Department of Education (2022), the number of traditional public elementary, middle, high, and combination K-12 Schools in Florida as of February 2023 were 3718 (see figure 14). The target population for this study was K-12 teachers of Florida public schools (see figure 15).

Figure 14

Number of Traditional Public Elementary, Middle, High and Combination Schools (K-12 General Education) by District 2022-23.

Number of Public Elementary, Middle, High and Combination Schools (K-12 General Education) by District 2022-23 as of February 9, 2023

District Number	District Name	Elementary	Middle	High	Combination	Total
00	FLORIDA	1,881	570	641	626	3,718

Note. Number of Traditional Public Elementary, Middle, High and Combination Schools (K-12 General Education) by District 2022-23 as of February 9, 2023

Figure 15

Full-time Staff in Florida's Public Schools Full-Time Staff by Activity Assignment 2022-23.

Staff in Florida's Public Schools
Full-Time Staff by Activity Assignment
2022-23, Final Survey 2
State/District Level Report

Notes: Distinct by district service, school service, SSN, and primary job code. Payroll and Staff reporting formats used. All active full time staff included with primary job code/EEO line from Payroll.

Dist #	District	Officials, Administrators and Managers	Consultants, Supervisors of Instruction	Principals	Assistant Principals	Deans, Curriculum Coordinators, and	Community Education Coordinators	Classroom Teachers		Exceptional Student Education Teachers	Other Teachers	Guidance Counselors
								Elementary Teachers (PK-6)	Secondary Teachers (7-12)			
00	FLORIDA	4,052	693	3,677	5,560	618	7	70,803	68,262	28,582	7,569	6,754

Note. Full-time Staff in Florida's Public Schools Full-Time Staff by Activity Assignment 2022-2023.

To recruit participants, the researcher contacted teachers via email. Teachers' email address list and the permission to use it was asked to the Florida Department of Education FLDOE - Research and Evaluation department (see Appendix A). The email invitation was sent as a blind carbon copy so that the recipients were unaware of others invited. All email invites

included participation instructions and disclosure of the research project and guidelines. Before collecting data from participants, participants had to acknowledge informed consent (see Appendix B). A statement of anonymity and voluntary consent was provided in the invitation to participate in the study and at the start of the electronic survey. Before starting the survey, participants had to confirm their consent indicating their understanding of the informed consent. If they do not accept consent, they were automatically redirected out of the survey.

Data Collection

Data were collected through surveys with the aim to gather useful information on how digital tools are selected, who oversees this selection, how teachers judge digital tools' effectiveness, to understand if teachers receive enough support in the selection process and to understand the product need. The survey was sent by email to K-12 Florida public schools' teachers. The researcher may have issues having teachers' email addresses and authorization to use them or a long waiting time to have them. If this will happen, the alternative solution will be to focus on one school known by the author or post the survey on social media.

The researcher supposed that the majority of responses to surveys were gathered in the first few days after email invitations were sent; to generate more responses, were sent out reminder email after a week. The survey were sent as soon the researcher gained information and approval from the Florida Department of Education to use teachers' email addresses and data collected during a two weeks window. The survey did not take more than 10/15 minutes to complete all the questions. Data were collected through SurveyMonkey, a freely accessible online data collection software program.

When using SurveyMonkey, all your participants' information is securely stored in their data centers that adhere to security and technical best practices. They ensure that collected data is

transmitted over a secure HTTPS connection, and user logins are protected via TLS. Data is encrypted using industry-standard encryption algorithms and strength (SurveyMonkey, n.d.-a). Once the data collection window was closed, the data were downloaded from SurveyMonkey in an Excel spreadsheet for analysis. Descriptive statistics were used to analyze the data. However, no data were collected until after IRB approval was obtained.

Instrumentation

To investigate the digital tools selection criteria, persons in charge of the selection, level of support and training that teachers receive, and level of knowledge about tools effectiveness, the researcher used a quantitative research approach and action research with surveys to electronically collect data from teachers at the research site. A need assessment was conducted through the survey to evaluate the need for the product.

Participants were asked to answer questions of several types: closed-ended such as multiple choices, Likert scale, matrix and demographics. The questions were selected to answer the research questions and to evaluate the need of a product to help teachers to select the right digital tools and have information about their effectiveness. The survey questionnaire covered an array of questions on how EdTech tools are selected, who oversees the selection, how teachers judge Edtech tools' effectiveness, the training and support teachers receive, and teachers' perceptions and attitudes toward EdTech tools. The survey included 24 questions, took not more than 10/15 minutes to complete all the questions, and data were collected through SurveyMonkey. Before starting the survey, participants had to confirm their consent indicating their understanding of the informed consent, in question item 1. If they did not accept consent, they were automatically redirected out of the survey. Questions items 2–9 aimed to understand how EdTech tools are selected and who oversees the selection. The questions were of different

types: matrix, single-answer multiple-choice, and multi-answer multiple-choice. Questions items 10–13 purposed to understand if teachers receive support and training in selecting EdTech tools. The questions were of different types, such as Likert and multi-answer multiple choice. Questions 14, 17, 18 and 19 pointed to understanding teachers' perceptions and attitudes towards EdTech tools. The questions were of different types, such as matrix and single-answer multiple choice. Questions 15 and 16 focused on understanding the criteria to determine EdTech tool effectiveness. The questions were of different types, such as multi-answer and single-answer multiple-choice. Questions 20–24 were single-answer multiple choice questions and collected demographic information.

Data Analysis

The purpose of this study, in greater detail, was to (a) acquire knowledge on EdTech tools used in K-12 public schools in the State of Florida, (b) understand how EdTech tools are selected and who oversees the selection, (c) understand if teachers receive enough training and support in the selection process, (d) to figure out how teachers judge an EdTech tool effectiveness, (e) to analyze what are teachers perception and attitudes toward EdTech tools, and (f) evaluate the need of a product aimed to help teachers to select the EdTech tools and have information about their effectiveness. Four research questions guided this study toward that focus. Descriptive statistics were used to answer research questions 1, 2, 3, and 4.

For research question 1, “What criteria are used by K-12 teachers to select EdTech tools?”, the descriptive variable was the selection criteria used to select EdTech tools. This variable wwas measured using data from question items 2–9.

For Research Question 2, “To what extent are K-12 teachers receiving support and training in selecting EdTech tools?”, the descriptive variable was the level of support and

training teachers receive in selecting EdTech tools. This variable was measured using data from question items 10–13.

For Research Question 3, “What are the perceptions and attitudes of the teachers towards EdTech tools?”, the descriptive variables were the attitudes and perceptions of the teachers towards EdTech tools. These variables were measured using data from question items 14, 17, 18 and 19.

For Research Question 4, “What determines an effective EdTech tool?”, the descriptive variables were criteria to determine EdTech tool effectiveness. These variables were measured using data from question items 15 and 16.

Ethical Considerations

All electronic instruments, raw and analyzed data, and the final research study were stored on a password-protected external hard disk in the researcher’s home for five years, after which time they will be destroyed. In addition, no data were collected prior to gaining information and approval from the Florida Department of Education to use teachers' email addresses. The researcher considered the ethical treatment of the participants, requiring the participants to complete informed consent prior to completing the electronic survey. This guaranteed the safeguarding of participants and data anonymity during and after the study. The electronic data collection process did not included the recording or tracking of any identifying information such as personal identification to maintain participants' anonymity. The benefit of this research was that teachers will be helping the researcher to understand if teachers receive enough support in selecting digital tools and if they have the instruments to judge their effectiveness. Participating in this survey had minimal risks such as possibly feeling uncomfortable if certain technical terms are discussed.

Limitations and Delimitations

Since the researcher found much literature about technology integration in the classroom, where technology referred mainly to physical devices, the study focused only on free digital learning tools available on the market. It did not include digital tools accessible with payment because there are too many options and require school investment of money. Finally, the researcher did not find many studies on the use of free digital learning tools. The only available were related to K-12, not to a specific grade or subject area.

The study could have some limitations. For example, the researcher may have issues having teachers' email addresses and authorization to use them or a long waiting time to have them. If this will happen, the alternative solution will be to focus on one school known by the author or post the survey on social media. Also, the research assumed that participants completing the survey would answer the survey questions honestly so that their unique viewpoints and opinions could be captured and that teachers understand the terminology and nature of the questions asked in the survey.

Summary

A quantitative survey action research study was implemented to investigate the digital tools selection criteria, persons in charge of the selection, level of support and training that teachers receive, and level of knowledge about tools effectiveness at the research site. The participants were obtained from Florida Department of Education FLDOE - Research and Evaluation department. No data were collected until after IRB approval was obtained.

The survey was provided electronically through e-mail and administered through the SurveyMonkey encrypted survey program to ensure confidentiality and anonymity. Data were collected during a two weeks window and then stored and analyzed via Microsoft Excel.

Utilizing the information collected from the quantitative research and after understanding the need for the product through the survey, the researcher implemented an instrument for the teachers to help them to select the right digital tools and have information about their effectiveness. This study and the product designed will be a guide for K-12 teachers willing to integrate digital tools in their classrooms.

Chapter IV: Results

Introduction

In the past few decades, the growth of education technology as an industry has rocketed, and the EdTech market is expected to continue expanding rapidly over the next several years. (GlobeNewswire, 2023). Before the pandemic, online education was already on the rise, and some teachers had begun to use various new technologies such as digital devices, flipped classrooms, and class management systems (McDiarmid & Zhao, 2023). The COVID-19 pandemic prompted a major infusion of technology into the US K-12 education system with the forced shift to remote learning (EY-Parthenon, 2022).

Given the growing usage of EdTech tools in K-12 settings (LearnPlatform, 2022) it was crucial to analyze the advantages that EdTech tools bring to teaching and learning experiences and the challenges teachers face in integrating them into the classroom. This research study and survey administered to teachers, aimed to explore the selection process of educational technology (EdTech) tools, identify the stakeholders responsible for these decisions, and assess the support and training provided to teachers. Furthermore, it examined teachers' ability to evaluate the effectiveness of these digital tools. Finally, by analyzing the educators' feedback concerning the integration of educational technology (EdTech) tools into teaching and learning environments, spanning periods preceding, during, and following the COVID-19 pandemic, the study provided a contextual understanding of the evolving landscape of EdTech integration, elucidating shifts in challenges and opportunities over time. These insights, in turn, informed the development of evidence-based policies, guidelines, and professional development initiatives tailored to bolster educators' capacity to leverage EdTech tools effectively.

Four research questions guided the study:

1. What criteria are used by K-12 teachers to select EdTech tools?
2. To what extent are K-12 teachers receiving support and training in selecting EdTech
3. tools?
4. What are the perceptions and attitudes of the teachers towards EdTech tools?
5. What determines an effective EdTech tool?

The researcher employed a quantitative approach to investigate the criteria for selecting digital tools, identify the individuals responsible for the selection, evaluate the support and training provided to teachers, and assess their knowledge of the tools' effectiveness. A quantitative survey was conducted alongside action research to collect data electronically from teachers at the research site. The researcher used descriptive statistics to answer the research questions.

Given the study's aim to evaluate the need for a product that aids teachers in selecting effective digital tools and improving education, a needs assessment was conducted via the survey to determine the necessity for such a product. Many survey questions included an "Other" option to capture all possible responses and gain insights into new trends, opinions, or needs that were not initially considered. Due to the substantial number of qualitative responses received, the researcher also employed a qualitative data analysis, theming and analyzing data through ChatGPT 4 to further compile and present the survey results. ChatGPT assisted the researcher in efficiently processing large volumes of data and quickly identifying specific patterns or themes. ChatGPT, developed by OpenAI, is an advanced language model built on the generative pre-trained transformer (GPT) architecture. It generates human-like text responses based on input it receives. Trained on a vast array of internet text, and fine-tuned for specific applications, ChatGPT can handle a variety of language-related tasks, such as answering queries, creating content, and aiding research.

Its effectiveness stems from deep learning methodologies and comprehensive training datasets, positioning it as a significant tool in natural language processing (Brown et al., 2020; OpenAI, 2023).

As a result, the researcher focused more on interpreting and reporting the results. This shift from a purely quantitative to a thematic analysis was driven by the richness and depth of the qualitative data, allowing for a more nuanced exploration of educators' experiences and preferences. This mixed approach provided detailed insights into the criteria for selecting EdTech tools, uncovering trends, preferences, and challenges that the researcher might have overlooked with quantitative methods alone.

This chapter will integrate the quantitative findings from the survey with the qualitative data, which were analyzed using themes. It will present the results, the methodologies employed to cleanse and prepare the data for analysis, and the analytical techniques used to interpret the findings. Additionally, the chapter will include statistical tables and a variety of graphical representations.

Summary of Analyses

Participants

The setting for this study was K-12 teachers employed at Florida public schools. To recruit participants, the researcher contacted teachers via email. Through a request form (see Appendix A), the researcher requested a listserv of teachers' email addresses from the Florida Department of Education (FLDOE) - Research and Evaluation department. The Department of Education promptly fulfilled this request within one day. However, the returned email addresses encompassed contact information for every certified teacher in the state, totaling 187,303 emails. Consequently, the researcher's initial task involved cleansing and categorizing this data to ensure the integrity of the study's population. The cleaning involved the exclusion from the dataset of the following categories (see table 1).

Table 1

Excluded Categories

Teachers Category
Art Specialist
Bilingual Specialist
Intermediate Resource Teacher
Job Coach, Exceptional Student Education
Music Therapist
Occupational Therapist
Orientation & Mobility Specialist
Physical Therapist
Primary Specialist
Speech and Language Pathologist
Substitute Teacher, Adult Education
Substitute Teacher, Basic Program
Substitute Teacher, Career and Technical Education
Substitute Teacher, Exceptional Student Education
Substitute Teacher, Other Instruction
Substitute Teacher, Prekindergarten
Teacher, Adult Education
Teacher, In-School Suspension, Elementary
Teacher, In-School Suspension, Middle/Junior
Teacher, In-School Suspension, Senior High
Teacher, Peer Counseling, Middle/Junior
Teacher, Peer Counseling, Senior High
Work-Study Coordinator

The researcher excluded certain categories of teachers from this study to ensure the focus remained on traditional classroom teachers who are directly involved in regular K-12 instruction. Categories such as art specialists, bilingual specialists, and various therapeutic roles were excluded because their engagement with educational technology differs significantly from that of core subject teachers. These specialists often focus on specific support services or therapeutic interventions, which were outside the scope of the study's objective to analyze the selection and effectiveness of EdTech tools in general classroom settings. Additionally, substitute teachers and those involved in adult education or in-school suspension programs were excluded due to the

inconsistency and variability of their interactions with EdTech tools, which could lead to unreliable data. By narrowing the participant pool to include only those who regularly use and evaluate EdTech tools in a standard instructional context, the study aimed to obtain more relevant and consistent insights into the criteria and effectiveness of these tools in enhancing K-12 education.

After selecting the category of teachers for the study, the researcher eliminated duplicate entries and entries lacking email addresses. Following these data cleansing procedures, the final count of valid email addresses totaled 129,645. The teachers who received the survey had several educational backgrounds and grade levels, encompassing special education, core subjects, career and technical education, fine arts and humanities, physical education, health, specialized elementary education programs, world language educators, and other specialized fields. This ensured a comprehensive understanding of the educational experiences and needs of the teaching staff.

The Department of Education provided the email addresses on March 15th. Considering the Spring break period, the researcher strategically decided to delay initiating email distribution until April to optimize data acquisition during enhanced availability and engagement.

Data Collection Method

The researcher used SurveyMonkey to distribute the survey to 129,645 potential participants. To adhere to SurveyMonkey's limitations, the email batches were organized into thirteen collectors, each capable of handling a maximum of 10,000 emails. The surveys were systematically sent out in staggered intervals over a two-week period, necessitated by SurveyMonkey's 24-hour waiting policy for surveys exceeding 10,000 recipients. A single reminder was dispatched per collector after one week to enhance response rates. All surveys were closed after two weeks to ensure uniform data collection. Table 2 summarizes the sending schedule.

Table 2

Sending Schedule

Sending ID	Sending Date	Reminder	Manual Closing	Invitation sent
1	4 April	automatic after 7 days	19 April	9995
2	5 April	automatic after 7 days	20 April	9995
3	6 April	automatic after 7 days	21 April	9995
4	7 April	automatic after 7 days	22 April	9995
5	8 April	automatic after 7 days	23 April	9995
6	9 April	automatic after 7 days	24 April	9995
7	10 April	automatic after 7 days	25 April	9995
8	11 April	automatic after 7 days	27 April	9995
9	13 April	automatic after 7 days	28 April	9995
10	14 April	automatic after 7 days	29 April	9995
11	15 April	automatic after 7 days	30 April	9995
12	16 April	automatic after 7 days	1 May	9995
13	17 April	automatic after 7 days	2 May	9705
			Total Invitation	**129645**

The researcher had to pause sending surveys for one day due to SurveyMonkey's 24-hour waiting policy, triggered when the number of recipients exceeded 10,000 with the first automatic reminder. The researcher observed that the subsequent reminders resulted in a higher response rate than the initial invitations. Additionally, the researcher sent an automated thank-you message when completing the survey through SurveyMonkey. On average, respondents spent approximately 7 minutes completing the survey.

A total of 1,914 responses were collected, with 1,862 (97.28%) providing informal consent. Out of these, 1,123 surveys were fully completed. The researcher noted that approximately 3% of emails opted out or bounced throughout the sending process. According to SurveyMonkey, opting out refers to the action taken by recipients to unsubscribe or cease receiving future communications, such as survey invitations, ensuring compliance with

communication regulations. A bounce occurs when an email or message sent through their platform is returned to the sender due to delivery failure. A "hard bounce" indicates a permanent failure, typically caused by invalid email addresses or server-related issues like blocked domains or IP addresses (SurveyMonkey, n.d.-b). At the end of the two-week window, the researcher retrieved survey data from SurveyMonkey and imported it into Microsoft Excel for analysis.

Summary of Survey Results

The researcher organized the summary of survey question results into six sections. The first section discussed demographic data. Four sections provided the results for each research question, and the final section covered the findings of the open-ended survey question.

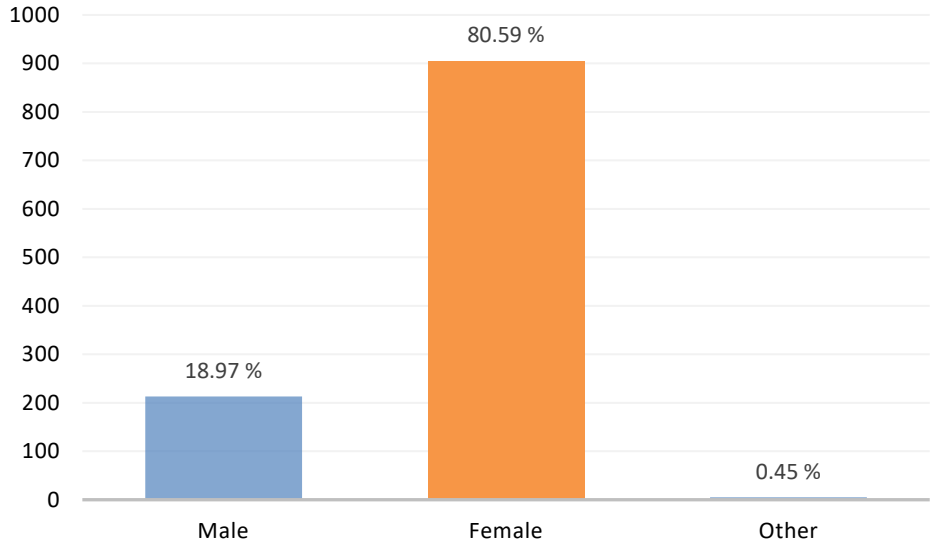
Results for Demographic Data

The researcher included demographic questions in the survey to get a general picture of the sample group. The researcher gathered demographic data on the target population through survey questions 20–24. The questions were single-answer, multiple-choice questions, and the results of these questions are below.

Question 20 of the survey asked about the participants' gender. The results are recorded in Figure 16 and show that over 80% identified themselves as female, less than 20% identified themselves as male, and less than 0.5 preferred not to specify.

Figure 16

Participants' Gender

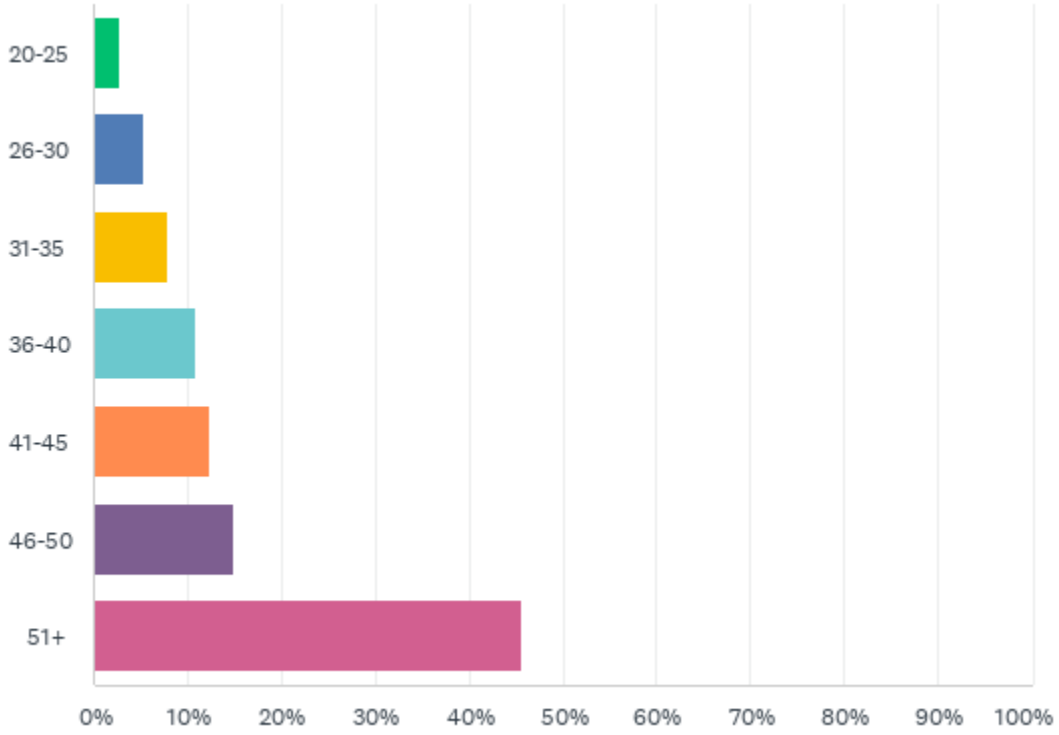


Note. Q20 Are you?

Question 21 aimed to examine the participants' age. Figure 17 below illustrates the results. The majority of respondents were in the 51+ age group, accounting for almost half of the total responses. The other age groups were more evenly distributed, with each subsequent group having a progressively smaller percentage of responses.

Figure 17

Participants' Age



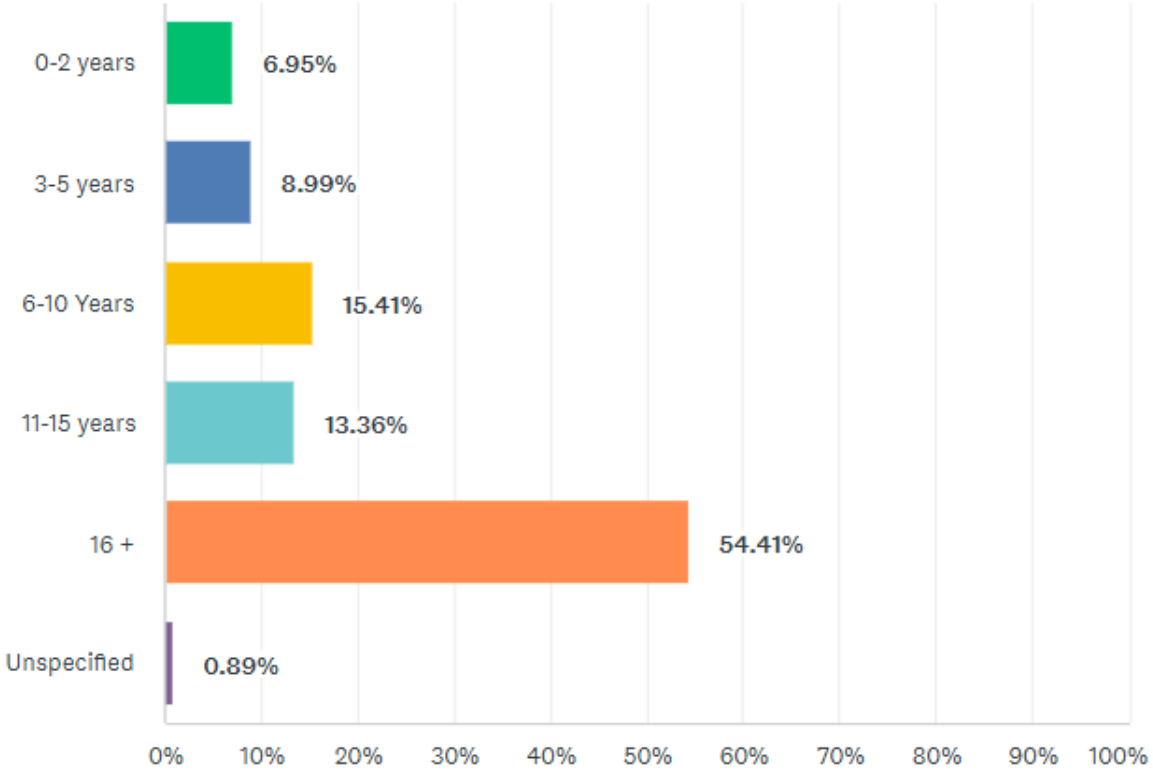
Note. How old are you?

Question 22 aimed to assess the distribution of teaching experience among respondents. The responses were categorized into six groups based on years spent teaching. The analysis of these responses reveals significant insights into the demographics of the teaching workforce; Figure 18 illustrates the results. The data indicates a strong presence of veteran teachers, with a substantial number of mid-career and early-career educators. Most respondents, 54.41% (611 out of 1,123), reported having 16 or more years of teaching experience. This substantial proportion indicates a highly experienced teaching workforce. The second largest group, comprising 15.41% (173 respondents), comprises teachers with 6–10 years of experience. Respondents with 11–15 years of experience account for 13.36% (150 respondents). Teachers with 3–5 years of

experience make up 8.99% (101 respondents and the smallest proportion of respondents, 6.95% (78 respondents), are those with 0–2 years of teaching experience. Lastly, a small fraction of respondents, 0.89% (10 respondents), did not specify their years of teaching experience. This category may include respondents uncertain about their exact tenure or those who preferred not to disclose this information.

Figure 18

Years of Experience



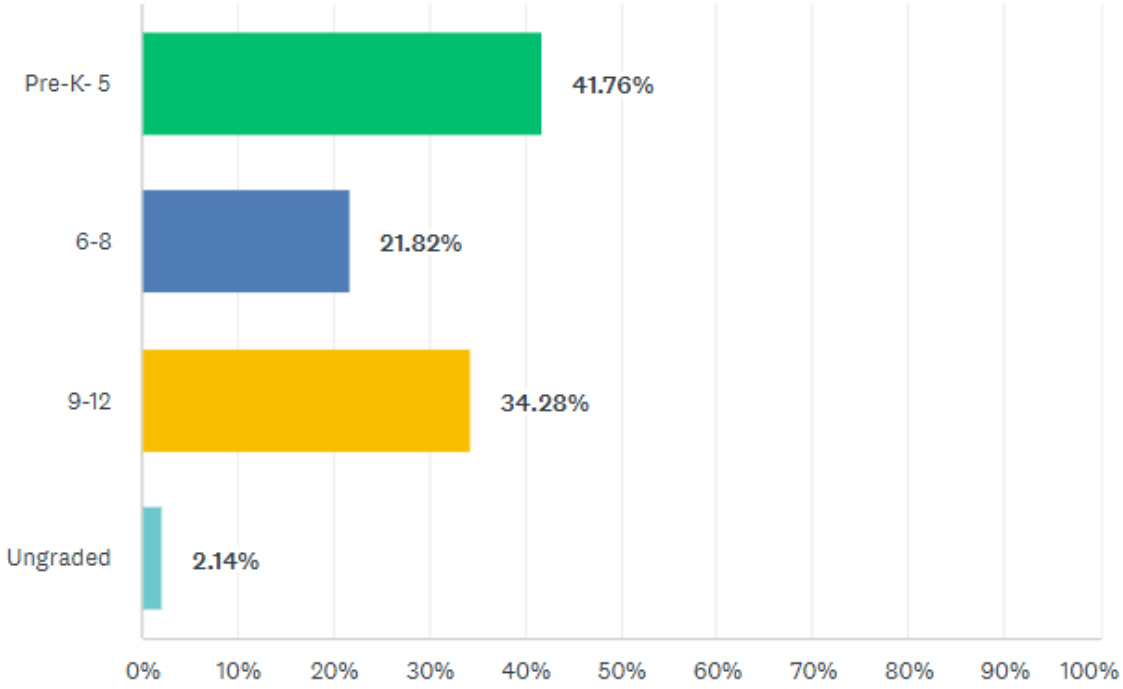
Note. How long have you been teaching?

The survey question 23 aimed to understand the distribution of teaching assignments across different grade levels. The researcher categorized responses into four groups: Pre-K-5, 6–8, 9–12, and ungraded. Analyzing these responses provides valuable insights into the focus areas

and potential challenges educators face at different educational stages. The survey responses reveal a diverse range of teaching assignments among respondents.

Figure 19

Teaching Assignments Across Different Grade Levels



Note. What grades are currently taught?

Figure 19 above shows that most respondents teach grades Pre-K through 5, making up the largest group. The next largest group teaches grades 9–12, followed by those teaching grades 6–8. A small percentage of respondents teach ungraded classes. These educators may be involved in special education, alternative education programs, or specialized instructional settings that do not adhere to traditional grade levels.

The survey question 24 aimed to understand the distribution of teaching assignments across various subjects. The responses were categorized into specific subjects, as well as a category for those teaching multiple subjects. This analysis provides insights into the focus areas

and potential challenges educators face in different academic disciplines. The largest group of respondents, representing 31.70% (356 out of 1123), indicated that they teach multiple subjects. This significant proportion likely includes elementary school teachers who cover a broad curriculum and educators in smaller schools or specialized programs requiring teachers to handle various subjects. English Language Arts (ELA) teachers constitute 24.22% (272 respondents) of the survey participants, making it the largest single-subject category. Math (12.91%) and Science (9.88%) are also frequently taught, and the minor common subjects taught are Health (0.53%), Physical Education (1.07%), and Computer (1.16%). Many respondents selected "Other" (225 responses), indicating they teach subjects not listed among the predefined options (Table 3).

Table 3

Teaching Subjects

Answer Choices	Responses	
Multiple	31.70%	356
English Language Arts (ELA)	24.22%	272
Math	12.91%	145
Science	9.88%	111
Social Studies	8.37%	94
Foreign Language	2.49%	28
Music	2.14%	24
Career	2.14%	24
Technical	1.78%	20
Art	1.60%	18
Computer	1.16%	13
Physical education	1.07%	12
Health	0.53%	6
	Answered	1123

Note. What subject are you teaching?

The researcher employed a qualitative content analysis approach to analyze the open-ended responses to the survey question. When prompted with “Based on the responses provided,

generate common themes," the ChatGPT-generated text indicated the common themes reported below (OpenAI, 2024).

- High incidence of multi-subject teaching.

  Many teachers indicated they are responsible for teaching multiple subjects, especially in elementary and special education settings.

- Core subject focus.

  Many respondents reported teaching more than core subjects, such as English Language Arts (ELA), Math, Science, and Social Studies.

- Special education (ESE) emphasis.

  A notable portion of teachers are engaged in Exceptional Student Education (ESE), addressing various subjects and specialized educational needs.

- STEM and technology integration.

  STEM (Science, Technology, Engineering, Mathematics) and technology-related subjects were among the responses.

- Specialized instruction.

  Subjects such as Health, Physical Education, Music, Art, and Foreign Languages, though less frequently mentioned, were also identified, even if they were between the options listed.

- Grade-specific teaching.

  Several respondents indicated they teach all subjects at specific grade levels, particularly early childhood and elementary education.

- Reading and literacy focus.

The responses frequently highlighted intensive reading and remedial reading programs, focusing on literacy improvement.

In analyzing the survey results, several key demographic and professional insights emerged regarding the respondents, who predominantly identify as female educators. The majority of respondents were in the 51+ age group, indicating a significant presence of experienced educators. Regarding teaching experience, a substantial proportion reported over 16 years in the profession, with notable contingents also in the mid-career and early-career stages.

The distribution of teaching assignments showed a majority focusing on Pre-K through 5th grades, followed by educators teaching in high school grades. The subject distribution highlights a considerable number of educators teaching multiple subjects, particularly prevalent in elementary and specialized educational settings. English Language Arts (ELA) emerged as the largest single-subject category, followed by Math and Science. The qualitative analysis of open-ended responses underscored prevalent themes such as multi-subject teaching responsibilities, emphasis on core subjects like ELA and Math, significant involvement in Special Education (ESE), integration of STEM and technology, and specialized instructional approaches catering to diverse student needs.

Results for Research Question 1

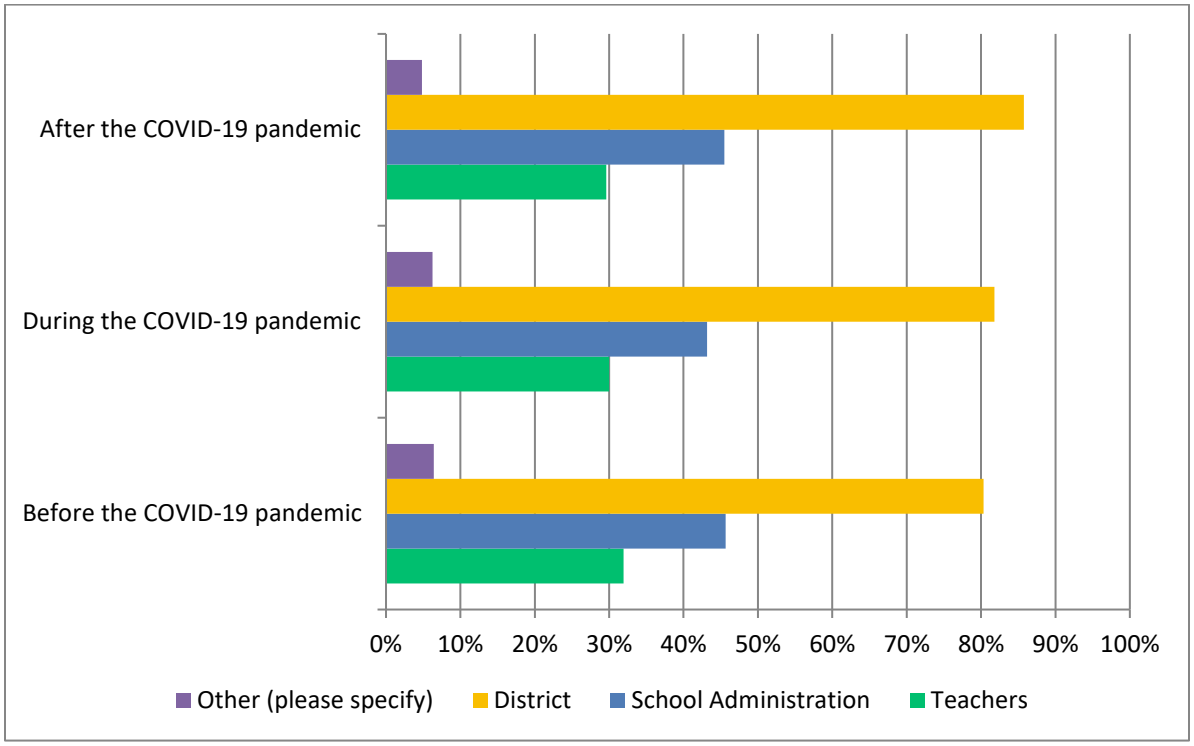
For Research Question 1, "What criteria are used by K-12 teachers to select EdTech tools?", the descriptive variable was the criteria used to select EdTech tools. This variable was measured using data from question items 2–9.

The aim of survey question 2 was to investigate the decision-making authority in selecting Educational Technology (EdTech) tools within educational settings across different phases: before, during, and after the COVID-19 pandemic. Specifically, the survey sought to

identify which entities, such as teachers, school administration, district-level authorities, and others, oversee the selection process of EdTech tools. This inquiry aimed to provide insights into how responsibilities for integrating technology in education are distributed among stakeholders during various educational contexts. Figure 20 below illustrates the results.

Figure 20

Persons in Charge of Edtech Selection



Note. Q2 Who oversees the selection of EdTech tools in the school? Choose all the options that apply.

Before the COVID-19 pandemic, survey data indicated distinct roles in selecting Educational Technology (EdTech) tools within educational settings. Approximately 32% of respondents identified teachers as actively involved in the decision-making process regarding EdTech tools. School administration assumed oversight responsibilities in 46% of cases, indicating a substantial administrative role in technology integration. Notably, approximately 80% of respondents attributed the primary oversight of EdTech tool selection to district-level

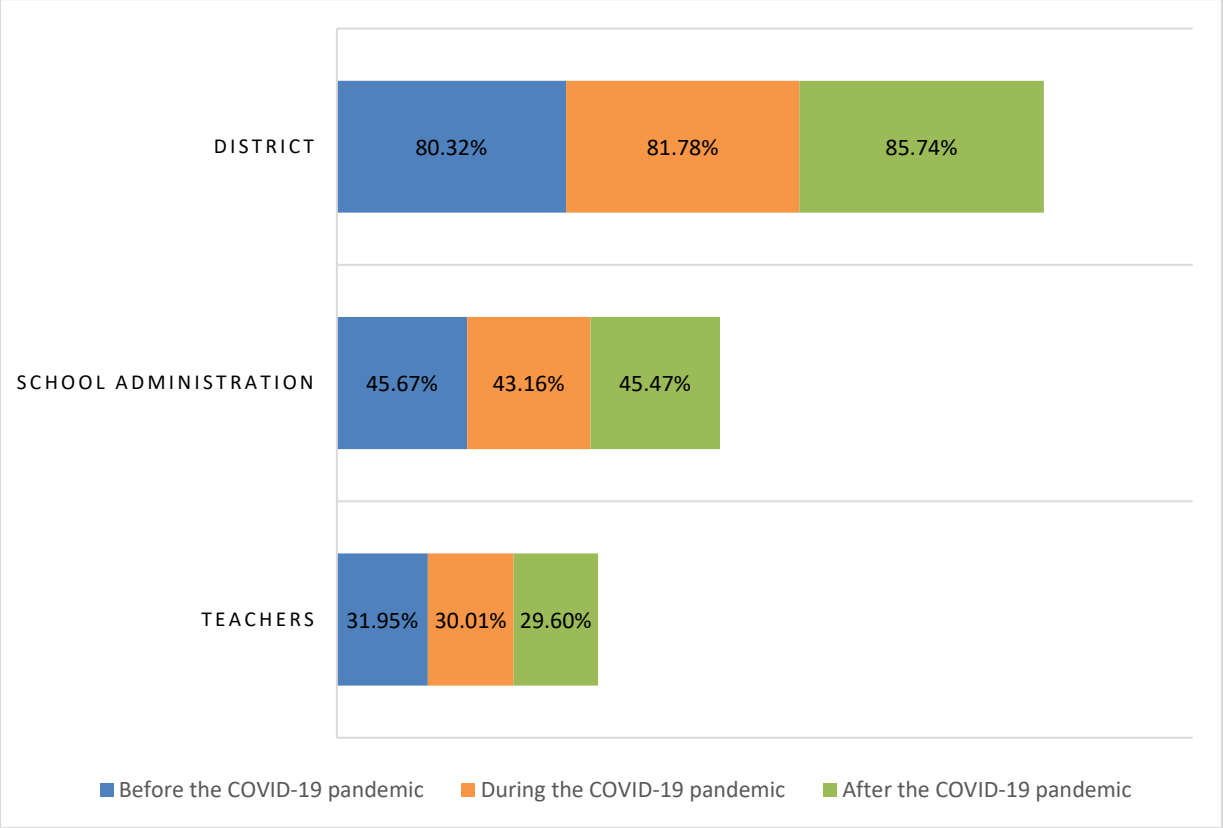
authorities, underscoring centralized decision-making within educational districts. Furthermore, 6.41% of responses delineated alternative entities beyond the specified categories, reflecting varied structures in decision-making across educational contexts.

During the COVID-19 pandemic, there was a discernible shift in the roles concerning selecting Educational Technology (EdTech) tools within educational settings. The participation of teachers in this decision-making process saw a marginal decrease, reducing to 30% of respondents. Oversight by school administration similarly declined, with 43% of respondents attributing responsibility to this level of authority. In contrast, district-level oversight maintained a prominent position, with approximately 82% of respondents indicating district involvement in selecting EdTech tools. Additionally, 6.26% of responses cited alternative entities beyond the primary categories, suggesting diversified roles in decision-making amidst the pandemic's educational landscape.

After the COVID-19 pandemic, there were notable shifts in the distribution of responsibilities for selecting educational technology (EdTech) tools within educational environments. The involvement of teachers in this process continued to decrease slightly, settling at 29.6% of respondents. School administration maintained a steady oversight role, with 45.47% of respondents indicating involvement. Conversely, district-level oversight significantly increased post-pandemic, with approximately 86% of respondents attributing primary responsibility for EdTech tool selection to district authorities. Furthermore, 4.84% of responses highlighted the involvement of entities not captured within the main categories, underscoring diverse and evolving structures in decision-making concerning educational technology integration in the aftermath of the pandemic. Figure 21 below shows the percentage for each phase stacked by category.

Figure 21

Percentage for Each Phase Stacked by Category



Note. Percentage for each phase, before the COVID-19 pandemic, during COVID-19 pandemic, after COVID-19 pandemic stacked by category.

A notable portion of respondents opted for 'Other' (107 responses), offering additional insights into diverse entities in selecting EdTech tools, indicating specialized roles beyond the primary categories. The researcher employed a qualitative content analysis approach to analyze the open-ended responses from the survey. This method systematically examined textual data to discern recurring themes and patterns. When prompted with “Based on the responses provided, generate key themes with examples,” the ChatGPT-generated text indicated the key themes reported below (OpenAI, 2024).

- Uncertainty/lack of knowledge.
    - "I have no idea."

    - "I am unsure."
    - "I don't know."
    - "Unknown."
- New to teaching or new to school
    - "This is my first year in this school."
    - "This is my first year in the country teaching."
    - "I did not teach before or during the pandemic."
    - "I wasn't teaching before or during COVID-19."
- Technology department/personnel
    - "Technology Department."
    - "Tech Specialist."
    - "Tech Facilitator."
    - "School Librarian."
- Collaborative or joint effort
    - "Collaborative effort."
    - "Teachers/schools can make requests."
    - "It's a joint effort."
    - "Tech approval boards with parents, teachers, admin."
    - "District technology committee."
- District or state control
    - "District provides certain resources."
    - "State and District have ALL the say-so."
    - "District purchases licenses and vets security protocols."

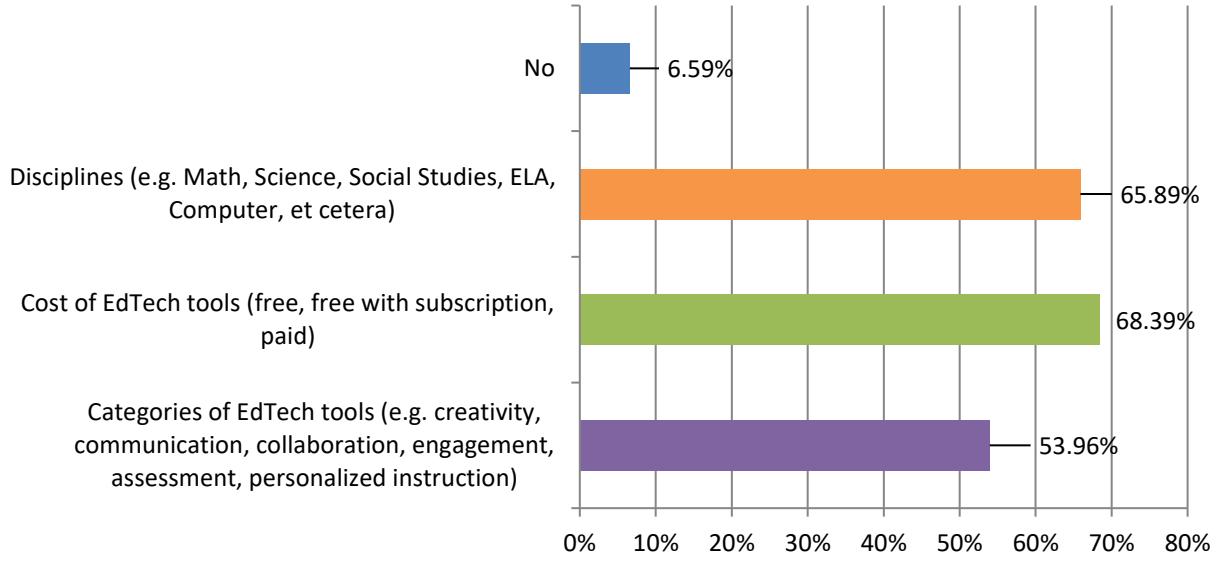
    - "A new law in Florida means the district has to approve the technology selected."
    - "State DOE in Florida with recent new laws."
    - "Federal and State Governments intervened during pandemic."
- Individual or school-based decisions
    - "We have a technician that works between two schools."
    - “Teachers may use apps and programs that the district has not acquired."
    - "Some programs in the school are district based, some are school purchased products."
    - "Teacher chosen EdTech tools are either free or paid for by teachers."

These findings underscored the persistent and central budget and approval constraints district-level authorities in overseeing the selection of EdTech tools across different phases of the pandemic and educational contexts. While teachers and school administration are actively involved, especially before and during the pandemic, district-level control strengthened post-pandemic, potentially reflecting broader strategic planning and policy implementation in integrating educational technology. These results are crucial for understanding the distribution of decision-making authority in educational technology adoption, informing policies to enhance technology integration, and supporting educators in effectively utilizing EdTech tools in teaching and learning environments.

Survey question 3 yielded responses highlighting several key factors affecting the choice of EdTech tools in schools. Figure 22 shows the results.

Figure 22

Factor Influencing the Selection of Edtech Tools



Note. Q3 How is the selection of EdTech tools in your school influenced? Please select all that apply.

The most significant factor influencing the selection of EdTech tools was their cost, with 68.39% of respondents (768 responses) indicating that the financial aspect plays a critical role. This included whether the tools are free, free with a subscription, or require payment. The second most influential factor was the specific academic disciplines the tools are designed to support. With 65.89% of respondents (740 responses) considering this factor, it was clear that schools prioritize tools that are relevant and effective in enhancing subject-specific learning. The categories of EdTech tools, such as those supporting creativity, communication, collaboration, engagement, assessment, and personalized instruction, were essential for 53.96% of respondents (606 responses). This indicated a significant interest in tools that offer diverse functionalities and cater to various educational needs and teaching strategies. A small percentage of respondents, 6.59% (74 responses), indicated that their selection of EdTech tools is not influenced by any specific factors listed in the survey. This might suggest a level of autonomy or a lack of

structured criteria in the selection process in some schools. Additionally, 105 respondents selected the "Other" category, suggesting that additional factors influence the selection of EdTech tools. When prompted with “Based on the responses provided, generate common themes with example.” the ChatGPT-generated text indicated the common themes reported below (OpenAI, 2024).

- Lack of teacher involvement and knowledge.

  Many respondents expressed uncertainty about the selection process for EdTech tools, indicating a lack of teacher involvement or awareness.

  Examples: "I am not sure or aware of this decision," "People above me pick," "Since teachers are not involved in the selection in our school, I am not completely sure what the criteria is."

- District and state control.

  The selection of EdTech tools is often controlled by district or state authorities, with little input from teachers.

  Examples: "Ed tools are chosen and provided by district staff according to state laws," "District selects and buys without recent experience in the classroom and without input of teachers," "State/District Overview Requirement for 'vetting.'"

- Security and privacy concerns.

  Security and privacy are significant factors in the selection process, ensuring the safety of student data.

  Examples: "Privacy rules for students' accounts," "Internet safety (students' privacy)," "Student data privacy agreement."

- Cost and funding.

EdTech tools' cost and funding availability significantly influence their selection.

Examples: "ESSER funds had to be spent on expensive products for non-recurring expenses," "lowest bidder on a district-wide subscription or purchase," "Grant Application and funding."

- Alignment with standards and policies.

  Tools must align with state standards and comply with district or state policies.

  Examples: "Compliance with Florida state policy regarding instructional materials," "Has to meet Governor's rules and be approved by committee," "fits the state standards."

- Needs of special education and assistive technologies.

  The needs of special education students and the incorporation of assistive technologies are important considerations.

  Examples: "Special education, ESOL student needs," "Students' needs, EdTech incorporated into assistive technologies for addressing special needs."

- Administrative decisions and vendor relationships.

Administrative preferences and relationships with vendors can influence the selection of tools.

Examples: "What the admin feel the student needs it seems," "The relationships with vendors and unspoken agreements are also considered," "Whatever company has partnered with the school district."

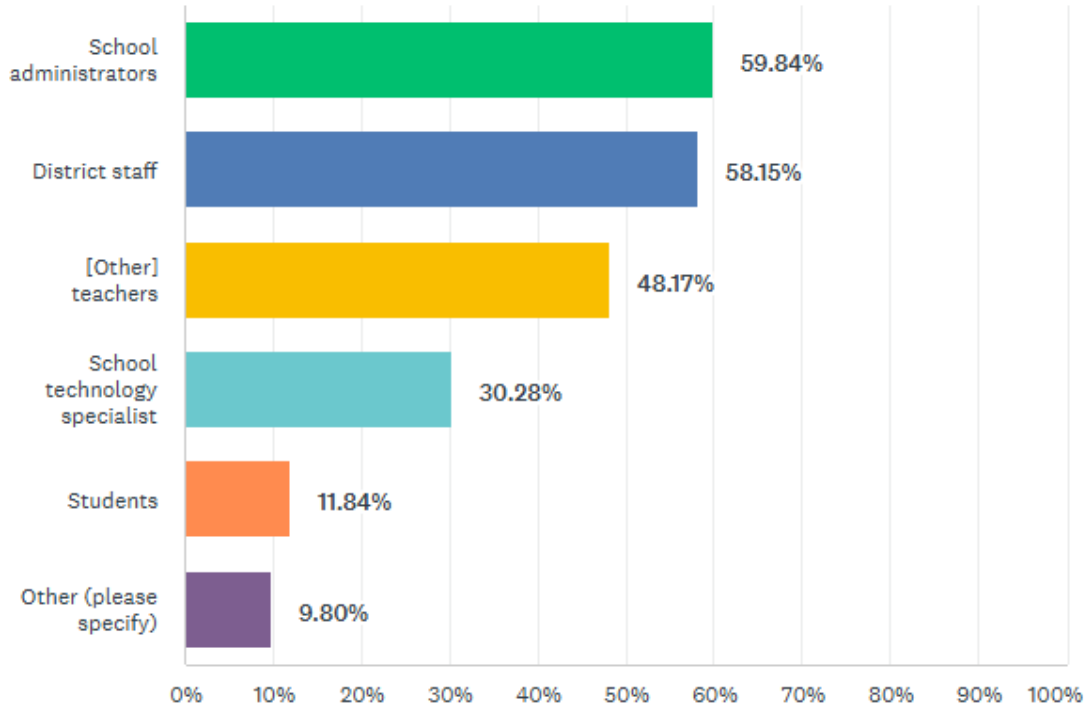
The selection of educational technology (EdTech) tools in schools appeared to be a multifaceted process influenced by several key themes. These themes highlight the complexities of selecting EdTech tools and the need for a balanced approach that considers teacher input,

security, cost, alignment with standards, inclusivity, and administrative considerations.

Question 4 results revealed a diverse array of support sources teachers rely on when choosing EdTech tools. The most prominent sources of support identified are school administrators, district staff, and fellow teachers. Figure 23 below shows the results.

Figure 23

Support Sources Teachers Rely on When Choosing Edtech Tools



Note. Q4 Who supports you in choosing EdTech tools to use in the classroom? Choose all the options that apply.

The majority of respondents (59.84%) indicated that school administrators are a primary source of support. This highlights administrators' significant role in guiding EdTech choices, likely due to their leadership positions and broader understanding of school-wide goals and policies. District staff support was noted by 58.15% of respondents, reflecting the centralized approach many school districts take in managing EdTech implementations. Peer support among

teachers is also substantial, with 48.17% of respondents relying on their colleagues. School technology specialists support 30.28% of respondents. Interestingly, 11.84% of respondents noted that students also play a role in supporting EdTech tool selection. Additionally, 9.80% of respondents selected "Other," specifying various additional sources of support. When prompted with “Based on the responses provided, generate common themes with examples and percentages,” the ChatGPT-generated text indicated the common themes reported below (OpenAI, 2024).

- Lack of teacher input and autonomy (Approximately 43%).

  Many responses indicated that teachers have little role in choosing EdTech tools. Examples included:

  - "No one. We have no choice."
  - "We have no input in edtech selection."
  - "Teachers don't choose."
  - "We don't get to choose - the district decides for us."
  - "District staff makes unilateral decisions without consideration for teachers or students."

- Self-selection and personal effort (Approximately 22%).

  Some teachers mentioned selecting EdTech tools themselves, often based on personal research or ease of implementation. Examples included:

  - "Myself - what is easiest to implement and use."
  - "I choose."
  - "Myself, and my continued self-learning."
  - "I research, then pick and choose what would work best for my students."

- Support from specific school staff (Approximately 16%).

  Teachers mentioned getting support from specific roles within the school, such as instructional coaches or department heads. Examples included:

  - "Department head."
  - "Instructional Coaches."
  - "ELA department head."
  - "School-based math coach."

- District-Level decisions and support (Approximately 12%).

  Some responses highlighted the role of district staff or district-level criteria in EdTech selection. Examples included:

  - "District digital integration specialist."
  - "District gives some input to teachers but makes overall selection."
  - "District staff is supposed to provide support."

- Involvement of media and technology specialists (Approximately 5%).

  There were mentions of support from media or technology specialists within the school. Examples included:

  - "Media specialist."
  - "Librarian gets a list then seeks approval for staff."
  - "Media center specialist."

- Other sources of influence (Approximately 2%).

  A few responses pointed to various other sources of influence, including external vendors or professional organizations. Examples included:

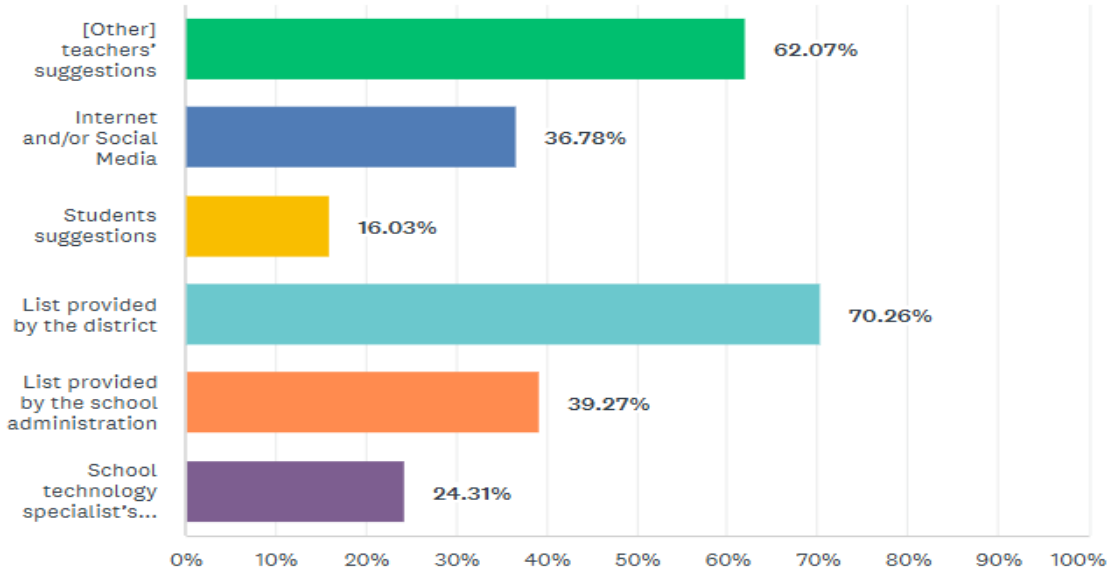
  - "Professional organizations."

- "Company reps."
- "ed tech provider."

Overall, the data suggests a need for more inclusive and supportive decision-making processes regarding EdTech tools, where teachers' voices are heard, and adequate training and resources are provided.

Figure 24

Resources Teachers Use to Select Edtech Tools



Note. Q5 Which resources do you use to select EdTech tools for your classroom? Choose all the options that apply.

The survey question 5 data revealed a variety of sources from which educators draw upon when selecting EdTech tools for their classrooms. Notably, a significant majority (70.26%) rely on lists provided by their district. Additionally, recommendations from fellow teachers (62.07%) emerge as another prominent source, highlighting the peer-driven nature of professional recommendations in educational technology decisions. Internet and social media platforms (36.78%) also play a role, albeit less predominant, suggesting that educators increasingly turn to

online resources for insights and reviews. Conversely, direct student input (16.03%) and recommendations from school technology specialists (24.31%) appear to have a comparatively lower impact yet remain noteworthy as supplementary channels in the decision-making process (figure 24). When prompted with “Based on the responses provided, generate common themes,” the ChatGPT-generated text indicated the common themes reported below (OpenAI, 2024).

- Autonomy and availability.

  Many educators expressed a desire for autonomy in selecting EdTech tools when resources are available. They often rely on their own research, professional networks, and personal experiences to determine which tools best fit their instructional needs.

- District mandates and restrictions.

  A significant number of respondents indicated that their choices are constrained by district policies and mandates. This includes using only approved tools due to security concerns or district procurement decisions, limiting educators' freedom to choose tools independently.

- Professional development and training influence.

  Educators frequently cited the influence of professional development (PD) and training sessions in their technology adoption decisions. Tools introduced during these sessions, whether directly provided by the district or discovered through PD, play a crucial role in their selection process.

- Student-centered and curriculum alignment.

  The appropriateness of tools to meet student needs, including those with Individualized Education Programs (IEPs) and specific curriculum requirements, was a common

consideration. Educators prioritize tools that align with curriculum standards and support diverse student needs.

- Personal research and peer recommendations.

  Personal research and recommendations from peers, such as media specialists or fellow educators, were influential factors. Educators value insights gained through professional networks and independent exploration of resources.

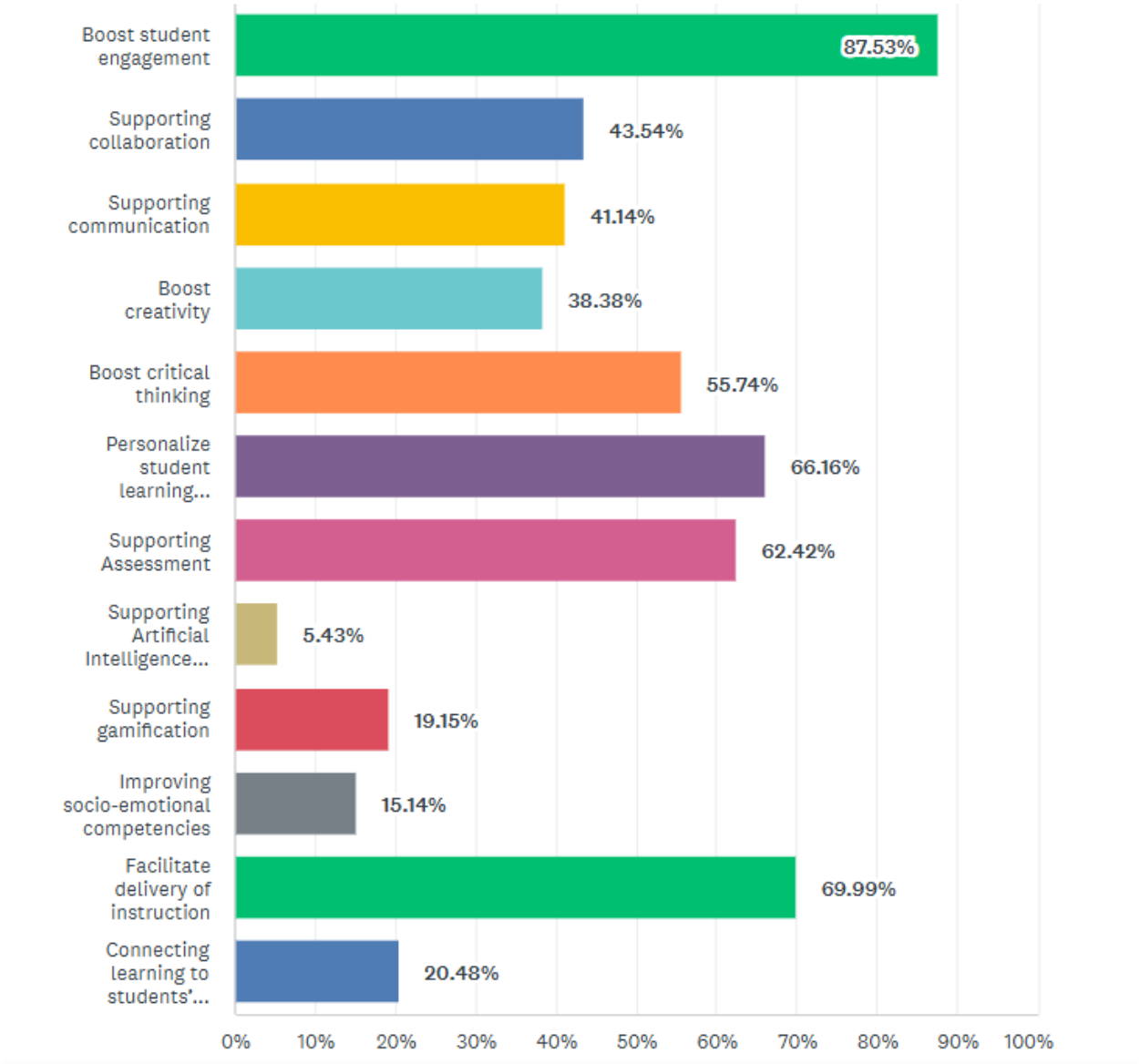
- Challenges and limitations.

  Challenges included limited access to updated information about new tools, frustration with district-imposed selections, and concerns over inadequate training or support for effectively using chosen tools in the classroom.

Survey question 6 explored the diverse objectives that guide educators in choosing EdTech tools, illuminating their roles in enhancing student engagement, collaboration, and personalized learning experiences. Figure 25 shows the results.

Figure 25

Purposes for Selecting EdTech Tools



Note. Q6 What are the purposes for selecting EdTech tools for your classroom? Choose all the options that apply.

The survey data revealed a spectrum of objectives educators prioritize when selecting EdTech tools for their classrooms. Boosting student engagement emerges as the predominant purpose, with an overwhelming 87.53% of respondents highlighting its importance. Supporting

assessment (62.42%) and facilitating the delivery of instruction (69.99%) also rank prominently, reflecting educators' reliance on EdTech tools to streamline assessment processes and optimize instructional delivery. Personalizing student learning experiences (66.16%) and boosting critical thinking skills (55.74%) represent further key objectives. In contrast, objectives such as supporting artificial intelligence knowledge (5.43%) and gamification (19.15%) show lower adoption rates, indicating varying levels of readiness or relevance in current educational contexts. When prompted with “Based on the responses provided, generate common themes with examples,” the ChatGPT-generated text indicated the common themes reported below (OpenAI, 2024).

- District mandates and lack of choice.

  Many educators indicated they are not permitted to select EdTech tools independently. District policies heavily influence or restrict their choices, citing concerns over privacy, consistency, and alignment with district-approved lists (e.g., "Teachers are not allowed to select technology tools for the classroom").

- Use of district-supplied tools.

  Educators commonly stated that they use tools provided by the district, such as IXL, Kahoot, or specific learning management systems, despite personal preferences or criteria they would consider if given a choice ("I do not get to choose" or "It's what the district supplies us with").

- Compliance and functional use.

  The focus often shifts towards practical aspects like grading efficiency, data collection, and meeting curriculum access needs rather than specific pedagogical goals listed in the

survey ("Helps students build connection and understanding of content/standards," "Make it easier to grade," "Collecting data").

- Frustration with limited autonomy.

  There was a palpable frustration with the lack of autonomy in tool selection, with educators feeling disconnected from decisions made "behind closed doors" or without their input ("Some of it is ok, and others are a total waste of money").

- Specialized educational needs.

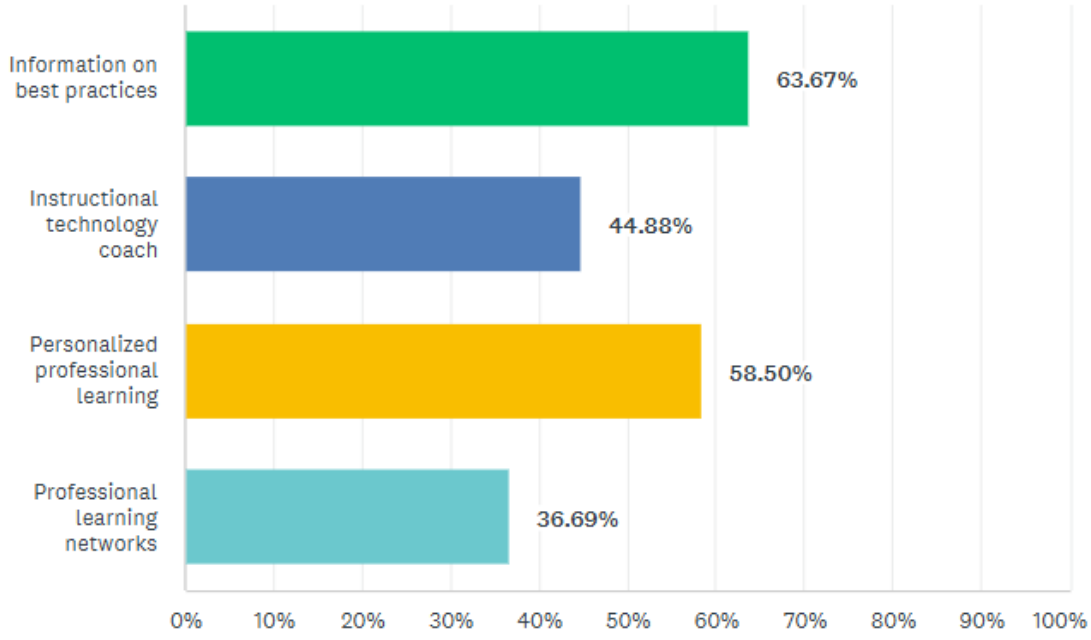
  Some educators highlighted the specific needs of their students, such as those in ESE (Exceptional Student Education) or ESOL (English for Speakers of Other Languages) programs, indicating a desire to tailor tools to better support these groups if given the opportunity ("ESOL student support," "ESE students strategies for learning").

In summary, educators selecting "None of the above" reveal a landscape where district policies heavily influence EdTech tool selection, limiting their autonomy but also emphasizing functional aspects like compliance, practical utility, and meeting diverse student needs.

Survey question 7 explored the diverse resources and support mechanisms educators prioritize to guide their decisions in adopting digital tools. Figure 26 shows the results.

Figure 26

Suggestion on What Could Help Teacher to Select the Right Edtech Tool



Note. Q7 What could help you to select the right digital tool for your classroom? Choose all the options that apply.

The survey data revealed several key factors that educators identify as essential for aiding their selection of digital tools for the classroom. Information on best practices emerges as the most influential resource, with 63.67% of respondents emphasizing its importance. Educators value access to evidence-based strategies and case studies that validate the efficacy of specific tools in improving instructional outcomes. Personalized professional learning (58.50%) ranks prominently, underscoring educators' preference for tailored training that aligns with their instructional needs and technological proficiency levels. The role of instructional technology coaches (44.88%) is also significant, with educators valuing direct guidance and mentorship in navigating the vast array of digital tools available. Professional learning networks (36.69%) are

cited as another valuable resource, enabling educators to collaborate, share insights, and learn from peers who have successfully integrated digital tools in similar educational settings. In addition to these mainstream resources, responses categorized as "Other" (66 responses) likely encompass a variety of innovative or specialized strategies that educators deem beneficial, reflecting a diverse array of needs and preferences in selecting digital tools.

When prompted with “Based on the responses provided, generate common themes,” the ChatGPT-generated text indicated the common themes reported below (OpenAI, 2024).

- Lack of autonomy due to district policies.

  A recurring theme was the restriction imposed by district policies on educators' autonomy in selecting digital tools. Many expressed frustration that decisions are dictated by district personnel, limiting their ability to choose tools based on their own assessment of student needs and educational goals.

- Desire for exploration and testing.

  Educators consistently expressed a desire for time and opportunities to explore and test different digital tools. They value hands-on trials, free options, and free trials to evaluate tools firsthand before committing to their adoption in classrooms.

- Practical applications and user-friendliness.

  There was a strong emphasis on the practical applications of digital tools in classrooms and their user-friendliness for both students and teachers. Educators seek tools that are easy to integrate into their teaching practices and support effective learning experiences without unnecessary complexity.

- Alignment with educational standards and curriculum.

Alignment with state standards and curriculum requirements was another significant consideration. Educators prioritize tools that seamlessly integrate with existing educational frameworks and contribute positively to student learning outcomes.

- Professional support and resources.

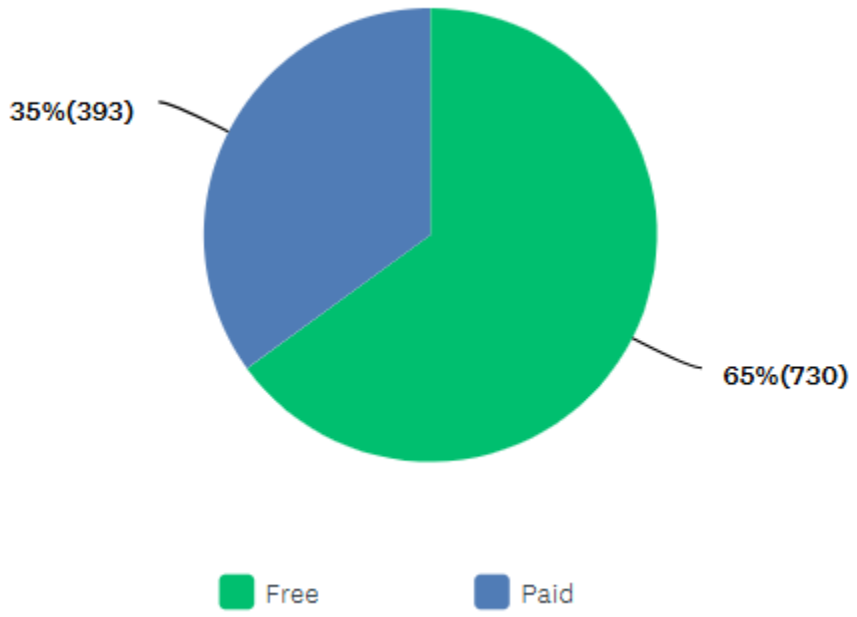
  Educators value support from instructional technology coaches, professional learning networks, and mentors who can provide guidance on selecting and integrating digital tools effectively. They also seek comprehensive resources such as annotated bibliographies or detailed lists of available tools to inform their decision-making process.

Overall, these themes and interpretations illustrate educators' diverse considerations when selecting digital tools, emphasizing the need for collaborative efforts between educators, administrators, and policymakers to ensure technology integration supports optimal learning outcomes for all students.

Survey question 8 investigated the prevalence and preferences among educators regarding using free versus paid EdTech tools in classrooms. Figure 27 shows the results.

Figure 27

Preferences among Educators Regarding the Use of Free versus Paid EdTech Tools in Classrooms



Note. Q8 What EdTech tools do you most use in the classroom?

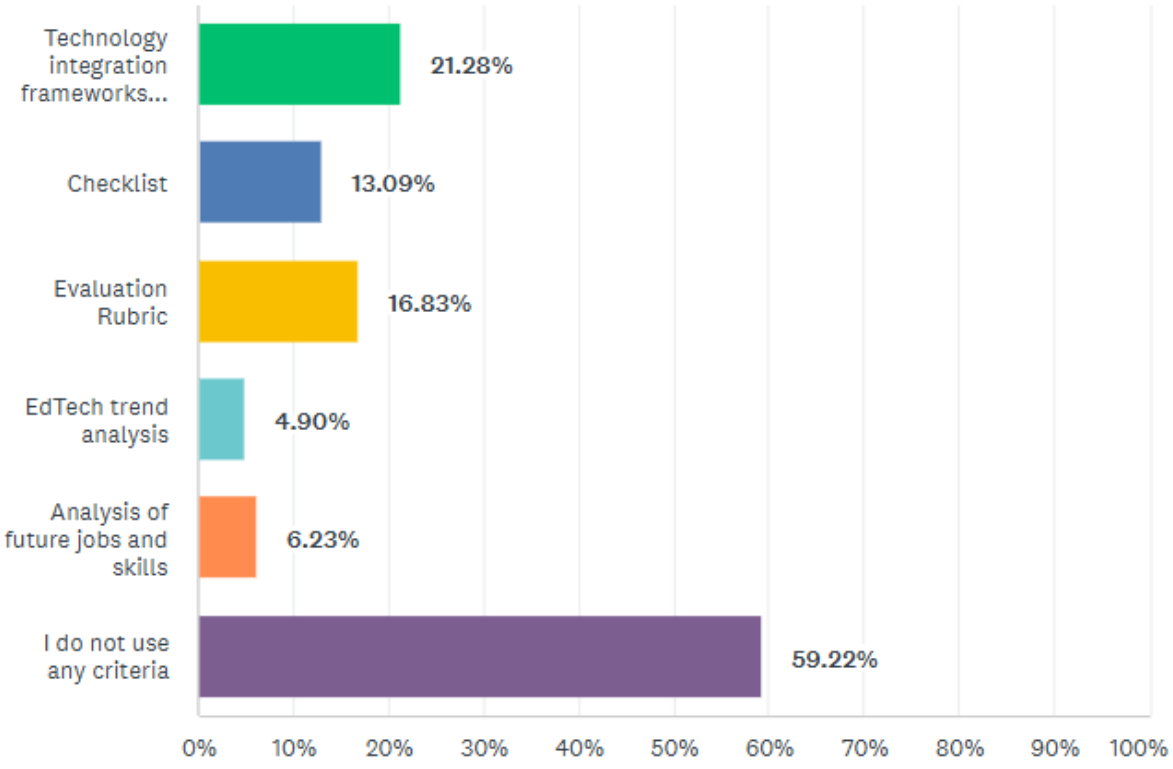
A significant majority, comprising 65.00% of respondents, prefer free tools. Conversely, 35.00% of respondents report using paid EdTech tools. These findings illuminate educators' diverse approaches in selecting EdTech tools based on cost considerations, reflecting a nuanced decision-making process that balances affordability with educational efficacy.

Question 9 explored educators' criteria when selecting EdTech tools, ranging from established frameworks and rubrics to emerging trends and future job skills analyses. The survey data revealed diverse approaches among educators in the criteria they use to select EdTech tools. A majority, comprising 59.22% of respondents, indicate that they do not use any specific criteria. This finding suggests a reliance on informal or ad hoc decision-making processes, where

educators may base their selections on personal experience, recommendations, or immediate instructional needs rather than structured frameworks or rubrics. Among the structured approaches, technology integration frameworks such as SAMR (substitution, augmentation, modification, redefinition) and TPACK (Technological Pedagogical and Content Knowledge) are employed by 21.28% of educators. Evaluation rubrics are utilized by 16.83% of educators. EdTech trend analysis (4.90%) and analysis of future jobs and skills (6.23%) represent emerging but less commonly used criteria (figure 28).

Figure 28

Criteria Educators Employ when Selecting Edtech Tools



Note. Q9 Do you use any of the following criteria to select EdTech tools?

The significant number of responses categorized as "Other" (99 responses) included the following themes. When prompted with “Based on the responses provided, generate common

themes with examples and approximately the number of responses," the ChatGPT-generated text indicated the common themes reported below (OpenAI, 2024).

- District mandates and approval (Approximately 30 responses).

  Many educators highlighted that district mandates and approvals constrain their choices. This includes using tools mandated by the district due to pre-approved lists, budget considerations, or administrative directives. Examples: "Most of the EdTech is selected by district," "The district buys the tool, we use what the district buys."

- Personal assessment and use trials (Approximately 20 responses).

  Educators emphasized personal assessment and hands-on trials as crucial criteria. They value direct experience with the tool to evaluate its effectiveness in meeting instructional goals, student engagement, and ease of use.

  Examples: "I try something out myself and decide if it meets the learning goals," "Try them out myself."

- Alignment with curriculum and instructional goals (Approximately 15 responses).

  Many educators prioritized selecting tools that align closely with their curriculum objectives and instructional strategies. This includes ensuring that the tool enhances student learning, supports curriculum content, and facilitates effective teaching methods.

  Examples: "Will it meet my instructional goals," "Content aligns to standards."

- Ease of use and accessibility (Approximately 10 responses).

  The usability of EdTech tools is critical for educators, with a focus on tools that are intuitive and accessible for both teachers and students. Ease of use reduces barriers to implementation and supports seamless integration into classroom activities.

  Examples: "User-friendliness is a priority," "Ease of use for students."

- Cost and budget considerations (Approximately 10 responses).

  Cost-effectiveness plays a significant role in decision-making, with educators considering the financial implications of adopting EdTech tools. This includes weighing the cost against the perceived benefits and educational value the tool provides. Examples: "Based on availability, cost, and benefit to students," "Price, student benefit, curriculum content, efficacy."

- Educator autonomy and professional judgment (Approximately 10 responses).

  Despite district constraints, some educators asserted their autonomy in selecting tools based on professional judgment, recommendations from peers, and what they perceive as most beneficial for their students.

  Examples: "I choose what I think will get the best bang for my buck," "Based on recommendations from other teachers and personal evaluation."

- Compliance and policy adherence (Approximately 5 responses).

  Educators adhere to district policies regarding data privacy, tool compliance, and other regulatory requirements when selecting EdTech tools. Compliance ensures tools meet legal standards and safeguard student information.

  Examples: "Permitted by the district," "Privacy concerns."

The themes and examples illustrated the varied considerations educators navigate when selecting EdTech tools, from district policies and personal assessments to cost-effectiveness and curriculum alignment.

Overall, the survey data revealed a multifaceted landscape of decision-making processes, illustrating both centralized control and diverse individual preferences. The survey data indicated that district-level authorities predominantly oversaw the selection of EdTech tools before the COVID-19 pandemic. This centralized control persisted and even intensified post-pandemic. Despite this, a

notable proportion of teachers and school administrators played significant roles, though to a lesser degree, reflecting a hierarchical decision-making structure. The selection criteria emphasized factors such as cost, relevance to specific academic disciplines, and categories of EdTech tools, with minimal use of structured frameworks. Additionally, qualitative content analysis of open-ended responses highlighted key themes such as the influence of district mandates, the importance of security and privacy, and the need for alignment with educational standards.

The primary purposes for selecting EdTech tools included boosting student engagement, supporting assessment, and facilitating the delivery of instruction, with a preference for free tools over paid alternatives. Overall, the data suggested a need for more inclusive and supportive decision-making processes regarding EdTech tools, where teachers' voices are heard, and adequate training and resources are provided. Resources considered helpful in the selection process included information on best practices, evidence-based strategies, and case studies validating the efficacy of specific tools in improving instructional outcomes, personalized professional learning, and instructional technology coaches. Educators consistently desire time and opportunities to explore and test different digital tools, valuing hands-on trials and free options before committing to adoption. A recurring theme was the restriction imposed by district policies on educators' autonomy in selecting digital tools, leading to frustration over decisions dictated by district personnel, limiting their ability to choose tools based on their assessment of student needs and educational goals.

Results for Research Question 2

For Research Question 2, “To what extent are K-12 teachers receiving support and training in selecting EdTech tools?”, the descriptive variable was the level of support and training teachers receive in selecting EdTech tools. This variable was measured using data from question items 10–13.

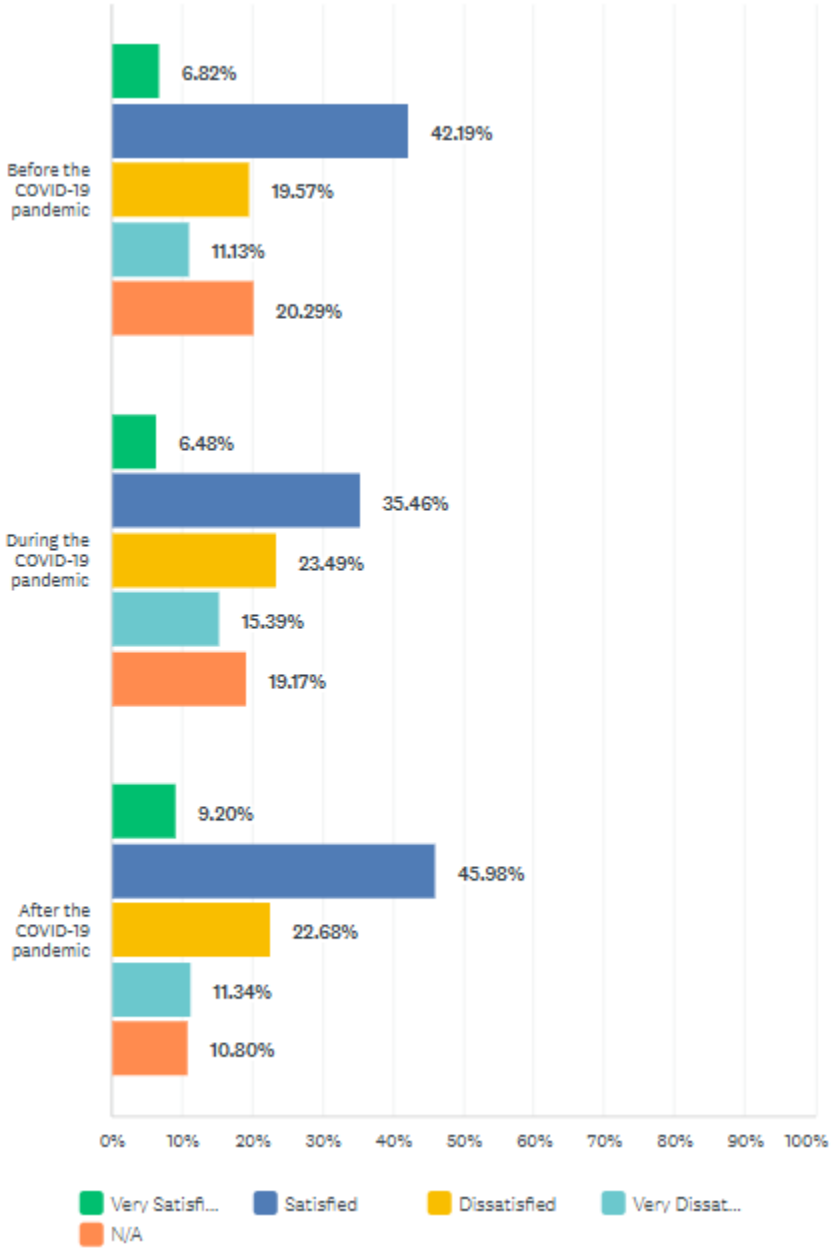
Central to the successful implementation of EdTech tools is providing comprehensive training and support for educators, equipping them with the knowledge and skills necessary to leverage technology effectively in their teaching practices. Question 10 evaluated the efficacy of the training provided by schools in preparing educators to utilize EdTech tools within their classrooms. By examining educators' ratings of the training received before, during, and after the COVID-19 pandemic, the question aimed to discern trends in satisfaction levels and identify areas for improvement in professional development initiatives related to EdTech integration.

Before the pandemic, satisfaction among respondents was moderate, with 49.01% expressing varying degrees of satisfaction (6.82% very satisfied and 42.19% satisfied), while 30.70% indicated dissatisfaction. During the pandemic, satisfaction levels decreased slightly to 41.94%, with 38.88% expressing dissatisfaction, reflecting heightened challenges during this period. However, post-pandemic, satisfaction levels improved noticeably, with 55.18% reporting satisfaction (9.20% very satisfied and 45.98% satisfied), and dissatisfaction declining to 34.02%.

Overall, the data suggests a mixed picture regarding training effectiveness on EdTech tools, with varying levels of satisfaction reported across different periods. While there has been some improvement in satisfaction levels post-pandemic, there remains room for further enhancement in training initiatives to better support educators in effectively integrating EdTech tools into their teaching practices. Figure 29 below visually shows the results.

Figure 29

Efficacy of the Training Provided by Schools in Preparing Educators to Utilize Edtech Tools Within Their Classrooms

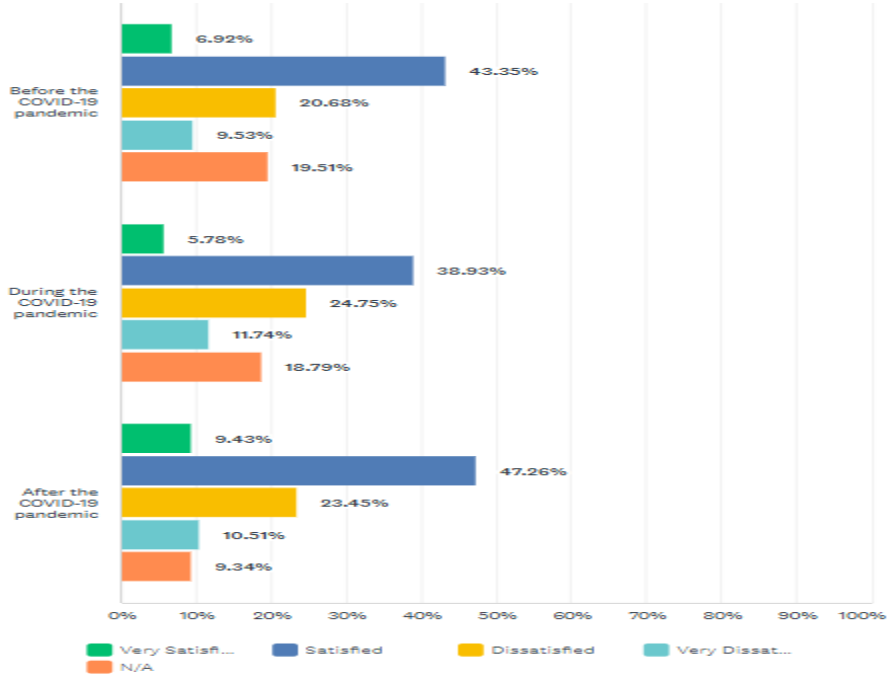


Note. Q10 How do you rate the training you receive by the school about EdTech tools to use in the class?

Survey question 11 sought to examine educators' perceptions of the support received from their schools regarding the provision of information pertaining to effectiveness, alignment with educational standards, and overall utility of EdTech tools. By evaluating educators' ratings of the support provided before, during, and after the COVID-19 pandemic, the question aimed to elucidate trends in satisfaction levels and identify areas for improvement in support mechanisms related to EdTech integration. Figure 30 reveals fluctuating satisfaction levels among educators regarding the support received from their schools regarding EdTech tools before, during, and after the COVID-19 pandemic.

Figure 30

Educators' Perceptions of the Support Received from Their Schools



Note. Q11 How do you rate the support (in terms of information about their effectiveness, alignment with the standard, et cetera) you receive by the school about EdTech tools to use in the class?

Before the pandemic, a notable proportion of educators (50.27%) expressed satisfaction or very satisfaction with the support provided. However, a considerable minority (30.21%) reported dissatisfaction or very dissatisfaction with the support received during this period. During the COVID-19 pandemic, satisfaction levels dipped slightly, with 44.71% of educators expressing satisfaction or very satisfaction with the support provided. Dissatisfaction levels increased to 36.49% during this period, indicating challenges in meeting educators' support needs amidst the pandemic-induced disruptions.

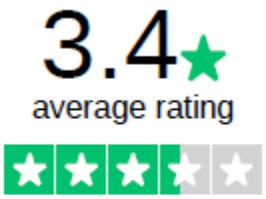
After the COVID-19 pandemic, satisfaction levels improved, with 56.69% of educators expressing satisfaction or very satisfaction with the support received. Dissatisfaction levels decreased to 33.96% during this period, reflecting efforts to enhance support structures in the post-pandemic educational landscape. Overall, the data suggests a nuanced trajectory in educators' perceptions of the support received from their schools regarding EdTech tools, with fluctuations observed across different pandemic phases. While improvements are evident in the post-pandemic period, there remains scope for further enhancement in support mechanisms to meet educators' needs better and facilitate more effective integration of EdTech tools into teaching and learning practices.

Central to the successful utilization of EdTech tools is educators' preparedness and proficiency in leveraging these technologies effectively within their instructional practices. Survey question 12 explored educators' perceptions of their preparedness to use EdTech tools. By examining educators' ratings of their preparedness levels, ranging from unprepared to extremely prepared, this question sought to discern trends in self-assessed proficiency and identify areas for improvement in professional development initiatives related to EdTech integration.

Figure 31 revealed varying levels of self-assessed preparedness among educators regarding using EdTech tools.

Figure 31

Self-assessed Preparedness Among Educators



	NOT AT ALL PREPARED	NOT SO PREPARED	SOMEWHAT PREPARED	VERY PREPARED	EXTREMELY PREPARED	N/A	TOTAL	WEIGHTED AVERAGE
☆	3.38% 38	9.08% 102	45.86% 515	26.98% 303	12.20% 137	2.49% 28	1,123	3.36

Note. Q12 In your opinion, how well prepared are you to use EdTech tools?

The majority of respondents (45.86%) feel prepared to use EdTech tools, indicating a moderate level of confidence. This suggests that many individuals may benefit from additional training or support to enhance their preparedness. A noteworthy 39.18% of respondents (very prepared and extremely prepared) express high levels of readiness to use EdTech tools. This positive response highlights a substantial segment of individuals who are already equipped or highly motivated to leverage these technologies effectively.

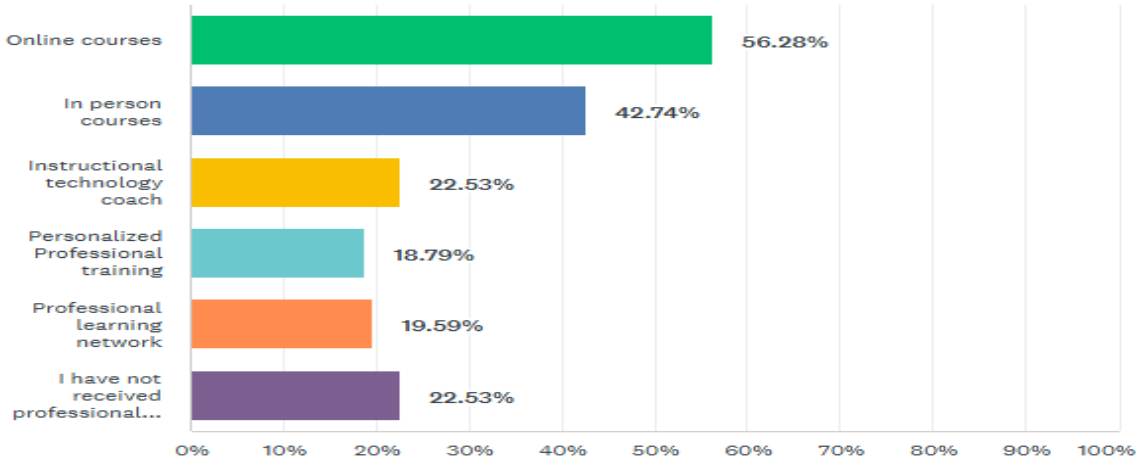
While a minority, 12.46% (not at all prepared and not so prepared) of respondents indicate lower levels of preparedness. Understanding their challenges or barriers could inform targeted interventions or support mechanisms to improve their readiness. The 2.49% who did not answer (N/A) may reflect various reasons, such as uncertainty about their readiness or unfamiliarity with EdTech tools, indicating a potential need for clarification in survey questions

or additional outreach to clarify responses. The overall weighted average preparedness score is 3.36, reflecting a generally moderate level of preparedness across all respondents.

Question 13 aimed to gather data on the various types of professional development and training programs that educators are exposed to regarding the use of educational technology (EdTech) tools. This information seeks to identify the range and nature of training experiences, assess the comprehensiveness of current training provisions, and determine the prevalence of different training modalities. The insights derived from this question will inform the development of more targeted and effective professional development programs, aimed to enhance educators' competencies in integrating EdTech tools into their teaching practices. Figure 32 below illustrates the types of professional training received by respondents regarding EdTech tools.

Figure 32

Types of Professional Development and Training Programs Teachers Receive



Note. Q13 What kind of professional training about EdTech tools do you receive? Choose all the options that apply.

A majority of respondents (56.28%) have undergone professional training through online courses, suggesting a popular and accessible mode of learning for EdTech tools. Nearly half of

the respondents (42.74%) have participated in in-person courses, indicating a significant preference for face-to-face training despite the availability of online options. A notable portion (22.53%) have received guidance from instructional technology coaches, highlighting the value of personalized support in integrating EdTech tools effectively. Around one-fifth of respondents have engaged in personalized professional training (18.79%) or benefited from professional learning networks (19.59%), underscoring the importance of tailored and collaborative learning environments in enhancing EdTech skills. A substantial proportion (22.53%) have not received professional training about EdTech tools, indicating a gap that could potentially be addressed through targeted initiatives to support professional development in this area.

The 68 responses indicating "Other" suggest diverse or specialized forms of training not captured by the listed options, warranting further exploration to understand unique training needs or preferences among respondents. After the researcher reviewed the responses and determined themes on their own, teacher responses to this survey question were run through ChatGPT 4 to confirm that no important themes were missed. When prompted with “Based on the responses provided, generate common themes,” the ChatGPT-generated text indicated the common themes reported below (OpenAI, 2024).

- Basic and insufficient training.

  Many respondents describe the training as "awful" and "very basic," suggesting that the provided sessions did not meet their expectations or needs for effectively integrating EdTech tools into their teaching practices.

- Diverse training methods.

Training is delivered through various methods, including online self-directed courses, platform-specific training (e.g., CK-12, Nearpod, Quizizz), district-level one-time sessions, and professional development days.

- Inconsistent and outdated training.

  Some respondents mention not having had in-person courses for many years or not recalling any specific EdTech training, indicating gaps and inconsistencies in the professional development offerings over time.

- Limited practical guidance.

  There is a recurring sentiment that tools are often introduced with little to no practical training on their effective use, leaving teachers to rely on colleagues, instructional coaches, or self-directed learning.

- Self-taught approaches.

  A significant number of respondents have taken it upon themselves to learn through "clicking around," using YouTube tutorials, personal research, or seeking help from more tech-savvy colleagues.

- Varied levels of formal education.

  Some respondents have advanced degrees in educational technology or related fields, suggesting a high level of self-initiative in acquiring EdTech knowledge independently of district-provided training.

- Systemic issues.

  There are mentions of systemic issues, such as district-mandated training that does not consider teachers' varying levels of technological proficiency, and a lack of ongoing support post-training.

Data revealed mixed satisfaction levels among educators regarding the training received across different phases. Before the COVID-19 pandemic, a notable portion of educators expressed dissatisfaction, while satisfaction levels improved during and after the pandemic, although some dissatisfaction persisted post-pandemic. The perceptions of support received from schools showed fluctuating satisfaction levels, with notable improvements following the pandemic. Educators self-assessed their preparedness to use EdTech tools as moderate overall, with many feeling somewhat prepared, highlighting the need for targeted support for less prepared educators. The most popular professional development modalities were online courses and in-person training, yet gaps in training comprehensiveness and consistency were identified.

Results for Research Question 3

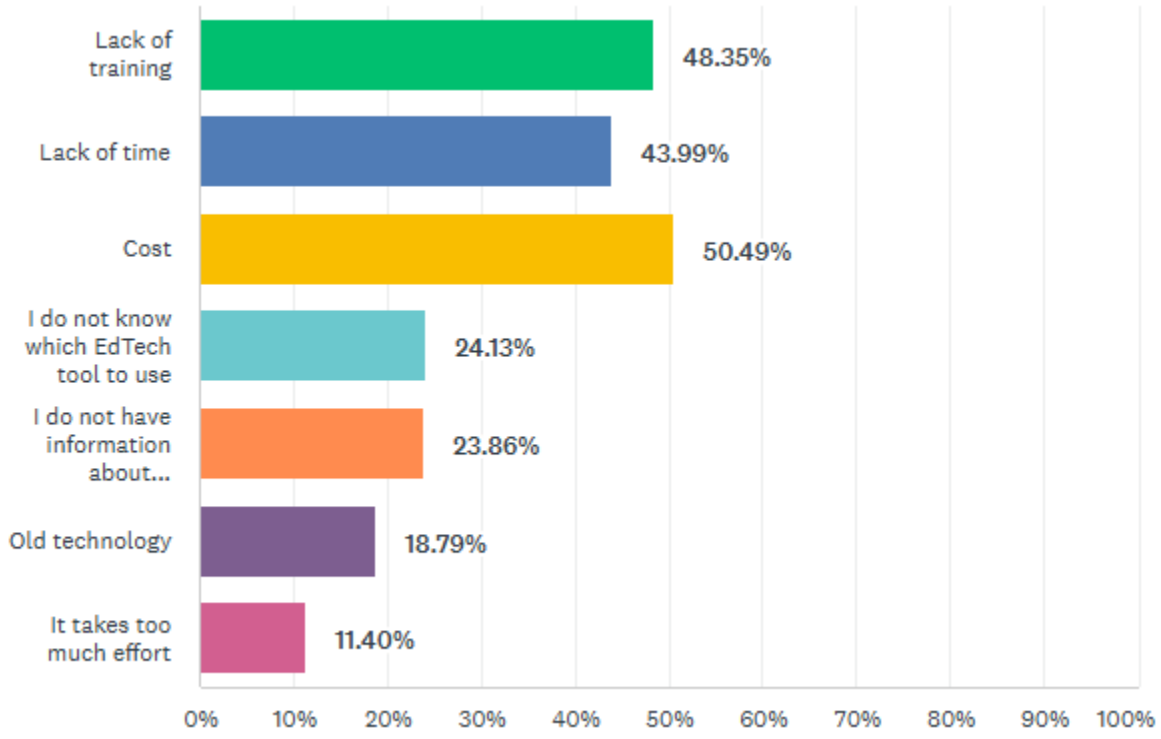
For Research Question 3, "What are the perceptions and attitudes of the teachers towards EdTech tools?", the descriptive variables were the attitudes and perceptions of the teachers towards EdTech tools. These variables were measured using data from question items 14, 17, and 18.

Question 14 revealed several reasons educators may choose not to adopt EdTech tools. Figure 33 shows the results. Cost emerges as the most significant barrier, with 50.49% of respondents indicating financial constraints as a deterrent. Furthermore, a lack of training is identified by 48.35% of educators as a substantial impediment. Additionally, time constraints are cited by 43.99% of respondents, reflecting the practical challenges educators face in balancing their teaching responsibilities with the demands of adopting and integrating new technologies. Uncertainties regarding tool selection (24.13%) and concerns about the effectiveness of student outcomes (23.86%) also emerge as notable barriers. Moreover, issues related to outdated

technology (18.79%) and perceived effort in implementation (11.40%) are identified as further deterrents.

Figure 33

Reasons Why Educators May Choose Not to Adopt Edtech Tools

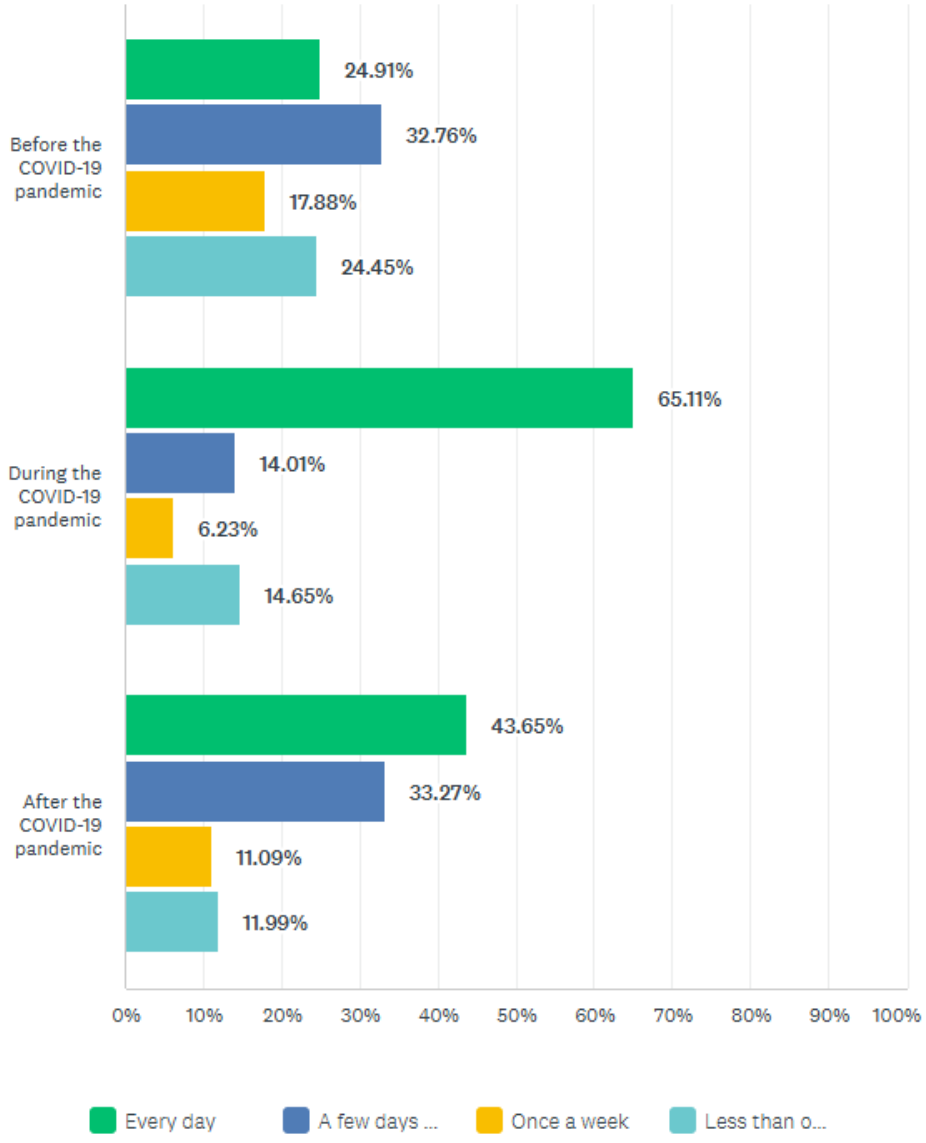


Note. Q14 What are the reasons why you may not choose to use EdTech tools?

The COVID-19 pandemic significantly influenced the utilization of educational technology (EdTech) tools, which necessitated a rapid shift to remote and hybrid learning environments. Understanding the frequency of EdTech tool usage before, during, and after the pandemic provides valuable insights into the evolving role of technology in education. Question 17 examined the patterns of EdTech tool usage among educators across these three periods to identify trends and inform future educational practices. Figure 34 illustrates the results.

Figure 34

Patterns of Edtech Tool Usage among Educators Before, During and After the COVID-19 Pandemic



Note. Q17 How often do you use EdTech tools?

The frequency of EdTech tool usage has varied notably across different periods surrounding the COVID-19 pandemic. Before the pandemic, the use of EdTech tools was relatively moderate. Only 24.91% of educators reported using these tools daily, while a larger

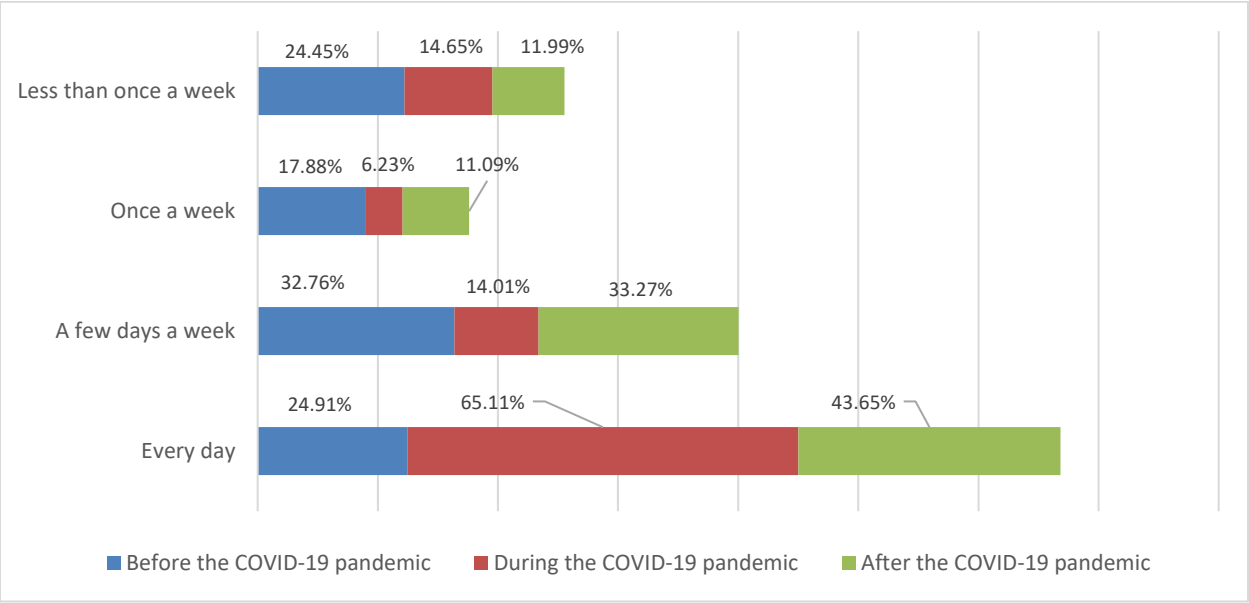
proportion, 32.76%, utilized them a few days a week. Additionally, 17.88% used EdTech tools once a week, and 24.45% used them less than once a week. This distribution indicates a varied but generally moderate engagement with educational technology before the pandemic.

During the COVID-19 pandemic, there was a significant increase in the daily use of EdTech tools. A substantial 65.11% of educators reported using these tools every day, reflecting the urgent need for remote learning solutions during this period. Conversely, the percentage of educators using EdTech tools a few days a week (14.01%), once a week (6.23%), and less than once a week (14.65%) declined markedly. This shift underscores the heightened reliance on technology to facilitate continued education amidst school closures and social distancing measures.

After the COVID-19 pandemic, the frequency of EdTech tool usage decreased from its peak during the pandemic but remained higher than pre-pandemic levels. Post-pandemic, 43.65% of educators reported using EdTech tools daily, indicating a sustained, albeit reduced, integration of technology in daily teaching practices. The percentage of educators using EdTech tools a few days a week increased to 33.27%, suggesting a return to a more balanced, yet still significant, usage pattern. Those using the tools once a week (11.09%) and less than once a week (11.99%) reflect a continued, though less frequent, engagement with EdTech compared to during the pandemic. The stacked graph below clearly shows how the adoption of various EdTech tools has changed over the pandemic (figure 35).

Figure 35

Adoption of Various Edtech Tools: Changes Over the Pandemic



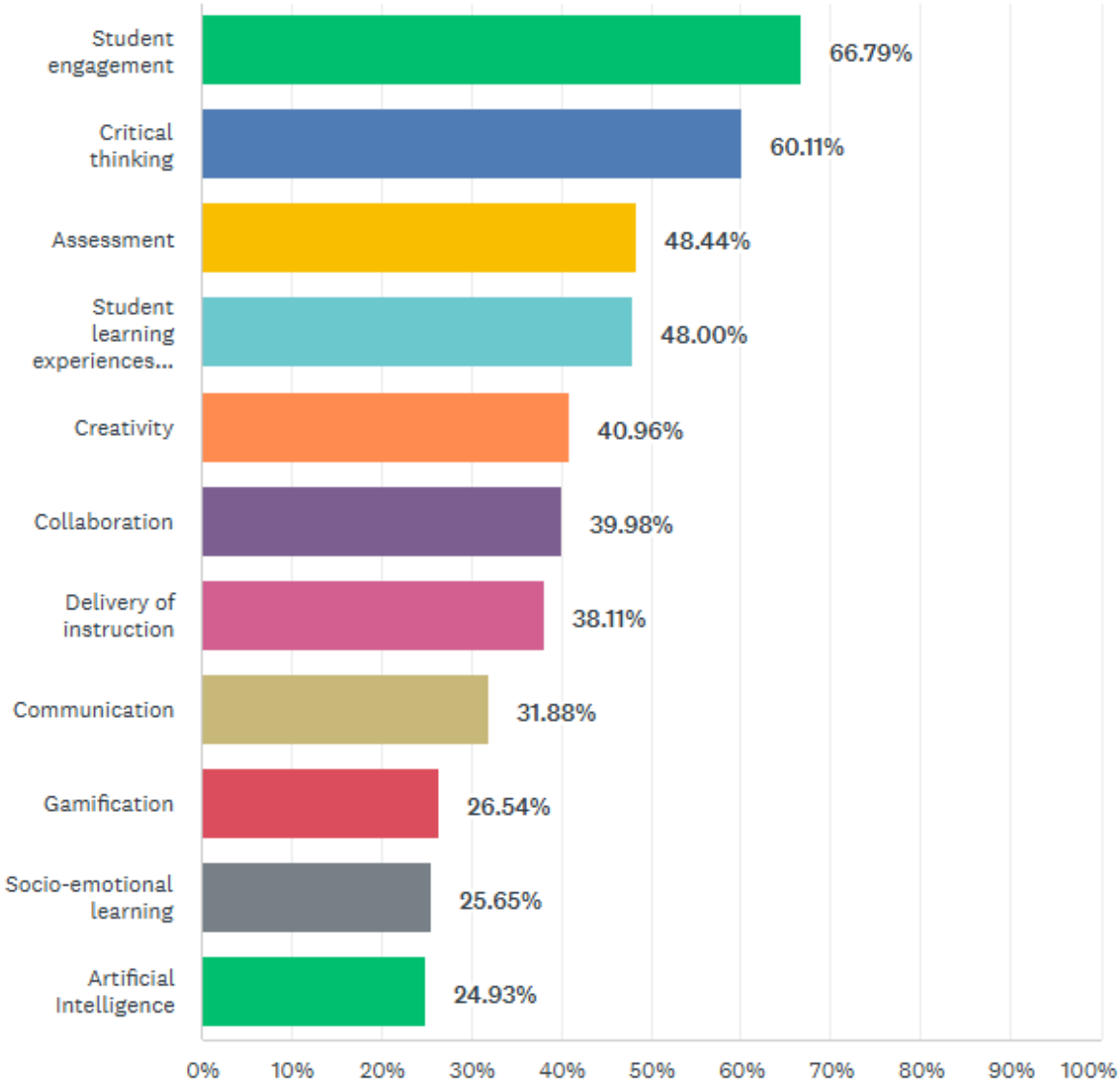
The COVID-19 pandemic acted as a catalyst for increased daily usage of EdTech tools, a trend that has persisted to a lesser extent post-pandemic. The data highlights the transformative impact of the pandemic on educational practices, leading to a greater integration of technology in teaching and learning. Addressing the challenges and opportunities presented by this shift will be crucial for maximizing the benefits of EdTech in future educational landscapes.

Integrating educational technology (EdTech) tools has revolutionized teaching and learning paradigms, offering diverse avenues for enhancing student engagement, fostering critical thinking skills, and personalizing learning experiences. As educators navigate the vast landscape of available EdTech tools, it becomes imperative to understand the specific categories that pique their interest and hold the potential for transformative impact within educational contexts. Question 18 explored educators' preferences and priorities regarding different

categories of EdTech tools, shedding light on areas of particular significance and relevance in the modern educational landscape. Figure 36 illustrates the results.

Figure 36

Teachers' Preferences Regarding Different Categories of Edtech Tools



Note. Q18 Which category of EdTech tools would you like to learn more about? Please check the categories for which you are interested in learning more about. (Please cross all that apply).

Among the categories surveyed, student engagement emerges as a clear frontrunner, garnering significant attention from 66.79% of respondents. This highlights educators' emphasis on creating dynamic and immersive learning experiences that captivate students' interest, motivation, and active participation in the learning process. Following closely behind, critical thinking emerges as another paramount concern, resonating with 60.11% of respondents. This underscores educators' recognition of the pivotal role played by critical thinking skills in equipping students with the ability to analyze, evaluate, and synthesize information effectively, thereby preparing them for success in an ever-evolving knowledge economy.

Similarly, assessment and student learning experience personalization are identified as key areas of interest, with 48.44% and 48.00% of respondents expressing a desire to delve deeper into these categories, respectively. These findings underscore educators' quest for innovative approaches to assessing student progress and tailoring instruction to meet individual learning needs, optimizing learning outcomes and fostering academic growth.

Collaboration and creativity also emerge as prominent areas of interest, resonating with 39.98% and 40.96% of respondents, respectively. These findings underscore educators' recognition of the value of collaborative learning environments and the importance of fostering creativity and innovation among students by integrating technology-enhanced tools and resources.

Moreover, delivery of instruction emerges as a focal point of interest for 38.11% of respondents, highlighting educators' quest for effective strategies to facilitate the seamless delivery of content and instruction in diverse educational settings. While several categories of EdTech tools garner significant interest among educators, it is noteworthy that certain areas, such as artificial intelligence, gamification, and socio-emotional learning, elicit comparatively lower

interest levels from respondents. Nonetheless, these findings provide valuable insights into educators' preferences and priorities, informing the development and implementation of EdTech solutions tailored to meet the diverse needs and objectives of contemporary educational practice. When prompted with “Based on the responses provided, generate common themes,” the ChatGPT-generated text indicated the common themes reported below (OpenAI, 2024).

- Lack of familiarity or interest: Many respondents expressed a lack of familiarity with EdTech tools or simply state that they are not currently using any or have no interest in learning more about them.
- Use of district-approved tools: Several respondents mentioned using specific district-approved EdTech programs, indicating a reliance on tools that have been vetted or mandated by their educational institution.
- Challenges with social and emotional learning (SEL): Some respondents expressed dissatisfaction with the effectiveness of SEL programs in their district, citing student disengagement or lack of impact.
- Resource limitations: Respondents highlight resource limitations, such as restricted access to specific devices or apps due to district policies or budget constraints.
- Interest in specific content areas: There is a notable interest in EdTech tools that cater to specific content areas, such as language acquisition, career awareness, science simulations, and art creation.
- Concerns about standards alignment: Some respondents expressed concerns about the pressure to use only standards-aligned tools, which they perceive as limiting their ability to implement creative and engaging teaching methods.

- Practical considerations: Some respondents mention practical considerations, such as time constraints or heavy workloads, as barriers to exploring or implementing new EdTech tools.

The analysis of teacher perceptions and attitudes towards EdTech tools revealed that cost, lack of training, and time constraints are the predominant barriers, indicating a need for financial support, professional development, and time management solutions. Furthermore, the pandemic significantly increased the daily use of EdTech tools, which has persisted post-pandemic at higher levels than before. This underscores the transformative impact of the pandemic on educational practices and the sustained integration of technology in teaching.

Finally, educators prioritize tools that enhance critical thinking, student engagement, assessment, and personalization. This highlights a focus on fostering skills and creating dynamic learning environments. Open-ended responses indicated varied interests in specific content areas and highlighted practical challenges, such as resource limitations and the pressure to align with standards. Data underscored the importance of addressing financial and training barriers, leveraging the increased familiarity with EdTech post-pandemic, and aligning EdTech tools with educators' priorities to maximize their impact on teaching and learning.

Results for Research Question 4

For Research Question 4, “What determines an effective EdTech tool?”, the descriptive variables were criteria to determine EdTech tool effectiveness. This variable was measured using data from question items 15 and 16.

Understanding the criteria by which educators assess the effectiveness of educational technology (EdTech) tools was essential for enhancing their integration and impact in educational settings. Survey question 15 explored various dimensions through which educators

evaluate the efficacy of EdTech tools, ranging from their alignment with instructional goals to indicators of student engagement and learning outcomes. By examining educators' perspectives on these criteria, the question elucidated the multifaceted considerations influencing their perceptions and decisions regarding adopting and utilizing EdTech tools in teaching and learning environments. Table 4 shows the results, followed by an analysis of each dimension.

Table 4

Dimensions through Teachers Evaluate the Efficacy of Edtech Tools

Answer Choices	Responses
If students show improvement in learning with that EdTech tool	74.62%
If they satisfy the purpose for which you select them	59.75%
If students show interest in learning with that EdTech tool	58.59%
I rely on other teachers' experiences	10.51%
I do not know	5.61%
Comments 23	

Note. Q15 How do you judge the effectiveness of an EdTech tool?

The responses revealed distinct criteria employed by educators to judge the effectiveness of EdTech tools. A significant majority (74.62%) prioritize the criterion of student improvement in learning outcomes, indicating a strong emphasis on measurable educational gains as a primary indicator of effectiveness. Similarly, a substantial proportion (59.75%) emphasizes the importance of EdTech tools aligning with their intended instructional purposes, underscoring the relevance of functionality and relevance in tool selection.

Furthermore, the high percentage (58.59%) of respondents considering student interest in learning with EdTech tools highlighted the role of engagement and motivation in evaluating effectiveness, reflecting educators' awareness of the impact of student engagement on learning outcomes. Conversely, a smaller percentage (10.51%) relies on the experiences of other teachers to judge effectiveness, suggesting varying degrees of reliance on peer insights within the professional community. A small percentage (5.61%) admitted uncertainty about how to judge

the effectiveness of EdTech tools and 23 comments were added to specify the reason for uncertainty.

When prompted with “Based on the responses provided, generate common themes with examples,” the ChatGPT-generated text indicated the common themes reported below (OpenAI, 2024).

- Student growth and data.
    - Tools must demonstrate student growth over time.
    - The ability to provide student data is essential.
    - Measurable improvements in comprehension are a key indicator of effectiveness.
- Ease of use and user-friendliness.
    - Tools should be user-friendly and simplify the educator’s work.
    - Accessibility for all students, including those with special needs, is crucial.
    - Tools should work seamlessly for both on-campus and off-campus use.
    - Ease of use for visually impaired students is essential.
- Alignment with standards.
    - Tools need to be aligned with educational benchmarks and standards.
    - Tools should complement other resources and cover relevant standards-based questions.
- Engagement and accessibility.
    - Tools should enhance student engagement.
    - Accessibility via various devices, including phones, is beneficial.
- Outcome-based evaluation.
    - College acceptance, placement, and scholarship rates judge effectiveness.

- Practical application is more valued in subjects with physical handicaps than academic grading/learning.

Survey question 16 elucidated educators' attitudes towards EdTech tools through a structured assessment, employing a five-point Likert scale to gauge agreement levels across several key dimensions. The seven dimensions include perceptions on the impact of EdTech on student learning, confidence in integrating these tools into classroom pedagogy, the influence of peer perspectives on integration comfort, perceived training needs, interest in best practices, and preferences for accessing successful experiences and collaborative networks within the EdTech community. Table 5 shows the results.

Table 5

Educators' Attitudes towards EdTech Tools

	1	2	3	4	5
Using EdTech tools improves students' learning experiences and outcomes	2.42%	3.13%	27.37%	35.42%	31.66%
I feel confident in integrating EdTech tools into the classroom	4.21%	9.13%	28.47%	31.07%	27.13%
Information about EdTech effectiveness from other teachers' points of view may make me feel more comfortable to integrate them into the classroom	3.57%	7.68%	30.54%	37.05%	21.16%
I need more training to effectively incorporate EdTech tools in the classroom	7.23%	14.55%	29.11%	25.98%	23.13%
I'd like to know about best practices for how incorporating EdTech tools	5.56%	9.32%	25.90%	34.41%	24.82%
I'd like to have info on successful EdTech tools coaches' experiences	6.52%	10.63%	25.11%	34.14%	23.59%
I'd like to have a network where I share opinions with other teachers on EdTech tools	8.71%	11.85%	29.35%	27.83%	22.26%

Note. Q16 On a five-point scale, where 5 means strongly agree, and 1 means strongly disagree, please rate your level of agreement with the following items about EdTech tools.

Using EdTech Tools Improves Students' Learning Experiences and Outcomes. The majority of respondents (67.08%) agree (35.42%) or strongly agree (31.66%) that using EdTech tools improves students' learning experiences and outcomes. This indicates a strong positive sentiment towards the effectiveness of EdTech tools among the respondents. A significant portion (27.37%) of respondents is neutral. This could suggest that while they do not have strong objections, they may not have seen significant evidence to strongly support or oppose the statement. Only a small percentage of respondents either disagree (3.13%) or strongly disagree (2.42%) with the statement, indicating that negative sentiment towards the effectiveness of EdTech tools is quite low.

Confidence in Integrating EdTech Tools into the Classroom. The majority of respondents (58.20%) agree (31.07%) or strongly agree (27.13%) that they feel confident in integrating EdTech tools into the classroom. This indicates that more than half of the respondents have a positive sentiment towards their ability to integrate EdTech tools effectively.
A significant portion (28.47%) of respondents is neutral. This could suggest that while they do not feel unconfident, they may still have reservations or require more support and training to feel fully confident. A smaller percentage of respondents either disagree (9.13%) or strongly disagree (4.21%) with the statement, indicating that a minority of respondents do not feel confident in integrating EdTech tools.

Impact of Information on EdTech Effectiveness From Other Teachers' Perspectives. A substantial majority of respondents (58.21%) agree (37.05%) or strongly agree (21.16%) that information about EdTech effectiveness from other teachers' points of view would make them feel more comfortable integrating these tools into the classroom. This indicates a strong positive

sentiment towards the value of peer feedback and shared experiences in increasing comfort with EdTech integration.

A significant portion (30.54%) of respondents is neutral. This could suggest that while they do not oppose the idea, they may need more concrete evidence or additional support to be convinced of its benefits. A smaller percentage of respondents either disagree (7.68%) or strongly disagree (3.57%) with the statement, indicating that a minority of respondents do not find peer feedback as crucial to their comfort in integrating EdTech tools.

Need for Additional Training to Incorporate EdTech Tools Effectively. A significant portion of respondents (49.11%) agree (25.98%) or strongly agree (23.13%) that they need more training to effectively incorporate EdTech tools in the classroom. This indicates that nearly half of the respondents recognize a need for additional training to feel more capable and effective in using EdTech tools. A substantial portion (29.11%) of respondents are neutral. This could suggest that while they may not strongly feel the need for more training, they are not entirely confident without it. A smaller percentage of respondents either disagree (14.55%) or strongly disagree (7.23%) with the statement, indicating that some respondents feel adequately trained or do not see additional training as necessary.

Interest in Best Practices for Incorporating EdTech Tools. A significant portion of respondents (59.23%) agree (34.41%) or strongly agree (24.82%) that they would like to know about best practices for incorporating EdTech tools. This indicates a strong interest among respondents in learning effective strategies and methods for integrating EdTech tools into their teaching practices. A substantial portion (25.90%) of respondents are neutral. This suggests that while they may not be opposed to learning about best practices, they may already feel confident or may not prioritize this information as highly as others. A smaller percentage of respondents

either disagree (9.32%) or strongly disagree (5.56%) with the statement, indicating that a minority of respondents do not see a need for learning about best practices or feel they already have sufficient knowledge.

Desire for Information on Successful EdTech Tools Coaches' Experiences. The survey indicates considerable interest to have information on successful EdTech tools coaches' experiences with a significant portion of respondents (57.73%) agree (34.14%) or strongly agree (23.59%). A substantial portion (25.11%) of respondents are neutral. This could suggest that while they may be open to learning about coaches' experiences, they may not prioritize it as highly as others, or they might need more context on the value it could provide. A smaller percentage of respondents either disagree (10.63%) or strongly disagree (6.52%) with the statement, indicating that a minority of respondents do not see a need for information on coaches' experiences or feel they already have sufficient knowledge.

Interest in a Network for Sharing Opinions on EdTech Tools. A notable proportion of educators (50.09%) agree (27.83%) or strongly agree (22.26%) that they would like to have a network where they can share opinions with other teachers on EdTech tools. This indicates a substantial interest among respondents in having a platform or community for discussing and exchanging ideas about EdTech tools with their peers. A substantial portion (29.35%) of respondents are neutral. This could suggest that while they may not be opposed to such a network, they might need more information on its benefits or may not see it as a high priority. A smaller percentage of respondents either disagree (11.85%) or strongly disagree (8.71%) with the statement, indicating that a minority of respondents do not see a need for such a network or feel they already have sufficient opportunities to share opinions on EdTech tools.

Overall, research Question 4 investigates the criteria determining the effectiveness of EdTech tools, revealing key dimensions educators use. The majority prioritize measurable improvements in student learning outcomes, while nearly sixty percent emphasize alignment with instructional goals. Additionally, significant percentages highlight student engagement and interest as crucial factors. Conversely, fewer rely on peer experiences or express uncertainty in judging effectiveness. The qualitative analysis underscores themes such as the importance of student growth data, user-friendliness, alignment with standards, and enhancing engagement through accessible technologies.

Survey question 16 further explored educators' perceptions of EdTech impact, indicating that the majority of respondents have a positive sentiment towards the use of EdTech tools, with most agreeing or strongly agreeing that these tools improve students' learning experiences and outcomes. Confidence in integrating EdTech tools into the classroom was also relatively high, with more than half of the respondents expressing confidence. The importance of peer feedback is underscored, as many believe that information from other teachers' perspectives would enhance their comfort in using EdTech tools. However, there is a recognized need for additional training, with nearly half of the respondents indicating they require more training to incorporate these tools effectively. There is a strong interest in learning best practices and gaining insights from successful EdTech coaches. Furthermore, many respondents expressed a desire for a network to share opinions with other teachers on EdTech tools, highlighting a substantial interest in collaborative platforms for discussing EdTech integration.

Results for Open-Ended Question

The rapid evolution of educational technology (EdTech) has brought forth transformative tools, among which artificial intelligence (AI) stands out as a potentially disruptive force in

classrooms worldwide. As schools increasingly explore integrating AI-driven applications to enhance teaching and learning experiences, assessing educators' preparedness and perspectives regarding these advancements becomes crucial (Barton & Johnson, 2019).

Survey question 19 aimed to investigate educators' readiness for using artificial intelligence within educational settings, probing their current levels of familiarity, concerns, and perceived benefits. Participants were invited to provide an open-ended response to this question. A qualitative data analysis was conducted, where responses were themed. When prompted with "Based on the responses provided, generate common themes with number of responses and examples," the ChatGPT-generated text indicated the common themes reported below (OpenAI, 2024). There were a total of 1123 responses to this question. Table 6 categorizes the responses based on the participants' readiness for using artificial intelligence in the classroom, showing the number of responses for each readiness level.

Table 6

Participants' Readiness for the Use of Artificial Intelligence in the Classroom

Readiness Level	Number of Responses
No	751
Yes	229
Somewhat	95
Not sure/Unclear	48

Outlined below are examples representing each thematic category.

- No

"No, Elementary - They need to learn how to think, write, and figure things out for themselves first."

"No, I need training on how to use AI."

"No, and I do not wish to do so until concerns about data privacy, intellectual property, encoded bias, etc., are sufficiently addressed."

- Yes

"I'm confident that I am well prepared. I use LLMs and generative AI models from time to time. I've personally enrolled in courses offered by OpenCV on this subject."

"Yes, very prepared."

"Yes, I already use GPT on a regular basis for creating lesson plans etc. I encourage students to use it as well for research purposes."

- Somewhat

"Somewhat prepared but eager to learn more."

"Somewhat. I can understand how it could be useful, especially in differentiated instruction, however student uses for cheating may be problematic."

"I'm somewhat prepared as I've been learning about AI on my own. My biggest issue is to provide access to AI to ALL my students and to teach them how to credit AI when completing assignments."

- Not sure/Unclear

"Not sure."

"I'm not sure but I think so."

"I am not sure."

A significant majority (67%) of respondents indicated they are not prepared for the use of AI in the classroom. Common reasons include lack of training, concerns about data privacy, and the belief that AI might hinder students' critical thinking skills. About 20% of respondents feel prepared, often citing personal initiative in learning about AI and the existing use of AI tools in

their teaching practices. Approximately 8% feel somewhat prepared but highlight the need for more training and clearer guidelines. A smaller group (4%) is unsure about their preparedness, indicating a need for more information and clarity on the use of AI in educational settings.

Summary of Results

Throughout this chapter, the researcher has detailed the data collected from the twenty-four-question survey. The survey (Appendix D) consisted of a mixture of open-response, matrix, single-answer multiple-choice, five-point scale, and multi-answer multiple-choice. The researcher created the survey through SurveyMonkey and collected data during a two-week window. All data collected was confidential, and no personal information was collected to identify participants. The researcher invited 129,645 teachers to the survey via email (Appendix B). A total of 1914 responses were collected, with 1862 (97.28%) providing informed consent. Out of these, 1123 surveys were fully completed. The data collected from the survey was analyzed using descriptive statistics. Due to the substantial number of qualitative responses received in the survey "Other" option, the researcher also employed a qualitative data analysis, theming and analyzing the responses through ChatGPT 4. The twenty-four survey questions were divided into six sections: 1) demographic data; 2) results for research question 1; 3) results for research question 2; 4) results for research question 3; 5) results for research question 4; and 6) findings of the open-ended survey question.

The data revealed significant insights into educators' demographics, preferences, and challenges related to EdTech tools. Predominantly, experienced female educators over the age of 51, teaching in Pre-K through 5th grades, expressed varying degrees of satisfaction with the training and support received for EdTech integration.

Analysis of the data for Research Question 1, "What criteria are used by K-12 teachers to select EdTech tools?" showed that the decision-making process for selecting EdTech tools is primarily controlled by district-level authorities, with teachers' input being secondary. Factors such as cost, relevance to academic disciplines, and alignment with educational standards were critical criteria. Still, there was a notable demand for more inclusive decision-making processes that incorporate teachers' perspectives and provide adequate training and resources. Additionally, educators emphasized the importance of hands-on trials, best practices, and mentorship from EdTech coaches.

Data results for Research Question 2, "To what extent are K-12 teachers receiving support and training in selecting EdTech tools?" highlighted mixed satisfaction levels regarding the support and training received. While some improvements were noted during and after the COVID-19 pandemic, significant gaps remained, underscoring the need for comprehensive and consistent professional development initiatives.

A review of the data about Research Question 3, "What are the perceptions and attitudes of the teachers towards EdTech tools?" identified critical barriers to EdTech adoption, such as cost, insufficient training, and time constraints. The pandemic significantly increased daily usage of EdTech tools, which remained higher post-pandemic than pre-pandemic levels. This sustained usage reflects the critical role of technology in education and the need for ongoing support.

Data related to Research Question 4, “What determines an effective EdTech tool?” revealed that educators prioritize measurable improvements in student learning outcomes, alignment with instructional goals, and student engagement as key indicators of EdTech tool effectiveness. The data also showed widespread interest in additional training, best practices and gaining insights from successful EdTech coaches to optimize technology integration into

teaching practices. The importance of peer feedback was underscored, as many believe that information from other teachers' perspectives would enhance their comfort in using EdTech tools. Furthermore, a significant number of teachers expressed a desire for a network to share opinions with other teachers on EdTech tools, highlighting a substantial interest in collaborative platforms for discussing EdTech integration.

Finally, a significant majority of respondents indicated a lack of preparedness for using AI in the classroom, citing concerns about data privacy and the potential impact on critical thinking skills. These findings collectively suggest a substantial need for a product that supports teachers in selecting effective EdTech tools, provides comprehensive training and resources, and addresses barriers to adoption. Such a product would facilitate informed decision-making, enhance instructional strategies, and ultimately improve educational outcomes.

Chapter V: Conclusion

Introduction

The final chapter interprets and contextualizes the results presented in Chapter IV, discussing the implications of the findings and their significance in relation to existing literature, theoretical frameworks, and research questions. It also explores any unexpected or contradictory results and attempts to explain them. Furthermore, it includes recommendations for future research, implications for practice, and study limitations.

The study aimed to enhance the understanding of EdTech tools used in K-12 schools by analyzing their benefits to teaching and learning, as well as the challenges educators face in integrating them. It focused on examining the selection process of EdTech tools, identifying decision-makers, and assessing whether teachers receive adequate support and training and have the necessary information to evaluate EdTech tools' effectiveness. The researcher employed a quantitative approach to investigate the criteria for selecting digital tools, identify decision-makers, evaluate support and training for teachers, and assess perceptions of tool effectiveness. This involved conducting a quantitative survey alongside action research and collecting electronic data from teachers at the research site. A needs assessment was conducted through the survey to assess the need for a product that aids in selecting effective tools and enhancing education. Due to the many qualitative responses, the researcher also performed thematic analysis to interpret the data and identify key patterns. This mixed-method approach provided detailed insights into tool selection criteria, revealing educator experiences and preferences that quantitative methods alone may not have fully captured.

The results from the survey, outlined in the previous chapter and summarized in this chapter, confirmed the need for a product to help teachers select the right digital tools and have

information about their effectiveness. This study and the product will guide K-12 teachers willing to integrate digital tools into their classrooms, thereby improving educational outcomes by providing tools, strategies, and insights for effective EdTech tools integration.

Summary of Results

The demographic findings underscored educators' complex roles and diverse practices within the surveyed population. The insights from this analysis inform understanding of demographic trends and professional experiences and highlight educators' varied and nuanced approaches to meeting students' educational needs effectively. The survey revealed that most respondents were female educators, predominantly aged 51 or older, indicating extensive teaching experience. They represented diverse career stages, with many having over 16 years in education. Teaching assignments focused mainly on Pre-K through 5th grades and high school settings, often involving multiple subjects. English Language Arts (ELA) was the subject taught the most, followed by Math and Science. The qualitative analysis highlighted recurring themes, including multi-subject teaching roles, emphasis on core subjects, significant engagement in Special Education (ESE), integration of STEM and technology, and tailored instructional strategies for diverse student needs.

In exploring EdTech tool selection among K-12 educators, key priorities emerged centered on enhancing student engagement, supporting assessment practices, and facilitating instructional delivery. Preference leaned towards no-cost tools, underscoring a clear call for more inclusive decision-making frameworks that prioritize educators' input and provide requisite training and resources. Crucial aids in the selection process encompassed insights into best practices, evidence-based methodologies, and empirical validations through case studies to optimize instructional outcomes. Educators consistently articulated a need for time and

opportunities to experiment with various digital tools, valuing practical trials and open-access alternatives before definitive adoption decisions.

The findings also underscored the persistent and central role of district-level authorities in overseeing the selection of EdTech tools across different phases of the pandemic and educational contexts. While teachers and school administration are actively involved, especially before and during the pandemic, district-level control strengthened post-pandemic, potentially reflecting broader strategic planning and policy implementation in integrating educational technology. Persistent concerns surfaced regarding district-level constraints on tool selection autonomy, eliciting frustrations over perceived limitations in aligning tools with student-specific needs and pedagogical objectives.

The survey findings highlighted varying levels of educators' satisfaction regarding the support and training received for EdTech integration. While improvements were noted during and after the COVID-19 pandemic, significant gaps persisted, emphasizing the necessity for comprehensive and consistent professional development initiatives. Perceptions of school support showed fluctuating satisfaction levels over time, with some improvements noted post-pandemic.

Educators' self-assessed preparedness to use EdTech tools indicated a moderate overall readiness, with a significant portion feeling somewhat prepared but recognizing the need for targeted support for less prepared educators. Primary modalities for professional development included online courses and in-person training, yet gaps in training comprehensiveness and consistency were evident. These findings underscored the urgency for enhanced and tailored professional development initiatives to support educators in effectively integrating EdTech tools

into classroom practices, addressing varying levels of preparedness, and ensuring sustained post-training support.

The analysis of teacher perceptions towards EdTech tools revealed significant barriers, including cost, lack of training, and time constraints, underscoring the need for financial support, professional development, and time management solutions. The pandemic markedly increased the daily use of EdTech tools, a trend that has persisted post-pandemic at elevated levels, highlighting its transformative impact on educational practices. Educators prioritize tools that enhance critical thinking, student engagement, assessment, and personalization, emphasizing the importance of fostering skills and creating dynamic learning environments. Open-ended responses indicated diverse interests and practical challenges, such as resource limitations and alignment with standards. Overall, the findings underscore the importance of addressing barriers to EdTech adoption, leveraging increased familiarity post-pandemic, and aligning tools with educators' priorities to maximize their effectiveness in teaching and learning.

In examining the factors determining the effectiveness of EdTech tools, educators prioritize measurable improvements in student learning outcomes, alignment with instructional goals, and student engagement as pivotal indicators. The analysis also reveals a widespread interest among educators in additional training, best practices, and insights from successful EdTech coaches to enhance technology integration into teaching methodologies. The significance of peer feedback emerges prominently, with educators recognizing the value of insights from colleagues in bolstering their confidence and proficiency in utilizing EdTech tools. Moreover, a notable proportion of teachers need a collaborative network to exchange opinions and experiences regarding EdTech tools, emphasizing a solid interest in platforms conducive to collective discussions on EdTech integration.

Finally, a notable majority of participants expressed unpreparedness for implementing AI in classrooms, primarily due to apprehensions regarding data privacy and potential effects on critical thinking abilities. The results underscored a significant requirement for a solution that aids educators in choosing suitable EdTech tools, delivers thorough training and resources, and mitigates adoption challenges. This tool would promote informed decision-making, elevate teaching methodologies, and enhance educational achievements.

Discussion of Results

This section delved into the implications of the study's findings, interpreting their significance in relation to the existing body of literature, theoretical frameworks, and the research questions that guided the study. The researcher examined each research question individually, highlighting the contributions and potential impact of the findings on adopting EdTech. Additionally, this section explored any unexpected or contradictory outcomes, providing possible explanations and considering their implications. Through this comprehensive analysis, the researcher sought to offer a nuanced understanding of the barriers and enablers of EdTech adoption in K-12 schools and how these insights can inform future research, policy, and practice.

Research Question 1

The aim of Research Question 1, "What criteria are used by K-12 teachers to select EdTech tools?" was to investigate the factors and considerations that influence teachers' decisions when choosing EdTech tools for their classrooms. Understanding these criteria was crucial for identifying educators' practical needs and preferences, as well as the pedagogical and technological features prioritized in the selection process. The question sought to uncover the specific attributes of EdTech tools deemed most important by teachers, such as ease of use,

alignment with educational standards, effectiveness in enhancing student engagement and learning outcomes, and accessibility for diverse student populations.

The findings underscored significant considerations in selecting EdTech tools by K-12 educators, emphasizing priorities such as enhancing student engagement, supporting assessment practices, and effectively delivering instructional content. These findings resonate with existing literature on effective technology integration, emphasizing the alignment of tools with instructional goals and the importance of pedagogical relevance (Miller, 2022; Tucker et al., 2017). The preference for free tools over paid alternatives aligns with educators' practical considerations within constrained budgets and reflects broader discussions on resource allocation in educational technology (Gallup-New Schools Venture Fund, 2019). The implications of these findings highlight a critical need for inclusive decision-making processes that empower educators to select tools aligned with their instructional needs, supported by evidence-based strategies and professional development opportunities (Erkens et al., 2018).

Information on best practices emerged as the most influential resource for aiding the selection of EdTech tools, with 63.67% of respondents emphasizing its importance. Educators value access to evidence-based strategies and case studies that validate the efficacy of specific tools in improving instructional outcomes. Personalized professional learning (58.50%) ranked prominently, underscoring educators' preference for tailored training that aligns with their instructional needs and technological proficiency levels. The role of instructional technology coaches (44.88%) was also significant, with educators valuing direct guidance and mentorship in navigating the vast array of digital tools available. Professional learning networks (36.69%) were cited as another valuable resource, enabling educators to collaborate, share insights, and learn from peers who have successfully integrated digital tools in similar educational settings.

The findings also underscored the persistent and central role of district-level authorities in overseeing the selection of EdTech tools across different phases of the pandemic and educational contexts. While teachers and school administration are actively involved, especially before and during the pandemic, district-level control strengthened post-pandemic, potentially reflecting broader strategic planning and policy implementation in integrating educational technology. These results are crucial for understanding the distribution of decision-making authority in educational technology adoption, informing policies to enhance technology integration, and supporting educators in effectively utilizing EdTech tools in teaching and learning environments. Additionally, the constraints imposed by district policies underscore challenges in achieving autonomy in tool selection, suggesting a potential gap between educator autonomy and administrative directives.

The findings also resonated with the frameworks and models discussed in the literature, such as Bloom's digital taxonomy and the TPACK (Technological Pedagogical and Content Knowledge) framework, which emphasize the importance of selecting EdTech tools that align with educational objectives and enhance pedagogical practices (Sneed, 2016; Wang, 2023). Educators' preferences for tools that support higher-order thinking, like those outlined in Bloom's digital taxonomy (Churches, 2008), underscore the significance of integrating technology to foster critical thinking and creativity among students. Similarly, the TPACK framework highlights the intersection of technological, pedagogical, and content knowledge necessary for effective technology integration (Hamilton, 2018). These frameworks provided structured approaches for evaluating and improving the selection and use of digital tools, ensuring they contribute meaningfully to student learning outcomes and instructional effectiveness. Thus, the

findings underscored the importance of aligning technological tools with these established frameworks to optimize their impact on teaching and learning in K-12 education.

A notable finding from the survey was the prevalent reliance on informal decision-making processes among educators, with a majority (59.22%) preceding specific criteria in favor of personal experience, recommendations, and immediate instructional needs. This contrasts with the structured approaches observed in the minority who utilize technology integration frameworks like SAMR (Substitution, Augmentation, Modification, Redefinition) and TPACK (Technological Pedagogical and Content Knowledge) (21.28%) and evaluation rubrics (16.83%) to assess digital tool effectiveness. These findings underscored a significant gap between the potential benefits of structured frameworks, such as Bloom's digital taxonomy and TPACK, and their actual adoption in practice. While these frameworks offer systematic guidance for aligning tools with educational objectives and enhancing teaching practices (Hamilton, 2018; Sneed, 2016), the predominance of informal decision-making highlights a need for greater awareness and training among educators in leveraging these frameworks effectively.

The discrepancy suggested opportunities for professional development initiatives to promote the use of technology integration models to optimize student learning outcomes. By bridging this gap, educators can more effectively harness the potential of EdTech tools to support diverse instructional goals and enhance student engagement and learning. This aligns with broader discussions in educational research and practice on the importance of integrating structured frameworks with practical teaching strategies, ensuring that technological advancements in education are leveraged to their fullest potential. Thus, addressing these findings enhances educator preparedness in technology integration and strengthens the overall quality of educational experiences in K-12 settings.

Research Question 2

Central to the effective implementation of EdTech tools is providing thorough training and support for educators, equipping them with the expertise and skills necessary to utilize technology efficiently in their teaching practices. Research Question 2, "To what extent are K-12 teachers receiving support and training in selecting EdTech tools?" aimed to investigate the degree to which K-12 teachers receive support and training in selecting EdTech tools. The objective was to evaluate how well-prepared educators are to integrate technology into their classrooms.

Data revealed varying levels of satisfaction among educators regarding the training they received. Before the COVID-19 pandemic, dissatisfaction with training was prevalent among educators, which improved during and immediately after the pandemic. Post-pandemic, 55.18% of educators reported satisfaction with their training (9.20% very satisfied and 45.98% satisfied), while dissatisfaction declined to 34.02%. Perceptions of school support also fluctuated over time, with 56.69% expressing satisfaction post-pandemic, compared to 50.27% before the pandemic. Educators generally assessed themselves as moderately prepared to use EdTech tools, with a significant proportion feeling somewhat prepared. Predominant professional development methods included online courses and in-person training, yet gaps in comprehensiveness and consistency of training were identified.

These findings underscored the critical need for enhanced and tailored professional development initiatives. Such initiatives are essential to support educators in effectively integrating EdTech tools aligned with educational goals, address varying levels of preparedness, and sustain support beyond initial training phases. The implications of these findings align with existing literature, emphasizing the ongoing gap between the expectations for technology-

enhanced teaching and the actual training provided to educators (Ertmer et al., 2012; Promethean, 2020). Effective professional development opportunities, such as personalized professional learning and community of practice models, are crucial for empowering educators to navigate these challenges, ensuring that EdTech integration contributes meaningfully to student learning outcomes and instructional effectiveness (Gallup-New Schools Venture Fund, 2019; Hamilton, 2018). Addressing these gaps through targeted and sustained professional learning approaches remains pivotal in bridging the divide between technological potential and effective educational practice.

Research Question 3

"Research Question 3, "What are the perceptions and attitudes of teachers towards EdTech tools?" aimed to investigate educators' attitudes and perceptions regarding EdTech tools. The literature consistently underscored that cost, training deficiencies, and time constraints are significant barriers to effectively integrating EdTech tools in educational settings (Gallup-New Schools Venture Fund, 2019; GoGuardian, 2016). These findings are echoed in the present study, which identified these factors as primary concerns among educators, highlighting the urgent need for financial support, comprehensive professional development, and improved time management strategies to address these challenges.

Specifically, the data revealed several reasons educators may choose not to adopt EdTech tools. Cost emerges as the most significant barrier, with 50.49% of respondents citing financial constraints as a deterrent. Furthermore, 48.35% of educators identified a lack of training as a substantial impediment, while 43.99% cited time constraints, reflecting the practical challenges faced by educators.

Moreover, while previous studies have noted the potential for global crises, such as the COVID-19 pandemic, to accelerate the adoption of EdTech tools (LearnPlatform, 2022), the current research confirms that the pandemic indeed spurred increased daily use of EdTech tools, with sustained levels observed post-pandemic. This underscored the transformative impact of crisis-driven educational shifts on technology integration practices.

Despite these challenges, educators in the study prioritized EdTech tools that enhance critical thinking, engagement, assessment, and personalization, aligning closely with literature highlighting the pedagogical benefits of such tools (LearnPlatform, 2022). However, open-ended responses revealed diverse interests in specific content areas and practical obstacles related to resource limitations and alignment with educational standards, indicating nuanced perspectives within the teaching community regarding adopting and implementing EdTech tools. Addressing these findings necessitates tailored strategies that leverage increased familiarity with EdTech post-pandemic while addressing educators' priorities to maximize the educational impact of technological innovations.

Research Question 4

Based on the findings related to the research question "What determines an effective EdTech tool?" this study illuminates several critical dimensions that educators prioritize in evaluating and adopting educational technology. The literature underscored the urgent need for digital literacy and effective digital learning environments, particularly highlighted during the COVID-19 pandemic's rapid shift to online education (EY-Parthenon, 2022; Jackman et al., 2021). The pandemic accelerated technology integration into K-12 education, emphasizing the importance of digital skills and literacy across all age groups (Park et al., 2020).

Despite widespread enthusiasm among educators for integrating digital tools into their teaching practices, concerns persist regarding the availability of reliable information on tool effectiveness and variability in their integration across educational settings (Artal et al., 2021; Bill & Melinda Gates Foundation, 2015; Gallup-New Schools Venture Fund, 2019). This study's findings reinforce these concerns while providing insights into educators' criteria for assessing EdTech tools. Key determinants identified include measurable improvements in student learning outcomes, alignment with instructional goals, and enhancement of student engagement and interest, echoing literature on the pedagogical benefits of effective digital tools (Gallup-New Schools Venture Fund, 2019).

Surprisingly, the study revealed a lesser reliance on peer experiences and some uncertainty in judging tool effectiveness, suggesting a need for more straightforward evaluative frameworks and robust peer-sharing mechanisms to enhance educators' confidence in selecting and utilizing EdTech tools effectively. Educators expressed positive sentiments towards EdTech tools, perceiving them as contributors to improved learning experiences and student outcomes. Survey data further underscored the desire for evidence-based demonstrations of effectiveness and the need for additional training to effectively integrate these tools into classrooms, as highlighted in the literature (Education Week Research Center, 2022; Gallup-New Schools Venture Fund, 2019).

A unique contribution of this research is the identified need for a product designed to help teachers select the right digital tools based on clear, evidence-based demonstrations of effectiveness. Teachers expressed a strong desire for tools that offer tangible proof of their impact on student engagement and learning outcomes, underscoring a critical gap in the market for EdTech products that provide comprehensive support and reliable information from the

teachers' perspective, as emphasized in the literature (Artal et al., 2021; LearnPlatform, 2022). The proposed product addresses these practical challenges educators face, emphasizing criteria for tool selection, best practices, and opportunities for peer collaboration to enhance educational outcomes through effective EdTech integration.

Open Ended Question

Based on the findings related to the research question, "Are you prepared for the use of artificial intelligence in the classroom?" this study provided insights into educators' current readiness and perceptions regarding the integration of AI technologies. The literature underscored the rapid evolution of technology in education, particularly highlighted by the shift from emergency to long-term planning post-COVID-19, emphasizing adaptive decision-making and flexible learning experiences (Pelletier et al., 2022). Technologies such as personalized learning, adaptive learning, and AI-driven tools like chatbots and virtual assistants are increasingly recognized for their potential to enhance student engagement and learning outcomes (Alexander et al., 2019; Grant & Basye, 2014).

However, the findings revealed a significant gap between enthusiasm for AI's potential benefits and concerns about its practical implementation in educational settings. Most respondents expressed unpreparedness for integrating AI tools, citing apprehensions about data privacy and potential impacts on critical thinking skills. This contrasts with the literature's optimistic portrayal of AI's ability to personalize learning experiences and streamline educational processes (Pelletier et al., 2022). The study highlighted educators' cautious approach toward AI adoption, suggesting a need for robust support systems that address concerns, provide clear guidelines on ethical use, and offer comprehensive training on integrating AI tools effectively into classroom practices.

Unexpectedly, despite the perceived benefits of AI in enhancing educational experiences, educators' readiness to implement these technologies still needs to be improved by practical considerations and ethical concerns. This discrepancy underscored the complexity of integrating AI technologies into educational contexts and the importance of addressing educators' hesitations through targeted professional development and policy frameworks (Hu, 2022; Yanduri & Majid, 2022). Moving forward, efforts to bridge this readiness gap will be crucial in harnessing AI's full potential to support teaching and learning in ways that are ethical, effective, and aligned with educational goals. This study contributed to ongoing discussions on AI's role in education, highlighting the need for balanced approaches that maximize benefits while mitigating risks associated with its implementation in K-12 classrooms.

Limitations

Multiple factors have limited the results of this research study. First, the researcher accessed 187,303 email addresses of Florida public school teachers from the Florida Department of Education. However, many entries were duplicates or lacked email addresses, and after filtering out-of-scope categories, the valid email count was reduced to 129,645. Approximately 3% of these emails either were opted out or bounced due mainly to school district filters and firewalls, making many emails unable to be delivered. The time the survey was open, the two-week window, and the time of the year (after spring break) were also noted as limitations in the number of qualified participants. Despite the substantial number of responses received, the overall response rate of approximately 1.6 % of invited participants raises concerns about the generalizability of the findings to the broader population of K-12 educators.

Several limitations can be identified in the methodology used by the researcher to conduct the survey via SurveyMonkey. Firstly, the reliance on SurveyMonkey's email

distribution system, with its constraints on batch sizes and the 24-hour waiting policy for large distributions, imposed logistical challenges that could have affected the timeliness and uniformity of survey responses. The need to pause survey distribution for one day due to this waiting policy may have introduced unintended delays and disrupted the survey's momentum. Moreover, while the researcher utilized automatic reminders to boost response rates, the higher response rates observed with subsequent reminders compared to initial invitations suggest potential biases in respondent behavior influenced by the timing or frequency of reminders.

Participants' unfamiliarity with EdTech tools led to requests for examples and clarifications and potentially skewed responses towards general technology rather than specific EdTech tools. While the research study had a substantial number of survey participants, the researcher noted that some teachers may have provided responses they believed to be correct rather than reflecting their genuine opinions. This could be due to a desire to appear knowledgeable. Since the survey indicated that the selection of EdTech tools is often district-centered, some responses may lack reliability because teachers are not directly involved in the selection process. Additionally, the broad range of EdTech tools and teacher categories included in the survey further complicates the interpretation of the data.

The reliance on self-reported data introduces response bias, and using an AI-driven tool for qualitative data analysis could need more transparency, affecting the interpretation of findings. Furthermore, some participants were unfamiliar with the research study process, and many inquired about the source of their email addresses, indicating a need for greater transparency and engagement. Overall, these limitations highlight the need for cautious interpretation of the results and suggest areas for further research to understand better educators' needs and challenges in adopting EdTech tools effectively.

Implications for Practice

Based on the findings of this study, several critical implications for integrating EdTech tools into K-12 education emerged. Firstly, teachers prioritize tools that enhance student engagement, align with curriculum standards, and support diverse learning needs. When evaluating and approving EdTech tools for classroom use, educational policymakers should prioritize these factors, focusing on tools that demonstrate measurable improvements in student learning outcomes.

Secondly, the study highlighted the crucial need for comprehensive support and training for teachers in selecting and using EdTech tools. Many teachers face challenges due to inadequate training, time constraints, and limited resources. To address these issues effectively, school districts and educational institutions should invest in ongoing professional development programs and provide access to instructional technology coaches.

Furthermore, teachers' perceptions and attitudes towards EdTech tools also underscored the need for user-friendly tools that simplify teachers' workload and align with educational standards. It is essential to involve teachers in the decision-making process regarding adopting EdTech tools, ensuring their voices are heard and their practical insights are considered. This collaborative approach can lead to selecting tools more likely to be accepted and effectively utilized by educators.

Lastly, effective EdTech tools support student growth, provide meaningful data, and enhance student engagement. Stakeholders should prioritize tools based on these criteria to ensure they align with instructional goals and accommodate diverse teaching styles and classroom dynamics.

The researcher developed a prototype of the "All-In-One Edtech Toolkit" website to address these identified needs. This platform aims to provide a comprehensive database of EdTech tools, categorized for easy access. It features a review system where teachers can leave detailed reviews and rate tools based on their experiences. Additionally, the website offers professional development resources, such as webinars and video tutorials, to support teachers in integrating EdTech tools. It showcases best practices and case studies to guide successful EdTech implementations and facilitates a collaborative platform for educators to share experiences and solutions. Moreover, the website includes resources and guidelines to address common barriers to EdTech adoption. By focusing on teacher perspectives and addressing their practical needs, this prototype website aims to empower educators, improve instructional strategies, and enhance educational outcomes across K-12 settings. The insights gathered from teachers' experiences can be invaluable to districts when making informed decisions about EdTech tool adoption and implementation.

All-In-One Edtech Toolkit

The prototype "All-In-One Edtech Toolkit" website is designed to address the comprehensive needs of K-12 educators by offering a multi-faceted platform that enhances their ability to integrate EdTech tools effectively.

The homepage of the All-In-One Edtech Toolkit offers a comprehensive introduction to the platform, outlining its mission to revolutionize education by equipping educators with the latest EdTech tools and resources to foster engaging learning environments. It underscores the inspiration behind its development, emphasizing the dedication to promoting creativity, critical thinking, and innovation in classrooms. Upon navigating the homepage, users encounter distinct sections that offer concise summaries of the platform's core components: its mission, specialized

professional development offerings for educators, best practices for effective EdTech integration, and guidelines for selecting suitable tools. Each section invites users to explore further by clicking through for detailed insights, aiming to provide a comprehensive overview of the platform's capabilities and resources available to support educational advancement.

The "About" page of the All-in-one EdTech Toolkit articulates its mission to transform education by equipping educators with cutting-edge EdTech tools that promote creativity, critical thinking, and innovation in classrooms. It underscores the platform's commitment to providing a comprehensive database of categorized tools, a robust review system for user feedback, and professional development resources tailored to enhance educators' instructional strategies. Finally, it presents the inspiration behind the implementation, explaining that a research-driven recognition of the need for effective integration of EdTech tools in educational settings inspired it.

The "EdTech Tools" page offers a comprehensive database organized into distinct categories, providing users with a systematic overview of available educational technology tools. Each category allows users to easily navigate and explore related EdTech tools tailored to their instructional needs. The selection of these categories was guided by survey findings, which highlighted educators' preferences for tools that enhance student engagement, support assessment practices, facilitate instructional delivery, personalize learning experiences, and foster critical thinking skills. These categories were specifically chosen to align closely with educators' objectives of improving educational outcomes and classroom effectiveness through technology integration. Additionally, educators are encouraged to actively participate by providing detailed feedback and ratings based on their direct experiences with these tools. This community-driven approach enhances the evaluation process and fosters collaboration among educators, thereby

promoting informed decision-making in integrating technology into their teaching methodologies.

The 'Best Practice' page offers educators resources to optimize instructional outcomes through best practices and empirical validations found in case studies. Educators are equipped to make informed decisions that align with their instructional goals by providing insights into best practices, practical tips, and strategies. Additionally, the page facilitates community engagement through a link to a forum where teachers can share experiences, support one another, and collaborate on solving challenges related to integrating educational technology effectively into their teaching practices. This collaborative platform fosters a community-driven approach to professional development and continuous improvement in educational practices.

The "Professional Development" page provides educators with diverse resources to effectively integrate EdTech tools into their instructional methods, such as video tutorials that offer step-by-step guidance on proficiently using various EdTech tools within the classroom environment. Additionally, educators can participate in both live and recorded webinars where experts share insights into best practices and innovative applications of EdTech. Interactive training modules are also available, featuring self-paced courses equipped with interactive elements, quizzes, and practical assignments designed to bolster teachers' competencies. These resources are thoughtfully curated to cater to various learning preferences, empowering educators to refine their instructional strategies and ultimately enhance student learning outcomes.

The "Selection Process" page offers educators a comprehensive framework for navigating the complexities of choosing the appropriate EdTech tools. Making informed decisions in this regard involves considering multiple factors, including technology integration frameworks that

guide educators in evaluating tools based on their alignment with instructional goals. The page highlights the importance of standards and current trends in educational technology, ensuring that the tools selected meet educational standards and support evolving pedagogical needs. Educators are encouraged to assess how each tool enhances student skills and aligns with the instructional objectives of their curriculum. This systematic approach equips educators with the knowledge and resources necessary to integrate technology effectively into their teaching practices, ultimately enhancing student learning outcomes.

Finally, the "Community" page is a platform that fosters community engagement among educators, providing a forum where teachers can exchange experiences, offer mutual support, and collaborate on addressing challenges associated with effectively integrating EdTech tools into the classroom. This space allows educators to share best practices, pose questions, and offer suggestions based on their personal experiences, thereby contributing to effective professional development initiatives. Additionally, educators can share successful experiences with instructional technology coaches, enhancing collective knowledge and promoting continuous improvement in educational practices through a collaborative and community-driven approach.

Focusing on teacher perspectives and meeting their practical needs, the " All-in-one EdTech Toolkit " prototype aims to empower educators, improve teaching methods, and elevate educational outcomes across K-12 settings. The direct insights from educators' experiences are crucial, offering districts valuable information to make informed decisions about adopting and integrating EdTech tools.

Recommendations for Future Research

The above study has added to the current literature on the criteria used to select EdTech tools for the classroom, the teachers' support and training in selecting them, their perception and attitude toward them, and what determines an effective Edtech tool.

Based on the findings and limitations of this research study, several recommendations can be made for future research:

- Before commencing surveys, providing participants with clear definitions and concrete examples of EdTech tools could minimize participant confusion and ensure that responses align more accurately with the intended subject matter. Additionally, conducting a field test at the outset of the survey process, for example, involving the researcher's doctoral cohort, can prove beneficial. This initial testing phase could allow for the refinement of survey questions, thereby enhancing the overall reliability and clarity of the research instrument used in subsequent data collection efforts.
- Extending the survey period beyond a two-week window and avoiding periods immediately following major breaks can increase participation and capture more varied responses.
- Given that EdTech tool selection is often district-centered, future research should include district administrators and decision-makers to gain a comprehensive understanding of the selection process and to incorporate their perspectives.
- Significant concerns emerge regarding the lack of teacher involvement and autonomy in the selection of EdTech tools within school districts. A substantial proportion of educators express dissatisfaction with their limited role in the decision-making process, often citing district mandates that restrict their ability to choose tools independently. This

situation highlights a critical need for future research to explore strategies that enhance teacher participation in technology selection, promote educator autonomy aligned with instructional needs, and evaluate the impact of district policies on technology integration.

- As AI in education is a growing concern, future research should explore educators' preparedness for using AI, address their concerns about data privacy and critical thinking, and develop strategies for effective AI integration.
- Longitudinal studies could investigate how educators' positive sentiments towards EdTech tools evolve and assess the sustained impact on student learning outcomes.
- Future studies could explore the effectiveness of collaborative networks or platforms for sharing experiences and insights among educators, integrating best practice and peer feedback on EdTech tools, further training in EdTech integration, and successful EdTech tools coaches' experiences.
- Future research endeavors could build upon the implementation and impact assessment of the ' All-in-one EdTech Toolkit" prototype website introduced in this study. This platform could influence educators' ability to select, integrate, and optimize EdTech tools in K-12 classrooms. Further studies could explore longitudinal effects, examining how sustained use of the toolkit influences student engagement, academic performance, and teacher satisfaction over time. Additionally, investigating the scalability and adaptability of the platform across different educational contexts and regions would provide insights into its broader applicability. Furthermore, comparative studies could evaluate the efficacy of the toolkit in enhancing instructional practices compared to traditional methods, offering valuable data for educational policymakers and administrators

By addressing these recommendations, future research can provide a more thorough understanding of educators' challenges and needs in adopting EdTech tools, leading to more effective and supportive solutions.

Summary

The study comprehensively explored adopting educational technology (EdTech) tools within K-12 education, addressing four critical research questions. It investigated the criteria used by K-12 teachers in selecting EdTech tools, highlighting priorities such as student engagement, alignment with educational standards, and effectiveness in enhancing learning outcomes. The findings underscored the significance of practical considerations, such as ease of use and affordability, alongside pedagogical relevance, echoing existing literature on effective technology integration in educational settings (Miller, 2022; Tucker et al., 2017;). The study also highlighted the central role of districts in selecting EdTech tools. Despite educators' involvement, district-level authorities exerted significant influence, emphasizing the need for inclusive decision-making processes and alignment with educators' instructional needs. These dynamics highlight the importance of policy adjustments to enhance educator autonomy and ensure effective EdTech integration.

Additionally, the study examined the extent of support and training provided to K-12 teachers in selecting and using EdTech tools, revealing varying satisfaction levels among educators with professional development programs. This pointed to persistent gaps in training adequacy and consistency, emphasizing the critical need for tailored and sustained professional development initiatives to empower educators and enhance their technological proficiency (Ertmer et al., 2012; Promethean, 2020).

Furthermore, the study explored educators' perceptions and attitudes toward EdTech tools, revealing a complex landscape shaped by cost, training deficiencies, and time constraints. Despite challenges, educators strongly preferred tools that support personalized learning, critical thinking, and engagement, aligning closely with educational goals and pedagogical frameworks according to the literature (LearnPlatform, 2022).

The findings and the literature provided insights into the determinants of effective EdTech tools and highlighted educators' emphasis on measurable improvements in student learning outcomes and the alignment of tools with instructional goals, reflecting broader discussions on the pedagogical benefits of technology-enhanced learning environments (Gallup-New Schools Venture Fund, 2019).

The study brought attention to methodological constraints, emphasizing survey distribution and participant involvement hurdles. Concerns such as email bounce rates and educators' unfamiliarity with EdTech jargon highlighted the necessity for more transparent communication and refined survey procedures. Recommendations for future research include refining survey methodologies, exploring district-level perspectives, and investigating longitudinal impacts and collaborative networks in EdTech adoption to deepen understanding and inform policy and practice in K-12 settings.

Furthermore, the researcher developed a prototype of the "All-In-One Edtech Toolkit" website to empower educators by providing comprehensive resources and support for effective EdTech integration. This platform featured a comprehensive database of EdTech tools and a robust review system for educators to share experiences and rate tools. Additionally, the website offered tailored professional development resources such as video tutorials and webinars, showcased best practices and case studies, fostered a collaborative platform for educators to

share insights and solutions, and equipped them with advocacy tools to navigate common barriers to EdTech adoption. This initiative aimed to enhance instructional strategies and improve educational outcomes across K-12 settings by focusing on teacher perspectives and addressing their practical needs.

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Appendix A: Email to FLDOE Research and Evaluation department and Form Request

Dear FLDOE - Division of Accountability Research and Measurement,

My name is Nunzia Del Vento, I am a doctorate candidate at Lynn University in Boca Raton. I am kindly requesting a report with Florida full-time instructional staff email addresses (See atached request form for details) for my research study, "Reimagining Learning: Overcoming Barriers to Effective EdTech Tools Adoption in K-12 Schools."

The intent of this research study is to enhance the knowledge of EdTech tools used in K-12 schools. It also analyzes their benefits to teaching and learning experiences and educators' challenges in integrating them into the classroom with the final aim to overcome barriers to effective EdTech tools adoption.

For the purpose of this study, EdTech tools are any technology-based content, apps, software, extension, website, or platform intentionally selected to promote student learning regarding accessibility, creativity, critical thinking, communication, collaboration, engagement, and assessment (Mississippi Department of Education, 2022).

The study involves completing one survey. The survey will be distributed via email to teachers in K-12 public schools across Florida. The dissemination will occur promptly once the researcher obtains information and approval from the Florida Department of Education to utilize teachers' email addresses. The purpose of the survey is to evaluate the need for a product aimed at supporting teachers in selecting the right EdTech tools and have information about their effectiveness. Involvement in the study is voluntary, so teachers may choose to participate or not without penalty. All information will be kept anonymous, their names will not appear anywhere.

Please see approved IRB attached.

Do not hesitate to ask any questions about the study, I will be happy to answer.

Thank you for your time.

Nunzia Del Vento

Doctoral Student,

Lynn University

ndelvento@email.lynn.edu.

Division of Accountability Research and Measurement
Bureau of PK-20 Education Reporting and Accessibility
Report Specification Form
One form per request

Filled in by Requester. Please provide as much information as possible and submit this form to: PeraDataRequests@fldoe.org

Section 1	**FDOE REQUESTER**			
	Name: Nunzia Del Vento		**Date Submitted:** 2/19/2024	
	Entity: Lynn University Doctoral Student		**Due Date Requested:** As soon as possible	
	Phone: [redacted]		**Email:** ndelvento@email.lynn.edu	
Section 2	**REQUEST TYPE** (check one below)			
	☒ New Report			
	☐ Annual Update to Existing Report (Provide details in Section 5 below.)			PERA #
	☐ Modification to Existing Report (Provide details in Section 5 below.)			PERA #
Section 3	**ORIGINS OF REQUEST**			
	Organization (if request is on behalf of someone besides the requester): Lynn University			
	Legislative Entity (if Applicable): Choose an item.			
	Request Title/Description or Question Asked by Requester: E-mail list			
Section 4	**OUTPUT REQUESTED**			
	Type of File Requested: Excel			
Section 5	**REQUEST DETAILS**			
	Report Level: Check all that apply			
	☒ State			
	☐ College			
	☐ District			
	☐ School			
	☐ Program			
	☐ Course			
	☐ Combination Specify Combination: Click here to enter text.			
	Staff	☒ Fulltime	☐ Part Time	☒ Instructional only	☐ All Staff
	Year(s): 2023-2024			
	Cohort Description (if applicable): Teachers			
	Count Un-duplication Level: Click here to enter text.			
File Layout: Excel spreadsheet				

Appendix B: Email to participants

Dear Participants,

My name is Nunzia Del Vento, I am a doctorate candidate at Lynn University in Boca Raton. I am kindly requesting your participation in a research study that I am conducting, Reimagining Learning: Overcoming Barriers to Effective EdTech Tools Adoption in K-12 Schools.

The intent of this research study is to enhance the knowledge of EdTech tools used in K-12 schools. It also analyzes their benefits to teaching and learning experiences and educators' challenges in integrating them into the classroom with the final aim to overcome barriers to effecive EdTech tools adoption.

For the purpose of this study, EdTech tools are any technology-based content, apps, software, extension, website, or platform intentionally selected to promote student learning regarding accessibility, creativity, critical thinking, communication, collaboration, engagement, and assessment (Mississippi Department of Education, 2022).

The study involves completing one survey, this will take approximately 10 - 15 minutes of your time. The purpose of the survey is to evaluate the need for a product aimed at supporting teachers in selecting the right EdTech tools and have information about their effectiveness. Involvement in the study is voluntary, so you may choose to participate or not. All information will be kept anonymous, this means that your name will not appear anywhere and no one except me will know about your specific answers.

Your informed consent will be gathered from the online survey. You may withdraw your consent at any time and discontinue participation without consequences of any kind. Participating in this

survey will have minimal risks such as possibly feeling uncomfortable if certain technical terms are discussed. At any time, you may stop and choose not to participate.

You will need to indicate your consent on the link below with full knowledge of the nature and purpose of the study. A copy of this consent form will be provided upon request.

Do not hesitate to ask any questions about the study. I will be happy to answer your questions and share my findings with you after the research is completed.

Thank you for your time and participation.

Click for link to participate

Nunzia Del Vento

Doctoral Student,

Lynn University

ndelvento@email.lynn.edu.

Dr. JeVaughn J. Lancaster

Disserta□on Chair

jjlancaster@lynn.edu

For any questions regarding your rights as a research participant, you may contact

Dr. Erika Grodzki

IRB Chair

egrodzki@lynn.edu

Appendix C: Informed Consent

Informed Consent

Reimagining Learning: Overcoming Barriers to Effective EdTech Tools Adoption in K-12 Schools

Purpose of the Research

The intent of this research study is to enhance the knowledge of EdTech tools used in K-12 schools. It also analyzes their benefits to teaching and learning experiences and educators' challenges in integrating them into the classroom with the final aim to overcome barriers to effective EdTech tools adoption.

For the purpose of this study, EdTech tools are any technology-based content, apps, software, extension, website, or platform intentionally selected to promote student learning regarding accessibility, creativity, critical thinking, communication, collaboration, engagement, and assessment (Mississippi Department of Education, 2022).

Duration of Participation and Compensation

This will take approximately 10 - 15 minutes of your time. There will be no compensation for participation. Involvement in the study is voluntary, so you may choose to participate or not. You may withdraw your consent at any time and discontinue participation without consequences of any kind.

Benefits

The benefit of this research is that you will be helping me to understand the challenges teachers face to effective EdTech adoption in K-12 schools and to evaluate the need for a product aimed at supporting teachers in selecting the right EdTech tools and have information about their effectiveness.

Risks

Participating in this survey will have minimal risks such as possibly feeling uncomfortable if certain technical terms are discussed.

Confidentiality

All information will be kept anonymous, this means that your name will not appear anywhere and no one except me will know about your specific answers. Your answers to questions will be stored for five years on a password-protected external hard disk in the researcher's home, after which time they will be destroyed.

Contact Information

If you have any questions about the research, you may contact the research, Nunzia Del Vento at ndelvento@email.lynn.edu. Further, you may contact Dr. JeVaughn J. Lancaster, the Dissertation Chair at jjlancaster@lynn.edu, or Dr. Erika Grodzki, IRB Chair at egrodzki@lynn.edu.

I have had an opportunity to read the consent form and have the research study explained.
I have had an opportunity to ask questions about the research project and my questions have been answered. I am prepared to participate in the research study described above.
By clicking "Yes" on question 1 of the survey, I am consenting to participate in the research study.

Question 1

I agree to complete the online survey:

o Yes

o No

Appendix D: Survey

Question 1

I agree to complete the online survey:

- Yes
- No
-

Question 2

Who oversees the selection of EdTech tools in the school? Choose all the options that apply.

	Before the COVID-19 pandemic	During the COVID-19 pandemic	After the COVID-19 pandemic
Teachers			
School Administration			
District			
Other (please specify)			

Question 3

How is the selection of EdTech tools in your school influenced? Please select all that apply.

- Categories of EdTech tools (e.g., creativity, communication, collaboration, engagement, assessment, personalized instruction)
- Cost of EdTech tools (free, free with subscription, paid)
- Disciplines (e.g., Math, Science, Social Studies, ELA, Computer, etc.)
- Other (please specify) _____

Question 4

Who supports you in choosing EdTech tools to use in the classroom? Choose all the options that apply.

- [Other] teachers
- District staff
- School administrators
- Students
- School technology specialist
- Other (please specify) _____

Question 5

Which resources do you use to select EdTech tools for your classroom? Choose all the options that apply.

- [Other] teachers' suggestions
- Internet and/or Social Media
- Students suggestions
- List provided by the district

- List provided by the school administration
- School technology specialist's suggestions
- Other (please specify) _____

Question 6
What are the purposes for selecting EdTech tools for your classroom? Choose all the options that apply.

5. Boost student engagement
6. Supporting collaboration
7. Supporting communication
8. Boost creativity
9. Boost critical thinking
10. Personalize student learning experiences
11. Supporting assessment
12. Supporting Artificial Intelligence knowledge
13. Supporting gamification
14. Improving socio-emotional competencies
15. Facilitate delivery of instruction
16. Connecting learning to students' future job and career

- Other (please specify) _____

Question 7
What could help you to select the right digital tool for your classroom? Choose all the options that apply.

- Information on best practices
- Instructional technology coach
- Personalized professional learning
- Professional learning networks
- Other (please specify) _____

Question 8
What EdTech tools do you most use in the classroom?

- Free
- Paid

Question 9
Do you use any of the following criteria to select EdTech tools?

- Technology integration frameworks (e.g. SAMR Substitution, Augmentation, Modification, and Redefinition; TPACK Technological Pedagogical and Content Knowledge; RAT Replace, Amplify, Transform; PICRAT Passive, Interactive, Creative, Replacement, Amplification, Transformation; TIM Technology Integration Matrix)
- Checklist

- Evaluation Rubric
- EdTech trend analysis
- Analysis of future jobs and skills
- I do not use any criteria
- Other (please specify) _____

Question 10
How do you rate the training you receive by the school about EdTech tools to use in the class?

	Before the COVID-19 pandemic	During the COVID-19 pandemic	After the COVID-19 pandemic
Very Satisfied			
Satisfied			
Dissatisfied			
Very Dissatisfied			
Not Applicable			

Question 11
How do you rate the support (in terms of information about their effectiveness, alignment with the standard, et cetera) you receive by the school about EdTech tools to use in the class?

	Before the COVID-19 pandemic	During the COVID-19 pandemic	After the COVID-19 pandemic
Very Satisfied			
Satisfied			
Dissatisfied			
Very Dissatisfied			
Not Applicable			

Question 12
In your opinion, how well prepared are you to use EdTech tools?

- Extremely prepared
- Very prepared
- Somewhat prepared
- Not so prepared
- Not at all prepared
- Not Applicable

Question 13
What kind of professional training about EdTech tools do you receive? Choose all the options that apply.

- Online courses
- In person courses
- Instructional technology coach
- Personalized Professional training
- Professional learning network
- I have not received professional training about EdTech tools
- Other (please specify) _____

Question 14
What are the reasons why you may not choose to use EdTech tools?

- Lack of training
- Lack of time
- Cost
- I do not know which EdTech tool to use
- I do not have information about effectiveness on students' outcome
- Old technology
- It takes too much effort
- Other (please specify) _____

Question 15
How do you judge the effectiveness of an EdTech tool?

- If they satisfy the purpose for which you select them
- If students show interest in learning with that EdTech tool
- If students show improvement in learning with that EdTech tool
- I rely on other teachers' experiences
- I do not know
- Other (please specify) _____

Question 16
On a five-point scale, where 5 means strongly agree, and 1 means strongly disagree, please rate your level of agreement with the following items about EdTech tools.

	1	2	3	4	5
Using EdTech tools improves students' learning experiences and outcomes					
I feel confident in integrating EdTech tools into the classroom					
Information about EdTech effectiveness from other teachers' points of view may make me feel more comfortable to integrate them into the classroom					
I need more training to effectively incorporate EdTech tools in the classroom					

I'd like to know about best practices for how incorporating EdTech tools					
I'd like to have info on successful EdTech tools coaches' experiences					
I'd like to have a network where I share opinions with other teachers on EdTech tools					

Question 17

How often do you use EdTech tools?

	Before the COVID-19 pandemic	During the COVID-19 pandemic	After the COVID-19 pandemic
Every day			
A few days a week			
Once a week			
Less than once a week			

Question 18

Which category of EdTech tools would you like to learn more about? Please check the categories for which you are interested in learning more about. (Please cross all that apply)

- Communication
- Collaboration
- Creativity
- Critical thinking
- Assessment
- Artificial Intelligence
- Gamification
- Student engagement
- Student learning experiences personalization
- Socio-emotional learning
- Delivery of instruction
- Other (please specify) _____

Question 19

- Are you prepared for the use of artificial intelligence in the classroom? _____

Question 20

Are you…?

- Male
- Female
- Other (please specify) _____

Question 21
How old are you?

1. 20-25
2. 26-30
3. 31-35
4. 36-40
5. 41- 45
6. 46-50
7. >50

Question 22
How long have you been teaching?

- 0-2 years
- 3-5 years
- 6-10 Years
- 11-15 years
- 16 +
- Unspecified

Question 23
What grades are currently taught?

- Pre-K- 5
- 6-8
- 9-12
- Ungraded

Question 24
What subject are you teaching?

- Math
- Science
- Social Studies
- English Language Arts (ELA)
- Computer
- Physical education
- Art
- Foreign Language
- Health
- Music
- Career
- Technical
- Multiple

Other _____

Appendix E: Lynn University IRB Approval

Institutional Review Board
3601 North Military Trail
Boca Raton, FL 33433
561-237-7348| lynn.edu
Erika Grodzki, Ph.D., IRB Chair

DATE: 03/13/24
TO: Nunzia Del Vento
FROM: Erika Grodzki
PROJECT NUMBER: 23.16
PROTOCOL TITLE: *Re-imagining learning: Overcoming barriers to effective EdTech tools adoption in K-12 schools*

PROJECT TYPE: New
REVIEW TYPE: Expedited

ACTION: APPROVED
APPROVAL DATE: 03/13/24
EXPIRATION DATE: 03/13/25

Thank you for your submission for this research study. The Lynn University IRB has APPROVED your NEW Project. This approval is in accordance with 45 CFR §46.111 Criteria for IRB approval of research. All research must be conducted in accordance with this approved submission.

It is important that you retain this letter for your records and present upon request to necessary parties.

- This approval is valid for one year. **IRB Form 4: Application to Continue (Renew) a Previously Approved Project** will be required prior to the expiration date if this project continues beyond one year.
- Please note that any revision to previously approved materials or procedures must be approved by the IRB29 before it is initiated. Please submit **IRB Form 5 Application for Procedural Revisions of or Changes in Research Protocol and/or Informed Consent Form 1 of a Previously Approved Project** for this procedure.
- All serious and unexpected adverse events must be reported to the IRB. Please use **IRB Form 6 Report of Unexpected Adverse Event, Serious Injury or Death** for this procedure.
- At the completion of your data collection, please submit **IRB Form 8 IRB Report of Termination of Project.**

If you have any questions or comments about this correspondence, please contact the chair of the Lynn University IRB, Erika Grodzki (egrodzki@lynn.edu).

Dr. Erika Grodzki, Institutional Review Board Chair
Institutional Review Board
Lynn University
3601 North Military Trail
Boca Raton, FL 33433
561-237-7348 | lynn.edu