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A Program Evaluation Of Technology-Rich Instruction In A Public Charter High School

Veronica Elizabeth Warwick
William & Mary - School of Education, vcombos@gmail.com

A PROGRAM EVALUATION OF TECHNOLOGY-RICH INSTRUCTION IN A PUBLIC CHARTER HIGH SCHOOL

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By

Veronica E. Warwick

Approved October 14, 2021 by

Amy C. Colley, Ed.D.
Committee Member

Leslie W. Grant, Ph.D.
Committee Member

Steven R. Staples, Ed.D.
Chairperson of Doctoral Committee

Dedication

This dissertation is dedicated to my grandmother, mother, and children. To Mawmaw, who loved learning and crossword puzzles. You always listened, asked questions, and wanted us to live our lives with kindness, compassion, and education. Mom, thank you for the countless phone calls, pep talks, and leadership discussions. You gave me the strength to persevere when I didn't think I had any. To my wonderful children, Lillyana and Benjamin—may you always be kind, strong, resilient, curious, and have a love for learning. You are the two most special people in my life and I am so proud and honored to be your mother—Education paves the way for your dreams and I hope you shoot for the stars. I love you all so much and wouldn't be here without your love and support.

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Table of Contents

List of Tables

List of Figures

Abstract

Technology-rich instruction is described an important instructional component for fostering the development of 21st century skills (U.S. Department of Education, 2017) and an effective pedagogy for teaching at-risk students (Darling-Hammond et al., 2014). The purpose of this qualitative case study program evaluation was to explore technology-rich instruction implementation at a public charter high school designed for supporting students at-risk of not graduating high school. The evaluation specifically investigated the stated, foundational curriculum, teacher knowledge and perceptions, and classroom practices. A document analysis, teacher surveys, teacher interviews, and classroom observations were used to provide about data about the alignment of the school's curriculum, teacher knowledge and perceptions, and classroom practices to research-based technology-rich instruction. Findings from this evaluation revealed little to moderate alignment to research-based technology-rich instruction for the charter document and teacher knowledge. Classroom observations also revealed low levels of technology integration. Recommendations for programmatic improvement include engaging in the strategic planning process, providing professional development for teachers about the tenets of technology-rich instruction and providing teacher professional development regarding technology-rich instruction implementation utilizing the Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006).

A PROGRAM EVALUATION OF TECHNOLOGY-RICH INSTRUCTION IN A PUBLIC CHARTER HIGH SCHOOL

CHAPTER 1

INTRODUCTION

Background

Picture this: a 21st century classroom of students, each provided with a computer and access to millions of resources at their fingertips. In this classroom, students are given meaningful learning opportunities where they explore, evaluate, create and collaborate to build new knowledge, connections and skills. That 21st century classroom depicts technology-rich instruction, a construct defined by active engagement, knowledge construction and capitalizing on digital tools that maximize learning and skill development (Bower & Vlachopoulos, 2018; Dondlinger et al., 2016; Florida Center for Instructional Technology [FCIT], 2019b). The ideal 21st century classroom, outlined as a primary goal in the National Educational Technology Plan, utilizes technology-rich instruction that not only engages students in personalized learning, but also prepares them to meet the expectations of the 21st century life and workforce (Office of Educational Technology, 2017). While this picturesque classroom is easily visible in our mind's eye, it is not yet a reality nationwide in K-12 classrooms. Technology access and resources continue to grow each year, but recent data indicates that the influx of tools does not automatically result in effective technology integration. In a 2018-2019 report on Equity in Educational Opportunities (Project Tomorrow, 2020), less than 50% of all teachers in the United States, regardless of majority minority or majority white demographics, report that they were less likely to provide lessons and activities that use digital tools supporting collaboration, strengthening critical thinking skills, or cultivating creativity. This data suggests that indeed we are nation at-risk. Diverse technological tools, devices, and platforms are readily available to promote 21st century learning and skill development and yet they are not being used to their potential. This disparity in technology use, referred to as the digital use divide, affects all United States K-12 students regardless of race or socioeconomic status (Office of Educational Technology, 2017). Technology-rich instruction needs to be prioritized by educational leaders, policymakers and teachers to successfully bridge the digital use divide and provide students with a foundation for success in the 21st century.

Technology-rich instruction or technology integration is a pedagogical technique rapidly gaining more momentum and notoriety in schools. Technology integration, technology-rich instruction, technology infusion, and technology-enhanced instruction are synonymous terms found in literature that all describe the same construct: instruction that facilitates active, student-centered learning and knowledge construction via technological resources or platforms (Bower & Vlachopoulos, 2018; Dondlinger et al., 2016; FCIT, 2019b). Technology-rich instruction is seen as a means to provide meaningful and equitable instruction that fosters the development of skills necessary for the 21st century workplace (World Economic Forum, 2015). The importance and benefits of technology-rich instruction is recognized throughout educational plans and policies nationwide. Beginning with the U.S. Department of Education's (USDOE) National Education Technology Plan (2017) and then seen iterated in state and local educational agencies such as the Virginia Department of Education's (VDOE, 2020c) Profile of a Graduate, where technology integration is emphasized as an integral component to contemporary classrooms.

Student-centered learning is defined as pedagogy that is driven by student needs and abilities, moving students from passive receivers to active participants in the learning process (International Society for Technology in Education [ISTE], n.d.-b). Student-centered learning is a key component found within many research-based, technology-enhanced learning design frameworks (Bower & Vlachopoulos, 2018), technology integration guidelines as seen in the ISTE (n.d.-b) standards and the Technology Integration Matrix (TIM; FCIT, 2019b), and a common outcome from technology integration implementation programs for schools beginning in 1986 (Ross, 2020). This type of instruction uses technology as a tool to provide personalized learning experiences, authentic assessments, and real-world problem solving (ISTE, n.d.-b). The constructivist epistemology underpinning technology integration and student-centered learning describes and acknowledges that students learn as they create and construct meaning via active engagement (Hoy & Miskel, 2013). Active engagement, knowledge creation and student-centered learning appear throughout literature as interconnected concepts placing emphasis on the role of the student in the classroom. Collaboration, feedback and social knowledge construction are other important components of technology integration. Each of these constructs, developed from Piaget's learning model, are evidence-based practices with known positive effect sizes on student learning (Hattie, 2012). Technology removes barriers for collaboration, feedback, creation, and engagement by providing a vehicle and resource that is adaptable and accessible to all (Dede, 2014). Technology-rich instruction, in its ideal implementation, describes pedagogy where technology allows students' individual knowledge and skills to drive and guide instruction.

Technology integration benefits are two-fold and useful for maximizing learning in the classroom and preparing students for work and life in the 21st century. Competencies such as communication, collaboration, critical thinking, creativity, non-cognitive skills, and foundational academic literacies are outlined as 21st century skills needed for students to thrive in a technology dependent world (Office of Educational Technology, 2017; World Economic Forum, 2015). Technology, when incorporated following a cohesive integration plan or framework, has the potential to provide avenues and opportunities for students to practice, learn, and master 21st century skills and competencies. The rapid evolution and creation of new technological platforms, resources, and tools allows for a multitude of diverse methods to engage students. Dede (2014) states "the real value in technology for teaching lies in rethinking the enterprise of schools in ways that unlock powerful learning opportunities and make better use of the resources present in the 21st-century world" (p. 5). Virtual games, simulations, and interactives exist to engage students and provide authentic exploration and personalized learning experiences not otherwise possible without technology. Other technological tools, like Microsoft Office and Google Classroom, offer platforms that make feedback more efficient and open avenues for collaboration and communication that extend past geographic barriers (Office of Educational Technology, 2017; World Economic Forum, 2015). Integrating technology effectively and in ways that provide opportunities for students to build their cognitive, interpersonal and intrapersonal capacities constitutes deeper learning (Dede, 2014; VDOE, 2020b). Technology provides the rich opportunities, augmented realities, and platforms for learning to intersect with 21st century skill development, thus creating deeper learning experiences. These types of experiences characterized by integrative, problem-based activities, require students to use recently learned skills and apply their knowledge in meaningful ways (Hewlett Foundation, 2013). Instead of creating a student knowledge profile with several individual learned silos of information, deeper learning via technology integration promotes cross-curricular understanding and use of skills. Integrating technology is important for providing students with deeper learning experiences that is necessary for effective transfer into their 21st century career.

Technology-rich instruction provides opportunities and benefits for all students, but emphasis needs to be placed on schools serving at-risk populations of students. At-risk, or high-needs students are defined as those that are at-risk of academic failure or in need of special assistance or support (U.S. Department of Education, 2020). The national public high school graduation rate has been increasing since 2010, going from 79% to 85% of students graduating on time (National Center for Educational Statistics, 2020). Although this increase is promising, it also demonstrates a 15% deficit for students who not graduating on-time or dropping out. Supporting at-risk populations of students through technology integration and deeper learning then becomes critically important for meeting their needs. Darling-Hammond et al. (2014) describe interactive learning, the correct blend of teachers and technology, and using technology for exploration and creation as three important variables effective for at-risk students. These variables align with standards and guidelines about technology-rich instruction and technology integration best practices. Technology integration is a vital need for schools today, not just a vision on the educational horizon.

Although the skills, knowledge and abilities emphasized within technology integration and deeper learning are varied and typically assessed with alternative or performance assessments (Dede, 2014), technology does have a positive impact on academic achievement alone (Tamim et al., 2011). Technology use of any kind was reported to have a positive and significant impact on student achievement in the classroom in comparison to classrooms without technology. Two purposes of technology use in the classroom were noted and measured: the use of technology for direct instruction and the use of technology to support instruction. Although both uses of technology have positive effect sizes on student achievement, there is a greater positive statistically significant difference between using technology in supportive roles

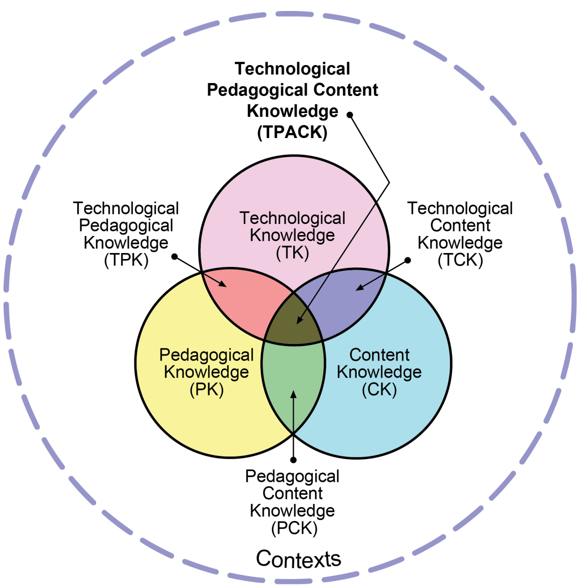
(ES= .42) versus using technology for direct instruction (ES=.31; Tamim et al., 2011). These data provide empirical evidence and support for technology integration standards, guidelines, and classroom benefits. This research further emphasizes that having technology in the classroom is not enough, it needs to be thoughtfully integrated. “Technology is a tool, not an end in itself. The goal isn’t to create a digital version of business as usual but to empower teachers to make better use of instructional strategies” (Dede, 2014, p. 2).

Among the many requirements for implementation, guidelines and scaffolding are two important considerations. Technology integration frameworks, founded in research and evidence-based practices, exist to outline essential conditions, meaningful learning environments and appropriate pedagogies. To support educators, administrators, and school districts in this process ISTE has published standards that outline core competencies and guidelines for using technology in educational settings. These standards include teacher best practices and general guidelines for designing technology-rich instruction (ISTE, n.d.-b). The FCIT (2019b) also provides resources and frameworks to help scaffold technology integration for teachers. Both frameworks place importance on designing instruction that supports active, engaged learning where students are responsible for constructing new knowledge instead of using technology as an instructional substitute (Dondlinger et al., 2016; FCIT, 2019b).

Teacher development, technical support, administrative support, and time are essential considerations when designing technology integration implementation. Building capacity in teacher knowledge and skills surrounding technology, pedagogy, content, and the intersections between each, referred to as TPACK, is necessary for developing high quality teaching with technology integration (Mishra & Koehler, 2006). The TPACK framework, shown in Figure 1, illustrates the importance of providing resources and learning opportunities for teachers that allows them to build skills throughout the individual and overlapping domains. Building capacity of teachers following this framework allows teachers to understand the capabilities of technology and pedagogy as it applies to their specific content or context (Mishra & Koehler, 2006). Evidence from recent literature reveals that technical support, administrative support, and time were reported from teachers as mediating variables and potential barriers for technology integration implementation (Francom, 2020; Hamutoglu & Basarmak, 2020; Liu et al., 2017). Policymakers and educational leaders need to be aware of these limitations and create the infrastructure, support, and development opportunities that educators need to provide students with technology-rich instruction.

Figure 1

Framework for Teacher Technological Pedagogical Content Knowledge (TPACK)



Note. Framework describing the knowledge necessary for teachers to integrate technology in the classroom. Reprinted from "TPACK Explained" by M. Koehler, 2012 (http://tpack.org/). Copyright 2012 by tpack.org. This figure is reproduced by permission of the publisher.

Progress has been made nationwide in terms of technology access and connectivity in schools through a federal program, E-rate, which helps to provide billions of dollars to schools in the United States to support high-speed wireless access (Office of Educational Technology, 2017). The Office of Educational Technology in the USDOE (2017) report decreasing cost of digital devices, an increase in the number of schools that have high-speed connectivity in classrooms, and an increase of the availability of quality interactive educational tools and applications. This progress has helped to close the digital divide, or the gap between students who have access to internet and devices and those that do not (Office of Educational Technology, 2017). Closing the digital use divide is now an area of concern for technology integration in classrooms. The digital use divide describes the gap between students who are using technology in ways that maximize and transform learning and those that are not (Office of Educational Technology, 2017). The digital use divide occurs in both high and low socioeconomic areas and is a consequence of having the digital tools and resources, but lacking teacher knowledge and skills to create those meaningful, technologically diverse, learning experiences for students.

In alignment with national trends and policies, the VDOE has iterated their version of 21st century skill development via the Profile of a Virginia Graduate. The Profile of a Virginia Graduate is a current state policy that provides the framework for graduation requirements and the development of a coherent K-12 plan that includes the knowledge, skills, and experiences for Virginia students to be life-ready. The Profile has four main components: content knowledge, workplace skills, community engagement and civic responsibility, and career exploration (VDOE, 2020c). Similar to the ISTE standards, the Profile of a Virginia Graduate emphasizes collaboration, communication, creativity, critical thinking, and citizenship (ISTE, n.d.-c; VDOE, 2020c). In further association with the ISTE standards, TIM and technology integration best practices, Virginia has recently revised and adopted an Educational Technology Plan (VDOE, 2020b) with foundations in constructivist learning. Personalized, or student-centered learning, is presented as the main learning goal with technological resources and devices identified as the vehicle for goal attainment. In connection to the Profile of a Graduate, critical thinking, creativity, collaboration, citizenship, and complex problem solving are emphasized with learning and skill mastery taking place through technology (VDOE, 2020b). The Profile of a Graduate and the Educational Technology Plan are important state policies that drive instruction and curriculum in Virginia schools. The broad goals and competencies outlined in each allow for loose coupling and local adaptation within school districts. Together, these policies and frameworks specify important educational goals and evidence-based methods of achievement via effective technology integration.

National, state, and local educational policies emphasize the importance of the development of 21st century skills and technology integration. Given these policies and expectations, local schools are required to implement technology integration. Implementation will vary among schools, even in the same locality, depending on many factors. Some of these factors include but are not limited to the capacity of school leaders and educators and technology infrastructure and support (Francom, 2020; Hamutoglu, & Basarmak, 2020; Liu et al., 2017). Although educational leaders and teachers might understand the importance of technology integration, there are varying levels of integration and a wealth of knowledge about TPACK, necessary to meet best practice techniques and promote student acquisition of 21st century skills and competencies. Following best practice techniques, teachers will need feedback on instruction to promote a deeper understanding of technology integration and ultimately improve instruction and student learning. In this evaluation of technology-rich instruction in a Virginia public charter high school, I sought to provide clarity on teacher knowledge of and practical application of technology integration.

Program Description

Cavill River Academy (CRA), a Virginia Public Charter high school, is ideally positioned to fulfill the Profile of a Graduate and meet standards present in the Educational Technology Plan for Virginia. CRA is designed to provide an academic, social, and career preparatory education for at-risk students in Grades 9-12. Earning its charter in 2001, CRA has evolved from serving only students in Grades 9 and 10 to becoming a comprehensive high school where students may graduate and earn a high school diploma. CRA places emphasis on providing technology-rich instruction as an effective strategy for educating at-risk students. CRA also outlines cooperative learning, teaming, problem-based learning, authentic assessments and other instructional activities and practices. The Profile of a Graduate, Educational Technology Plan for Virginia and CRA literature all place emphasis on the acquisition of 21st century knowledge, skills, and competencies acquired through authentic experiences and technology.

Context

CRA is a small, public charter high school situated within a larger school district. The foundational purpose of CRA is to increase educational opportunities for at-risk students The average number of students enrolled over the past 3 years was 70, with a decreasing trend. Acceptance into CRA is based on an application filled out by the student and parents, scores on a reading test, and behavior infractions. Student selection is focused on under-performance, low grades, attendance related issues, and the lack of excessive behavioral transgressions. As CRA is designed to reach at-risk students, the class sizes are capped at 14 for Grades 9-10 and 16 for Grades 11-12. These small class sizes are intended to provide more individualized instruction and interventions.

The school district within which CRA resides has an average number of 12,886 students enrolled. Both the school district and CRA have met accreditation standards. Although, accreditation has been waived through 2022 due to the school closures from the COVID-19 pandemic, beginning in 2020. In March of 2020, schools nationwide closed and abruptly transitioned to remote or distance learning per state guidelines. Both the school district and CRA display a drop in enrollment for the 2020-2021 school year, likely due to pandemic related barriers and impacts. In a normal school year from December to May, CRA recruits students from middle schools through tours, student presentations and informational meetings, and discussions with the guidance counselor and current students. However, the 2020 spring closures interrupted recruitment efforts, resulting in decreased enrollment.

The state and local school district standards guide and direct instruction at CRA. The Digital Learning Integration Standards published by the VDOE (2020a) outline a vertical description and leveled progression of K-12 digital competencies that are based on the ISTE standards for students and correlated with the 5 C's found in the Profile of a Graduate (VDOE 2020c). Integrating digital competencies within current curricula is an objective within the strategic plan of the school district and also present in the Digital Learning Integration Standards of Learning for Virginia Public Schools (VDOE, 2020a). The digital competency integration plan outlined by the school district includes technology-related addendums to K-5 English, K-12 math models, and Grades 6-12 history and social sciences. Providing teachers with professional learning and leadership opportunities are listed as steps within the school district's educational technology plan for objective attainment. The school district also reports creating educational technology classroom observation checklists for administrators and teachers. Recent direction given from state and local educational policies points to the necessity of modifying curriculum to support technology-rich instruction. According to the data provided from the school district, they are making progress towards technology integration goals present in the state plan.

The current educational technological landscape in CRA's school district consists of a 1:1 technology initiative, new online learning management system and subscriptions or licenses to a variety of online tools and resources, most notably Microsoft Office 365. Prior to the school closures and shift to remote learning, the school district operated with a Bring Your Own Technology (BYOT) initiative, where students were able to use personal laptops and devices for classroom instruction when appropriate. However, the abrupt shift to remote learning following the Coronavirus pandemic required the school district to support funding for a 1:1 technology initiative. In the 1:1 technology program, all students are issued devices with secure access to learning resources and technology support, all provided through the school district. The 1:1 technology initiative ensures equitable access to curriculum, whether inside or outside the school building. The school district also states the purpose of the program exists to enhance instruction, student engagement and meet digital competencies and goals outlined in the strategic plan.

The Virginia Standards of Learning and school district's strategic plan influence CRA's long-term goals and outcomes. CRA uses those guidelines and further outlines the processes and procedures it will take in order to meet those goals for an at-risk, or educationally disadvantaged, population of students. Instructional strategies listed within CRA literature designed to achieve local and state goals include technology-rich instruction, authentic assessments, problem-based learning, cooperative learning and service learning. In alignment with the Profile of a Graduate and school district plans, CRA highlights the importance and inclusion of workplace readiness skills and the 5 C's in the classroom.

Description of the Program

CRA was founded on several guiding principles: small class sizes, an emphasis on career preparation, technology-rich environments and instruction, a community/team-oriented approach, and providing authentic learning experiences. Presently, CRA staff include nine fully licensed teachers, one special education para-educator, one guidance counselor, and one principal. The school advertises student exposure and exploration to a diverse plethora of technology including, Apple products, Microsoft Office Suites, web design, drones, and various other computer-based software programs.

CRA describes technology-rich instruction as an important pedagogy for increasing educational opportunities for at-risk students. CRA defines technology-rich instruction as an array of technological learning experiences facilitating student learning and modeling current technology. Extant literature uses technology-rich instruction interchangeably and synonymously with technology-rich learning environments, technology-enhanced learning, technology-enhanced instruction and technology integration. These terms share a constructivist epistemology that includes student-centered learning models and technology as a tool to deepen learning (Bower & Vlachopoulos, 2018; Dondlinger et al., 2016; Ross, 2020).

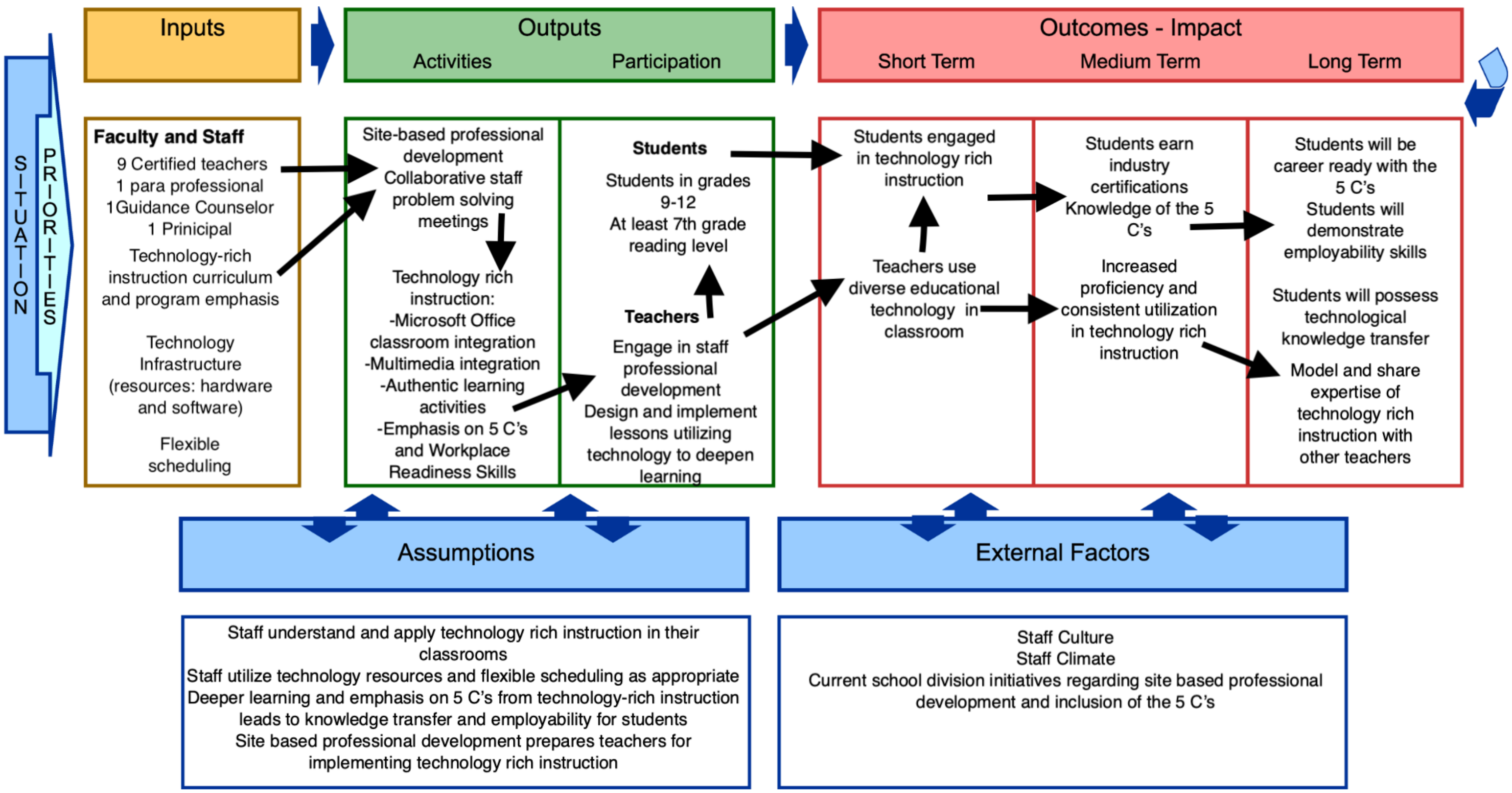
The logic model (Figure 2) illustrating CRA's technology-rich instructional theory of action hypothesizes:

1. Technology-rich instruction, outlined in foundational and marketing documents, is a focus and input of the instructional program.

2. Providing site-based professional development and opportunities for collaborative problem solving will promote the design and implementation of lessons utilizing technology to deepen learning.
3. The professional development and collaborative meetings, under the auspices of the school, school district and statewide goals, focus on Microsoft Office classroom integration, multimedia integration and authentic learning activities, all with an emphasis on the Profile of a Graduate, 5 C's and workplace readiness skills.
4. Teacher professional development and lesson design and implementation will promote teacher use of diverse educational technology in the classroom and have students engaged in technology-rich instruction as a short-term outcome.
5. The teachers' use of technology-rich instruction leads to increased proficiency and consistent utilization as a medium-term outcome.
6. A long-term outcome for teachers is that the proficiency and consistency of technology-rich instruction will promote future modeling and sharing of expertise with other teachers during site-based or district-wide professional development.
7. Engaging students in grades 9-12 in technology-rich instruction promotes the acquisition of industry certifications and the 5 C's as a medium-term outcome.
8. Gaining industry certifications and knowledge of the 5 C's demonstrates employability skills for students as a long-term outcome.

Figure 2

Logic Model Representing Cavill River Academy's Technology-Rich Instruction Program



Overview of the Evaluation Approach

The purpose of program evaluations is to provide useful empirical evidence about programs, products, or performance in decision-making contexts (Mertens & Wilson, 2012). Program evaluations may monitor the inputs, processes, outputs, or outcomes of a program. Formative evaluations provide feedback for improvement during the delivery or development of a program (Mertens & Wilson, 2012). This evaluation, following the Context, Input, Process, Product (CIPP)Program Evaluation model (Mertens & Wilson, 2012), intends to provide formative feedback on the technology-rich instruction input and short-term outcome at CRA. The CIPP model considers the program's context, inputs, processes, and products. Within the CIPP model, this product evaluation will help to gauge the success of the program and determine the effectiveness (Mertens & Wilson, 2012) in terms of classroom instruction. While this study and evaluation focus on the products of the program, the context, inputs, and processes are outlined and diagramed in the logic model (Figure 2) to provide a comprehensive understanding of CRA's program functionality in terms of technology-rich instruction.

Purpose of the Evaluation

This program evaluation, grounded in the pragmatic paradigm and the use branch, is intended for formative feedback and program improvement. The use branch and pragmatic paradigm are concerned with collecting data that is useful to stakeholders (Mertens & Wilson, 2012). The data collected from the evaluation will be used to provide teachers and administrators with information regarding the types of technology-rich instruction implemented in the CRA classrooms. Data will also be used to provide staff with a comparison about their technology integration knowledge, intentions, and applications to evidence-based practices published in extant literature. The formative information gathered and presented to staff could then be used to target specific areas of need to improve instruction, student learning, and alignment to technology integration standards and frameworks. Technology-rich instruction is listed as an important instructional activity CRA uses to engage students and meet the goals and mission of the school. Technology-rich instruction, or technology integration is also recognized nationally and articulated in the Digital Learning Integration Standards of Learning from the VDOE (2020a) as an important and highly effective pedagogical strategy for teaching content, 21st century competencies, and noncognitive skills (Office of Educational Technology, 2017). For these reasons, the evaluation will serve the purpose of supporting the school and staff in meeting local, state, and national policies.

Focus of the Evaluation

This study followed the CIPP Program Evaluation model to investigate an input and one of the products, or short-term outcomes, of the program. This input and product evaluation was focused on the presence of technology-rich instruction in CRA classrooms. To provide a comprehensive understanding of technology-rich instruction as it is implemented at CRA, data were collected to determine CRA curriculum alignment to technology-rich, research-based practices, existing teacher knowledge and perceptions, as well as observations of classroom instruction. Teachers, as the mediators of classroom instruction, served as the focus of the evaluation and the major stakeholders and beneficiaries of evaluation information. Following the pragmatic worldview, multiple sources of data were collected to determine the alignment of the school curriculum, teacher knowledge and perceptions, and implementation of technology-rich instruction to research-based best practices. Practical information from classroom observations and teacher knowledge were compared to conceptual knowledge from extant literature on technology integration.

Evaluation Questions

Technology-enhanced learning, or technology-rich instruction, is important for engaging students in deeper learning and preparing them to succeed in the constantly evolving 21st century technological landscape (ISTE, n.d.-c). Some core components necessary for designing technology-enhanced learning environments are exploration of a real-world problem, collaboration, and creation (Bower & Vlachopoulos, 2018; Dondlinger et al., 2016; Varma & Linn, 2012). CRA identifies technology-rich instruction and student-centered learning as integral components of its instructional program. The technology infrastructure is present in the school, but to evaluate the effectiveness of the program and improve instruction, more information is needed on technological pedagogy, teachers' technological knowledge, and its application in the classroom. The evaluation questions investigated were the following:

This evaluation addressed the following research questions:

1. How well do CRA's stated instructional strategies align with research-based, technology-rich instruction guidelines?
2. How does CRA teachers' knowledge and perceptions about technology-rich instruction compare to recommended standards for best practices as published in the extant literature?
3. What research-based, technology-rich strategies do teachers indicate are being used in the classroom?
4. What research-based, technology-rich instructional practices are being implemented in the classrooms at CRA?

Definitions of Terms

21st century skills: Core competencies such as communication, collaboration, critical thinking, creativity, non-cognitive skills and foundational academic literacies (Office of Educational Technology, 2017; World Economic Forum, 2015).

Deeper learning: Collaboration, communication and critical thinking skills alongside content knowledge, academic mindsets and learning strategies (Dede, 2014; Hewlett Foundation, 2013; VDOE, 2020b).

Digital use divide: gap that exists between students who are actively using technology and those that are passively using technology in classrooms (Office of Educational Technology, 2017).

Student-centered learning: Process where instruction and learning is driven and guided by the unique needs of each student and where students are active participants, with teachers as facilitators (ISTE, n.d.-b; FCIT, 2019b).

Technology-rich instruction (technology-enhanced instruction or technology integration): Pedagogical technique where students are using technology effectively to engage in active, student-centered learning (Bower & Vlachopoulos, 2018; Dondlinger et al., 2016; FCIT, 2019b).

Technology Integration Matrix (TIM): tool that provides common language surrounding technology integration practices for educators. The matrix lists characteristics of technology-rich learning environments across five levels of integration (FCIT, 2019b).

Technological Pedagogical Content Knowledge (TPACK): Teacher knowledge of three interdependent and overlapping components, pedagogy, content, and technology, that forms the basis of good teaching with technology (Mishra & Koehler, 2006).

Virginia Profile of a Graduate: VDOE policy describing the skills, knowledge and experiences students must have for college and career readiness (VDOE, 2020c).

CHAPTER 2

REVIEW OF RELATED LITERATURE

This chapter provides background research focusing on important elements related to the evaluation of technology-rich instruction at CRA. Knowledge of technology-rich instruction or the technology integration construct are pertinent for the evaluation. Additionally, a practical understanding of best practices in technology integration in the K-12 classroom are necessary to develop comparative observations. Finally, it is necessary to understand teacher development, in terms of technology integration, and any potential barriers or challenges to effective implementation.

Characteristics of Technology Integration

Technology-rich instruction is a pedagogical technique with a constructivist epistemology that focuses on active, student-centered learning (Bower & Vlachopoulos, 2018; Dondlinger et al., 2016; FCIT, 2019b). Technology-enhanced instruction, technology infusion or technology integration are synonymous terms used to describe the technology-rich instruction construct. Although extant research is lacking one clear, consistent definition, several overlapping themes exist including best practices and pedagogy that facilitate active, student-centered learning, and knowledge construction.

Technology integration is broadly described as a concept involving technology use in classrooms that support a variety of pedagogy and goals (Liu et al., 2017). As there is not one set of universally accepted technology integration standards, this definition encompasses the many ways technology in classrooms has been operationalized. Although this universal definition of technology integration does not provide practical information for classroom teachers, standards and foundational frameworks exist to guide pedagogy. The ISTE standards provide a framework for technology integration and innovation in education (ISTE, n.d.-c). Another research-based tool that exists to support technology infusion is the TIM developed by the FCIT. The TIM provides characteristics of a technology-rich learning environment across five levels of classroom integration (FCIT, 2019b). The TIM and ISTE standards are well-known, research-based guidelines for technology integration. Similarities that exist between these popular guidelines represent key descriptors and practical applications of technology integration for contemporary classrooms.

ISTE is an international, widely recognized organization that provides resources, research, guides, and professional development opportunities for teachers that build capacity for innovation and educational technology (ISTE, n.d.-a). ISTE provides standards and frameworks for students, educators, educational leaders, and coaches. The current ISTE standards for students share commonalities with the TIM. Both frameworks place emphasis on constructing knowledge, collaboration, and empowering students via authentic learning, goal setting, creativity, and choosing technology actively as a tool to support learning (FCIT, 2019b; ISTE, n.d.-c). The ISTE and the TIM frameworks outline technology integration as a tool to help students to develop 21st century skills. Separately, the ISTE standards provide pedagogical techniques and outcomes for students while the TIM provides scaffolding and leveled progression for technology integration, culminating with student-centered learning. Together, the ISTE standards and TIM describe instructional activities and outcomes that enable students to acquire 21st century skills and competencies. Core competencies including critical thinking, complex problem solving, collaboration, and multimedia communication are often referred to as

21st century skills necessary for success in the global economy (U.S Department of Education, 2017). Table 1 depicts a comparison of the characteristics of learning present in either or both the ISTE Standards for students and the TIM.

Table 1

Characteristics of Learning Attributes Present in TIMs

Characteristics of Learning	ISTE Standards for Students	TIM
Active	X	X
Authentic		X
Citizenship	X	
Collaborative	X	X
Communication	X	X
Computational thinking	X	
Constructive	X	X
Goal-directed		X

Note. ISTE = International Society for Technology in Education; TIM = Technology Integration Matrix. An "X" indicates the trait is present in the framework.

Knowledge construction, nested in the constructivist paradigm, is a commonality among technology integration guidelines (FCIT, 2019b; ISTE, n.d.-c) and learning design frameworks (Bower & Vlachopoulos, 2018). Constructivism is a worldview or belief system that approaches an understanding of practice from the perspective that humans construct meaning as they engage with the world they are interpreting (Creswell & Creswell, 2018). Many features seen throughout technology integration guidelines and frameworks include active engagement and involvement with the technology to promote learning, which illustrates a constructivist point of view. At the highest level, or most personalized, student-centered level of knowledge construction, students are using technology to explore, research, evaluate and create artifacts that represent meaningful learning (FCIT, 2019b; ISTE, n.d.-c). These descriptions paint a picture of technology integration where students have choice and ownership in their learning. In addition to knowledge construction for individual students, technology-rich instruction also includes social knowledge construction and collaboration. Social knowledge construction is an overlapping construct with collaboration as they both involve the use of peer discussion to personalize, support, and deepen individual and group learning (Bower & Vlachopoulos, 2018; Dondlinger et al., 2016; FCIT, 2019b). When operationalizing peer collaboration via technology in classrooms, it is important to understand that connections and collaboration occur in the classroom with their peers but, with the use of technology students and teachers are no longer limited by geographic location. Technology integration removes barriers and allows for collaboration among experts in the field or other students worldwide (Office of Educational Technology, 2017). Technology integration, in its ideal operation, is a term that describes effective opportunities, pedagogies, and activities that leverage multifaceted technological platforms, devices, and/or resources.

Student-centered learning is at the heart of technology-rich instruction. ISTE (n.d.-b) describes student-centered learning as a process based on individual needs and abilities with students as active participants. In practice, student-centered learning involves teachers taking a facilitator role in the classroom and acting as guide or mentor for students (FCIT, 2019b). Historically, technology initiatives and technology integration placed emphasis on technology as a tool to promote student-centered learning. Ross (2020) reviewed technology integration from the past 30 years and concluded that technology infusion initiatives in schools were mainly driven by and resulted in changes to pedagogy, going from teacher-led to student-led. In each technology initiative, schools were provided with devices and overtime learning became more personalized, engaged, and focused on higher order skills such as researching, problem solving, organizing, communicating, and evaluating information. In these cases, technology was used as tool to provide students with unique situations, scenarios and opportunities to learn content knowledge while developing 21st century skills necessary for success in life and in the workforce. Ross (2020) notably observed that “few if any of the laptop programs were designed primarily for raising student achievement on high-stakes assessments” (p. 8). The primary functions governing the technology and laptop initiatives in the meta-analysis were equity, increasing student-centered learning, increasing technology skills, and developing 21st century learning skills (Ross, 2020).

Student-centered learning and technology integration place emphasis on active engagement. Active engagement through technology provides opportunities for students to create, design, build, collaborate, connect, and/or experience. Conversely, passive use of educational technology consists of students consuming media, completing digitized worksheets, or otherwise receiving information without opportunities to engage, use, or explore (FCIT, 2019b; Office of Educational Technology, 2017). Therefore, active engagement, as it is operationalized in technology integration, is an inclusive pedagogical technique involving a robust and diverse combination of collaborative and explorative student-centered learning opportunities.

Technology-rich instruction, or technology integration, is a multi-dimensional construct that focuses on the acquisition of 21st century skills through active, constructive, collaborative, explorative, and creative student-centered learning experiences. Independently, student-centered learning, active engagement, knowledge construction, and social knowledge construction are all effective pedagogical techniques. Designing and implementing technology-rich instruction provides an opportunity to increase engagement through the intersection of these effective pedagogical constructs. Technology integration, as it is defined here, acts as an amplifier and cohesive property for maximizing learning.

Technology Integration Best Practices

Technology integration does not follow any one procedure and varies in look in different classrooms. However, guiding principles and foundational practices exist to guide teachers and educational leaders through the process of creating, identifying, and supporting technology integration in schools. In alignment with technology integration components, best practices in the classroom should be guided by the Universal Design for Learning (UDL; CAST, 2018; Office of Educational Technology, 2017) and selecting platforms, technologies, or games and simulations that engage students with content and technologies in diverse modalities (Dede, 2014; World Economic Forum, 2015). Following best practices for technology integration provides an equitable, engaging learning environment that fosters the development of key 21st century skills, including foundational literacies, core competencies and important character qualities for all students (World Economic Forum, 2015).

As technology has become more omnipresent in society and the digital divide decreases, a digital use divide continues to exist among students (Anderson & Kumar, 2019; Darling-Hammond et al., 2014). The digital divide represents a gap between students with access to internet and devices at home and school, while the digital use divide describes a disparity between students who use technology in active, transformative ways and students who use technology for passive consumption of material. Unlike the digital divide, the digital use divide exists for all students across high- and low-poverty schools and communities (Office of Educational Technology2017). Educational policies and programs exist nationally to help close the digital divide via infrastructure, access, and funding, but closing the digital use divide requires a transformation in pedagogy in addition to access to resources. Supporting at-risk students in the classroom and closing the digital use divide requires that teachers provide opportunities for interactive learning and using technology for exploration and creation instead of drilling activities (Darling-Hammond et al., 2014). Emphasis needs to be placed on how technology is used to support the needs and skills of all students.

Ensuring equity and accessibility is necessary for developing technology-rich instruction that meets the needs of all learners. UDL is a teaching methodology with lesson design principles that help to make learning accessible to everyone. The UDL framework has three main three main tenets, each with its own scaffolded skillset underneath. The three guiding principles in UDL are to provide multiple means of engagement, representation, action, and expression (CAST, 2018). The UDL principles are driven by activating the affective network, recognition network, and strategic network of the brain. Focusing on varied expressions of instructional delivery and activities within one classroom allows an opportunity for all learners to engage (CAST, 2018). Technology integration with UDL requires a robust knowledge of educational technology and content. As UDL suggests, students require diverse opportunities and activities, which likewise requires a higher level of teacher technological knowledge.

Many educational technology resources exist today and continue to develop and evolve every day. Technology integration does not identify specific platforms or products, but presents actions and activities with which students should be engaged in. This holistic definition allows teachers to choose technologies and platforms that best fit the needs of the students, curriculum or choose ones that are supported by their local schools. While specificity is limited in terms of identified technological resources, general types of pedagogies are outlined as effective for active, student-centered learning, and engagement. Open educational resources (often abbreviated as OER), project-based learning (often abbreviated as PBL), online communication and collaboration tools, and interactive simulations and games are tools that help students construct knowledge and develop 21st century competencies such as communication, collaboration, and creativity. Some suggested collaborative and communicative platforms for students are Microsoft products and Google Apps for Education as they allow students to collaborate and communicate digitally and in real time (World Economic Forum, 2015). Game-based learning, simulations and immersive media allow students to manipulate events, processes, or activities to promote a deeper understanding of the content (Dede, 2014; Office of Educational Technology, 2017; World Economic Forum, 2015). These immersive games and simulations provide an experience for students and teachers that is not otherwise possible without the aid of technology. Dede (2014) describes "technology as a catalyst is effective only when used to enable learning with richer content, more powerful pedagogy, more valid assessments, and links between in- and out-of-classroom learning" (p. 6). Technology, when used as tools to develop robust learning experiences for students, has the ability to transform educational experiences and remove the walls of the classroom.

A recent qualitative study exploring technology-rich instruction with iPads in a middle school classroom demonstrates how technology is used to deepen learning and the understanding of content while promoting collaboration, teamwork, and innovation (Santori & Smith, 2018). Santori and Smith (2018) focused their study on learning via multimodal literacy, which provides a framework for incorporating linguistic, auditory, visual, spatial, and gestural modes into teaching and learning. The multimodal literacy framework shares similarities with UDL and technology integration best practices. All frameworks place emphasis on multiple modes of representation, expression, and engagement. During the observed lessons, students were collaboratively reading and manipulating digital texts as well as working together to answer and turn in a digital quiz or create a movie trailer or cartoon. Students were able to choose their learning activities and modes of expression (Santori & Smith, 2018). In this learning environment the teachers were facilitators in the classroom, allowing the students to control their learning and activities. Classroom observations and interviews with teachers and students demonstrated how iPads were effectively used to increase engagement and provide opportunities for student-centered learning, differentiation, collaboration, knowledge construction, and creativity (Santori & Smith, 2018).

Effective technology integration in the classroom, focused on active, student-centered learning and knowledge construction, has the potential to prepare students for work and life in the 21st century. Using games and simulations in the classroom allow students to engage with content in an interactive environment while they simultaneously build non-cognitive skills such as self-awareness, problem solving, and persistence (Office of Educational Technology, 2017; World Economic Forum, 2017). Collaborative problem solving, communication and active knowledge construction made possible by educational platforms and pedagogy provide opportunities for students to build on a variety of necessary skills while simultaneously learning content. Closing the digital use divide with students, requires teachers to leverage technology as a tool for equitable instruction that promotes knowledge acquisition and student practice with 21st century skills.

Teacher Development

Effective implementation of technology-rich instruction requires attention to teacher development. Seminal research on teacher development in the technology arena points to the importance of building capacity in teachers' technological pedagogical content knowledge, known as TPACK (Mishra & Koehler, 2006). Designing technology-rich lessons that support 21st century skills require knowledge of diverse technological platforms, pedagogies, content, and how each construct intersects. In addition to TPACK, recent research focuses on teacher development to include principles of UDL and the TIM to build capacity in teachers and allow them to plan for lessons that meet the needs of all students (Benton-Borghi, 2013; Muilenburg & Berge, 2015). These frameworks for professional development and technology integration are foundationally related as they all provide teachers with working knowledge of technology integration best practices.

Teacher development is a complex science with variability between grade level, content, years of experience, and level of coursework. The TPACK framework provides a model for understanding and developing quality teaching with technology integration. Three main domains of knowledge exist in the TPACK framework, technological knowledge, content knowledge, and pedagogical knowledge. Each of these domains are interrelated and do not exist in isolation (Mishra & Koehler, 2006). At the center of the model is the Technological Pedagogical Content Knowledge which is composed of technological knowledge, content knowledge, and pedagogical knowledge. TPACK presents a complex, holistic view of good teaching with technology. Understanding and working within the TPACK framework is necessary for providing support and professional development for effective technology integration in classrooms. Mishra and Koehler (2006) discuss the importance of building capacity in teachers by providing professional development that is context specific and mirrors best practices of technology integration, where teachers learn by doing.

Building on the TPACK framework, recent research has looked to combining other best practice techniques into teacher development. Benton-Borghi (2013) presents a compelling, research-based argument on nesting the TPACK model with the UDL framework to better prepare teachers to engage general and special education students in the 21st century technologycentric classroom. In this synthesis, the UDL framework guides teachers with instructional and technological decision-making guidelines. Building capacity in teachers for equitable technology integration requires development of their knowledge bases, as outlined in TPACK, and best practices for meeting the needs of all students (Benton-Borghi, 2013). Similarly, a Technology Fluency and Integration Model was developed to promote teacher education and preparation for effective technology integration (Muilenburg & Berge, 2015). This model includes UDL principles, and the TIM framework situated in the TPACK learning methodology. The synthesis of these models provides a comprehensive understanding of technology integration and teacher development useful for developing targeted strategies and support for technology transience. Technology transience is defined as the "rapid proliferation of technology tools, the frequent update of such tools, and their ever-shortening life span" (Muilenburg & Berge, 2015, p. 94). Recent research in the technology integration and the teacher development arena, describe the importance of providing strategies and support for teachers that is specific to their unique TPACK knowledge base via the TIM and UDL principles. Incorporating these elements is endorsed as best practice for providing teachers with tools, knowledge, and techniques that promote technology-rich instruction for all students.

A formative program evaluation of a comprehensive one-to-one laptop initiative provides an example demonstrating the importance of teacher development for effective technology integration. The first phase in the first year of the initiative was devoted solely to teacher professional development. Continuing later in year one and into year two, the initiative focused on technology access, use, and teacher practice. Finally, in years three and beyond, the evaluation sought to measure the impacts of technology on content area knowledge and 21st century skills (Morrison et al. 2019). The evaluation revealed positive perceptions from students, teachers and administrators. During interviews teachers discussed the importance of peers, professional development, and practice for building capacity in technology-rich instruction. Peer-to-peer professional development was specifically stated by several teachers as being effective because they were able to choose what they wanted to learn and collaborate and share with teachers in similar grades and/or content areas (Morrison et al. 2019). These findings align with the TPACK framework in that teachers were increasing their specific technological, pedagogical or content knowledge to support effective technology integration. Teachers reported during this third year of implementation that they were now using technology tools more efficiently, providing more student choice and had established more positive technology routines and pedagogies (Morrison et al. 2019). This evaluation is an example of successful technology integration via targeted individual and group professional development and peer, administrative, and technological support.

Barriers to Implementation

Successful and sustainable implementation of programs require attention to implementation drivers, or common features that exist within successfully implemented programs. Three implementation drivers exist that influence success: competency drivers, organization drivers, and leadership drivers (National Implementation Research Network, n.d.). Research focused specifically on technology integration implementation has revealed barriers with regards to technology access, technical and administrative support, intrapersonal factors, and time (Francom, 2020; Hamutoglu & Basarmak, 2020; Liu et al., 2017). Except for time, each of these barriers is categorized within the implementation drivers.

Competency drivers are described as activities that develop, improve, or sustain teachers' and administrators' capacity with the program (National Implementation Research Network, n.d.). In specific regard to the competency driver for technology integration, a study developing a path model for factors that affect technology integration found that teacher readiness has the highest total effect on technology integration (Inan & Lowther, 2010). Inan and Lowther (2010) define teacher readiness as the teachers' perception of their own skills and capabilities necessary to integrate technology in the classroom. As a mediating factor in teacher readiness, Liu et al. (2017) found through a multilevel path analysis from 1,235 K-12 teacher surveys, that teacher confidence and comfort with technology and classroom technology integration were positively influenced by teaching experience with technology and school technology support. A needs analysis for technology integration with 844 teacher participants similarly revealed that teachers are lacking in technology knowledge and technology pedagogical knowledge that could be improved through specific, on-going professional development (Vatanartiran, & Karadeniz, 2015). This research points to the importance of using the TPACK framework to guide professional development and technology integration implementation. These large-scale teacher surveys demonstrate the need for teachers and administrators to build capacity and competency with technology integration for successful implementation.

Environmental supports and infrastructures necessary for adequate and effective implementation, referred to as organizational drivers (National Implementation Research Network, n.d.), are another mediating impact for effective technology integration. Hamutoglu and Basarmak (2020) provide evidence that external factors, such as technology infrastructure, lack of training, lack of vision, lack of money, and time have a direct and positive effect on internal or intrapersonal factors, such as self-efficacy. Francom (2020) and Vatanartiran and Karadeniz (2015) support similar conclusions that administrative support, while not a top determinant for effective technology integration, is among the top three barriers mentioned by teachers. Access, commonly listed as a barrier for implementation, has been discovered to be a decreasing problem through a recent time-series survey conducted among K-12 teachers (Francom, 2020). This evidence suggests that while technology tools and resources have become more present in schools, administrative and technical support remain a necessary component and organizational driver for technology integration implementation.

Time is listed consistently in recent research as a significant barrier to technology integration (Francom, 2020; Hamutoglu & Basarmak, 2020; Vatanartiran & Karadeniz, 2015). Teachers need time to practice, learn, and prepare lessons utilizing technology tools. Morrison et al. (2019) captured teacher perceptions of technology integration over a three-year implementation and found that over time, the teachers described how their practices changed and the importance of on-going, embedded professional development was for that transformation. Time has and will always remain a limiting factor for teachers and schools; however, effective use of professional development and staffing could provide teachers with the support they need to develop technology-rich instruction.

In preparation for technology integration, it is important to consider factors that could impede implementation. Building capacity of educators through professional development and readily available technical support are important components driving implementation competency. Organizational drivers, such as technology infrastructure, access, administrative support, and leadership are environmental factors necessary to analyze and develop prior to implementation. Technology integration implementation is a multi-faceted endeavor that requires specific professional development, access to diverse technological resources, and support from administration and technical staff.

Summary

Technology-rich instruction or technology integration is an important classroom pedagogy present in both national and international guidelines for providing 21st century education (ISTE, n.d.-a; Office of Educational Technology, 2017). Technology integration, or technology-rich instruction, is broadly defined as using digital tools or resources to support classroom learning and goals (Liu et al., 2017). Technology integration has many impactful and research-based classroom benefits ranging from student engagement, increased student-centered instruction, and the development of 21st century skills and non-cognitive competencies (Dede, 2014; Ross, 2020; Santori & Smith, 2018; World Economic Forum, 2015). For students to yield the most benefits from effective and active technology integration, teachers must be versed on best practices in general and within their specific content area. This specific set of teacher skills is referred to as TPACK (Mishra & Koehler, 2006), which requires continuous development opportunities for teachers to learn, collaborate, and engage with digital tools, devices, and resources relevant to their skill level, needs, and content. In addition to providing teachers with development opportunities, it is also necessary to provide teachers with time, support, and the infrastructure to create meaningful, technology-rich learning opportunities (Francom, 2020; Hamutoglu & Basarmak, 2020; Liu et al., 2017).

CHAPTER 3

METHODS

The purpose of this qualitative program evaluation study was to examine technology-rich instruction implementation in a Virginia public charter high school designed to support at-risk students via career-oriented and technology integrated instruction. This program evaluation specifically investigated the CRA technology-rich instruction curriculum, teachers' knowledge, and perceptions of technology-rich instruction, as defined by best practices present in extant literature, and the level of technology integration in classrooms measured via the TIM created by the FCIT (2019b).

Technology-rich instruction, also known as technology integration or technology infusion, is a concept that describes using technological devices or resources as a tool to support diverse pedagogy and goals (Liu et al., 2017). The technology integration construct is operationalized for teachers when viewed through the ISTE standards for students and the TIM, as they provide specific guidelines, goals, and outcomes for student activities and learning. Both frameworks emphasize student-centered learning, active engagement, knowledge construction, and collaborative learning (FCIT, 2019b; ISTE, n.d.-c). Classroom implementation of these technology integration best practices requires robust teacher technological pedagogical content knowledge, or TPACK (Mishra & Koehler, 2006).

Evaluation Questions

The questions for this study evaluated an input and the specific short-term outcome of technology-rich instruction as it is currently implemented at CRA. This information will help teachers and administrators at this school improve practice, pedagogy, and student learning. Evaluation Question 1 aimed to provide feedback on the CRA instructional program and school curriculum, specifically regarding technology-rich instruction. Evaluation Questions 2 and 3 were designed to examine and compare the current teachers' technology-rich instructional knowledge and perceptions and technology-focused curriculum with evidence-based best practices. Evaluation Question 4 sought to determine the level of technology integration present in classrooms.

1. How well do CRA's stated instructional strategies align with research-based, technology-rich instruction guidelines?
2. How does CRA teachers' knowledge and perceptions about technology-rich instruction compare to recommended standards for best practices as published in the extant literature?
3. What research-based, technology-rich strategies do teachers indicate are being used in the classroom?
4. What research-based, technology-rich instructional practices are being implemented in the classrooms at CRA?

Program Evaluation Approach or Model

This study was an input and outcome focused program evaluation of technology-rich instruction at a public charter high school. The instructional program described in foundational literature was reviewed against research-based technology-rich instruction best practices and guidelines for the input component of this evaluation. The foci of the outcome evaluation was on teacher knowledge and the use of diverse educational technologies and pedagogies in comparison to research validated, technology integration best practices. Mertens and Wilson

(2012) defined an outcome evaluation as one that focuses on short-term results with the purpose of measuring a program's effectiveness. The evaluation was framed within the CIPP model, focusing specifically on a product of the program (Mertens & Wilson, 2012). Context, Input, Process, and Product are the four components of the CIPP model. A context evaluation aids in the identification of needs, assets, and resources. Input evaluations collect information about strategies, budgets, staffing, or resources to assess and guide implementation. Process evaluations, or implementation evaluations monitor and assess program activities. Product or impact evaluations are the final part of the CIPP model that aims to provide summative information regarding the achievement of program outcomes and goals (Mertens & Wilson, 2012). A product evaluation was chosen because it would formatively guide teachers and administrators in designing professional development opportunities to improve student learning via technology-rich instruction.

Description of the Program Evaluation

This program evaluation followed a qualitative case study design in the pragmatic paradigm. The purpose of the evaluation was to provide data and formative feedback regarding technology integration implementation at CRA. Informational school literature, teacher knowledge and perceptions, and practical classroom application of technology-rich instruction was collected as data to provide a comprehensive understanding and in-depth analysis of this program and one of its intended outcomes. This study followed a pragmatic approach, which describes research and evaluations that are useful for stakeholders and advocates (Mertens & Wilson, 2012). As a qualitative case study design, a variety of data collection procedures were used to explore, understand, and describe a particular program (Creswell & Creswell, 2018; Mertens & Wilson, 2012). A document analysis, teacher surveys, semi-structured teacher interviews, and classroom observations were collected to fully understand the technology integration construct as it is practically applied at CRA. The charter document, which serves as foundational and promotional literature, was the document analyzed for school-level intended technology integration guidelines. The semi-structured teacher interviews and teacher surveys preceded the classroom observations and provided information about teacher knowledge, perceptions, and practices. The TIM developed by the FCIT (2019a) was used during the classroom observations to categorize the types of technology-rich instruction practices occurring in the classroom.

Role of the Researcher

The researcher acted as a facilitator during interviews and an observer as participant (Creswell & Creswell, 2018) during classroom observations. As a fulltime content teacher at CRA for the past 10 years, I have intricate knowledge of the unique setting as well as persistent and prolonged exposure at the school. The persistent participation at the school helps ensure trustworthiness of the data by providing knowledge of daily school operations, routines and patterns in the classrooms (Mertler, 2017). To mitigate potential bias caused by the dual roles of program evaluator and staff, member checks and peer debriefing occurred after teacher interviews and classroom observations. Both processes ensured that the data is represented and interpreted accurately (Mertler, 2017).

Participants

The participants in the study were general education teachers at CRA. Each teacher had been teaching full-time at the school for at least 8 years, the longest being 20 years. All teachers are fully licensed and endorsed in the subject matter they teach. Teacher hiring criteria provided by the principal of the school through a personal communication includes basic licensure criteria for content areas, technology integration experience, and experience working with at-risk groups of students. Each participant is responsible for designing and implementing instruction. Collectively, the participants are responsible for all classroom instruction taking place at CRA. This purposeful sampling was utilized to determine the nuances of technology-rich instruction at CRA. Purposeful sampling is useful for studying a specific case in depth (Mertens & Wilson, 2012).

Data Sources

This evaluation followed a pragmatic approach using qualitative research methods which allowed for an in-depth analysis of the program and its intended outcome (Creswell & Creswell, 2018). Data was collected qualitatively through a document analysis, teacher surveys, teacher interviews and classroom observations. Multiple data sources and strategies were used to enhance credibility (Mertens & Wilson, 2012). The surveys and interviews sought to assess the current knowledge and components of technology-rich instruction within the classrooms and school. The observations provided data regarding the level of technology-rich instruction taking place in the classrooms. All the teacher participants completed the survey, participated in the individual semi-structured interview, and participated in the classroom observations.

Document Analysis

CRA marketing and charter documents were reviewed and analyzed to determine how well the stated technology-related instructional strategies align with research-based technology-rich instruction strategies. The CRA charter document is provided to prospective parents and students and given to school board personnel for review. The document is divided into sections about different components of the charter school. The main sections of informational material include the mission, belief statements, description of the program, curriculum, instructional program, program goals and operation, governance and operations, general information, and the student application process.

Teacher Surveys

The teacher surveys consisted of questions housed in the TIM tools survey database, Technology Uses and Perceptions Survey, with some questions modified to align more closely with the evaluation questions. The Technology Uses and Perceptions Survey includes over 200 question items in seven different categories. The categories include technology access and support, preparation for technology use, perceptions of technology use, confidence and comfort using technology, technology integration, teacher and student use of technology, and technology skills and usefulness (FCIT, 2020b). The teacher survey used in this evaluation consisted of 23 select questions from the Technology Uses and Perceptions Survey regarding perceptions of technology use and technology integration. Other categories and some survey questions within those categories were eliminated because they were not in alignment with the evaluation questions. Some questions in the perceptions of technology use category were customized to align with the TIM and research-based technology-rich instruction characteristics. The survey was externally reviewed by experts in the field for question validity and clarity. The survey is commercially marketed and validated and used within the TIM Tools subscription. The following survey directions and questions were asked:

Perceptions of Technology Use. In this section we are exploring how technology relates to you and your students. Please read the following statements and select the one response that best reflects your level of agreement (Strongly disagree, disagree, neutral, agree, or strongly agree).

1. Technology is a useful classroom tool for student collaboration.

2. Technology skills are essential to my students' success in school.
3. Technology skills are essential to my students' success in their future workplace.
4. Technology is a helpful tool for linking learning activities to the world beyond the classroom.
5. Technology is a tool that allows teachers to have choice and ownership in their learning.
6. Technology changes my role as a teacher.
7. Technology is a useful tool for providing opportunities for students to connect new information to their prior knowledge.

Technology Integration. Listed below are teaching modes in which technology may be used. Please select the response that best indicates how often you use technology in each teaching mode (Not at all, once per month or less, once per week, several times per week, every day, or multiple times per day).

1. Small group instruction
2. Individual instruction
3. Cooperative groups
4. Independent learning
5. As an extension activity
6. As a reward
7. To tutor/for remediation
8. As a research tool for my students
9. As a tool for students to use in planning and managing projects (individual and group)

10. As a productivity tool for my instruction (e.g., to create charts, reports or other products)
11. As a student presentation tool (including multimedia)
12. Student discussion/communication
13. Instructional delivery
14. As a communication tool (e.g., email, electronic discussion)
15. To create online content for my students (web pages, blogs, etc.)
16. To assess student learning

The surveys were distributed electronically through the TIM tools CRA website. A copy of the electronic layout of the survey is provided in Appendix A.

Teacher Interviews

Individual semi-structured interviews were conducted prior to classroom observations. The semi-structured interviews sought to determine the teachers' conceptual and practical knowledge on technology integration as it specifically pertained to their setting and classroom. The following interview questions were asked:

1. What types of pedagogies and practices make CRA unique?
2. Technology-rich instruction is listed in CRA informational and promotional literature. What is your definition or description of technology-rich instruction or technology integration?
    a. Are you aware of any references or specific uses of technology rich instruction in CRA's curriculum? If so, can you describe them?
    b. Note: If candidates don't know or answer no, I will provide them with a prompt using the definition of technology-rich instruction from the marketing

documents: The literature provided to prospective parents defines technology-rich instruction as "an array of technological learning experiences facilitating student learning and modeling current technology". Does this quote prompt you to recall any references or specific uses of technology-rich instruction in the school's curriculum? If so, please describe.

3. Have you been presented with instructional strategies specifically about technology-rich instruction or technology integration through your in-service or professional development at CRA?
    a. If so, what instructional strategies have you been presented with?
    b. How have you used these strategies in your teaching practice?
        i. In what ways are students using technology?
    c. Have you received any information about technology-rich instruction from other sources besides site-based professional development?
4. What would it look like if I came into your classroom and you were using technology?
5. What other strategies do you use or ways you integrate technology?
6. Thank you for this valuable information. Is there anything else you would like to share?

Classroom Observations

Classroom observations were conducted in participants' classrooms during two separate, scheduled instructional periods. Observation data was cataloged and described using the TIM developed by the FCIT (2019b). Technology integration characteristics consist of varying levels of integration for each of the following learning environments: active, collaborative, constructive, authentic, and goal-directed. Observation data was further compared with teacher interviews and surveys to determine teacher knowledge of research-based, technology-rich instruction.

The TIM (see Appendix B) was initially developed and published in 2005 with two further revisions and publications in 2011 and 2019. The purposes of the TIM are to serve as a resource for planning and evaluating technology integration in K-12 classrooms as well as targeting teacher professional development (FCIT, 2019b; Welsh et al., 2011). The TIM was created using a literature review, iterative classroom observations, focus groups, structured interviews and field tests with Florida teachers. It has been revised twice by repeating the literature review, structured interview and focus groups processes (Harmes et al., 2016).

The TIM is organized as a framework for classrooms with a focus on student activities (Harmes et al., 2016). The matrix is divided into five rows for different characteristics of the learning environment and five columns to provide a leveled rating for the spectrum of integration of technology going from entry (teacher-centered) to transformation level (student-centered). The five characteristics of the learning environment outlined are active learning, collaborative learning, constructive learning, authentic learning, and goal-directed learning (FCIT, 2019b).

The TIM is based on research founded in constructivist pedagogy and effective teacher practice. Research emphasis was placed on active learning and student performance, authentic learning environments, instructional practices for collaborative learning, goal-directed learning, student-centered instructional practices and effectiveness, and technology integration (FCIT, 2020a). The TIM has been used in a variety of educational research studies in both K-12 and higher education settings. Recent research includes the TIM's use for pre-service and in-service teacher professional development (FCIT, 2020a), as a reference for the technology integration construct (Liu et al., 2017) and to evaluate the level of technology integration following a one-to-one technology initiative (Strudler & Schrader, 2016).

Data Collection

Data collection took place from April to May of 2021. The most recent marketing and charter document was obtained and used for analysis. An annual school subscription to the TIM tools was used for sending out surveys and completing classroom observations. Teachers were provided with the purpose of the evaluation and consent was obtained from each participant prior to the data collection by providing teachers with the Participant Informed Consent Form (Appendix C). The surveys were distributed electronically, via email, two weeks prior to the individual, semi-structured interviews. Teachers who did not complete the survey within one week received a reminder email to complete the survey. Two days prior to the interviews, teachers who had still not completed the survey received an in-person reminder. All survey results are anonymous, and pseudonyms were provided. Table 2 is a Table of Specifications outlining the alignment between evaluation questions and data sources. Survey questions are categorized by the evaluation question it intends to answer.

Individual teacher interviews were scheduled at their convenience during the school day. The Teacher Interview Protocol (Appendix D) was followed for each interview. The interviews provided qualitative information regarding the teachers' knowledge and perceptions about technology-rich instruction at CRA and within their classrooms. The interviews were audio-recorded and handwritten notes were taken during the interview as recommended practice if recording equipment fails (Creswell & Creswell, 2018). Upon completion of the interviews, a brief meeting was scheduled with each teacher to confirm the accuracy of the information collected via member checking. Member checking allows the participants to review the data to ensure an accurate representation and trustworthiness, or qualitative validity, of the data (Creswell & Creswell, 2018; Mertler, 2017).

The classroom observations provided qualitative information about the practical implementation of technology-rich instruction (Table 2). Specifically, the TIM provided levels of technology integration based on five, research-based characteristics in a meaningful learning environment: active learning, collaborative learning, constructive learning, authentic learning, and goal-directed learning (FCIT, 2019b). Classroom observations of two different instructional periods and lessons were scheduled at the convenience of each teacher. Observations lasted an entire 90-minute class period. The Technology Integration Matrix Lesson Observation Tool (TIM-O), housed on the TIM tools website, was used during each classroom observation.

The TIM-O is designed to help an evaluator identify observable patterns of student activity, teacher activity, and instructional settings within the context of technology-rich instruction. A question-based and matrix-based version of the tool are available for use. The question-based version of the TIM-O uses skip-logic and branching questions that is based on the TIM and is designed to arrive at a technology integration profile efficiently and consistently (FCIT, 2019a). The matrix-based version is recommended for evaluators that are very familiar with the TIM and are comfortable with the observation protocol. The FCIT (2019a) recommends observing the lesson for five to ten minutes prior to answering any questions or making selections on the matrix. The question-based version does not allow the observer to go back and change the answer to an earlier question, but it does have a natural progression, beginning with the use of technology in any fashion. Subsequent questions are geared towards characteristics of the learning environment, focusing on the types of activities students are engaged in and the level of integration based on teachers' actions. The number of questions will vary depending on the answers to previous questions. At the end of the questions a highlighted matrix, or profile, is produced illustrating the level of integration for each characteristic: active, collaborative, constructive, authentic, and goal-directed. Each characteristic is evaluated during the observation and the level of integration is assigned based on how the teacher instructs students to use the technology. The least integrated level, entry, involves only teacher use of technology. Conversely, the highest level of integration, transformation, describes the teacher as a facilitator for higher-order learning activities and innovative use of technology tools (FCIT, 2019b). At this point, the observer will have the opportunity to read through a detailed descriptor of each cell and make any changes as necessary to better represent the lesson on the matrix (FCIT, 2019a).

For these observations, the question-based format of the TIM-O was used for consistency and reliability. Following the TIM guidelines, questions were answered on the TIM-O after viewing the lesson for 10 minutes. If there were multiple learning activities, notes were taken and if necessary, the level of integration was adjusted following the lesson descriptors found within the TIM-O. The profile of technology integration for each teacher and lesson generated at the conclusion of the observation was reported holistically on a table. Trustworthiness of the data was further be ensured by taking detailed notes during the observation and engaging in reflexivity (Mertler, 2017).

Table 2

Table of Specifications for Evaluation Questions

Evaluation Question	Interview Questions	Survey Questions	Document Analysis	Observations
1. How well do CRA's stated instructional strategies align with research-based, technology-rich guidelines?	1, 2a, 2b	--	Charter and promotional documents	--
2. How does CRA teachers' knowledge and perceptions about technology-rich instruction compare to recommended standards for best practices as published in extant literature?	2, 3a, 3b, 3c	Perceptions of Technology Use, 1-7	--	--
3. What research-based, technology-rich strategies do teachers indicate are being used in the classroom?	4, 5	Technology Integration, 1-16	--	--
4. What research-based, technology-rich instruction practices are being implemented in the classrooms at CRA?	--	--	--	TIM-O Tool

Note. CRA = Cavill River Academy; TIM-O = Technology Integration Matrix Lesson Observation Tool.

Data Analysis

Following qualitative data collection procedures outlined by Creswell and Creswell (2018), all data and information was first organized and prepared for analysis by transcribing interviews, typing up observation field notes, and categorization based on types and information sources. Following the data organization, all data was read and annotated for overall meaning, first impressions and thoughts. After the first reading, the interviews were coded by hand and themes were generated. Findings were summarized and compared to research-based practices found in current literature following data analysis (Creswell & Creswell, 2018). Summary tables were created to display the qualitative data for each evaluation question. If the participant's interview or document yielded data containing singular presence of codes, then that presence was denoted with an "X." If data contained more than one code per participant interview or document, then a frequency table was used.

The document analysis, surveys, and interviews sought to provide information regarding the existing knowledge and intended application of technology integration. CRA's foundational charter document was reviewed for the document analysis and intended learning design framework of the school. The document was read and coded using a priori codes. A priori coding, involves a predetermined set of codes and categories that are applied to the data (Saldaña, 2016). The a priori codes consisted of themes present in technology integration best practices: student-centered, authentic, collaborative, constructive, active learning, and multiple representations and expressions (principles of universal design).

Teacher knowledge and perceptions surrounding technology-rich instruction were gathered through surveys and semi-structured interviews. The teacher surveys were used to provide information about current technology integration practices and student use of technology throughout the school. The survey responses were listed and reported holistically to determine school-wide perceptions or knowledge. The survey responses were also compared to interviews and observations. Semi-structured teacher interviews were used to describe teacher knowledge and application of technology integration as it is currently understood. Interviews were recorded and transcribed into a Word document. After transcription, the data was coded using descriptive coding and a priori codes. Descriptive coding summarizes the topics from the interview and allows for categorization (Saldaña, 2016). The a priori codes from the document analysis were also used to analyze the semi-structured interviews and surveys. Using these codes served as a consistent starting place for comparison of teacher's knowledge and intended technology-rich instruction with evidenced-based practices.

Following the TIM, classroom observations provided qualitative data about pedagogies and practices currently present. The results from the classroom observations were presented in terms of pedagogy and their observed level of technology integration. The classroom observations from each teacher were compared to their survey and interview responses to determine consistencies and alignment between their knowledge, perceptions, and actions. The data from classroom observations was also aggregated on a table to represent a holistic view of technology integration implementation at the school. The table containing the levels of technology integration seen in each of the 10 lessons was used to describe trends, patterns, or discrepancies for technology integration at the school level. Table 3 provides a summary of the evaluation questions, data sources, and data analysis procedures.

Table 3

Data Collection and Analysis Methods for Evaluation Questions

Evaluation Question	Data Sources	Data Analysis
1. How well do CRA's stated instructional strategies align with research-based, technology-rich guidelines?	Document analysis and teacher interviews	Qualitative analysis and interpretation of informational and promotional documents and teacher interviews through descriptive and a priori coding.
2. How does CRA teachers' knowledge and perceptions about technology-rich instruction compare to recommended standards for best practices as published in extant literature?	Teacher surveys and interviews	Qualitative analysis and interpretation of teacher interviews through descriptive and a priori coding. Survey data reported and listed holistically.
3. What research-based, technology-rich strategies do teachers indicate are being used in the classroom?	Teacher surveys and interviews	Qualitative analysis and interpretation of teacher interviews and teacher surveys.
4. What research-based, technology-rich instruction practices are being implemented in the classrooms at CRA?	Classroom observations	Qualitative analysis and interpretation of observations using the TIM and comparing results to responses from teacher interviews and surveys.

Note. TIM = Technology Integration Matrix.

Delimitations, Limitations, and Assumptions

Delimitations

The delimitations of this study include the choice of the TIM classroom observation tool to evaluate the level of technology-rich instruction taking place. Another delimitation includes the selection of general education teachers, rather than all teachers, at the public charter high school. Due to time constraints of research and volunteer participants only two classroom observations were conducted per teacher. The two classroom observations were selected by each teacher and therefore may not provide a comprehensive interpretation on daily technology integration practices, but a highlight of the teacher's best practices or specialized lessons. The results of this study are context specific and could be used to provide formative feedback to teachers and administrators regarding technology-rich instruction implementation.

Limitations

The small size of the school and unique mission provides limitations for generalizability. As this study is a program evaluation, the participants are an intact group, which may not be representative of any larger group but do provide formative information about the effectiveness of the program (Mertens & Wilson, 2012). The sample, consisting of five general education teachers, limits the generalizability of the data and restricts any quantitative data analysis as the number is too small to infer practical and significant statistical differences (Mertens & Wilson, 2012). However, the data was used to provide a more holistic image of technology-rich instruction and teacher knowledge and perceptions in the school setting. The small sample size is appropriate and typical of qualitative data because it provides in-depth information about the evaluand (Creswell & Creswell, 2018). There are also limited documents available about CRA and within those documents there is minimal information provided regarding instructional decisions and applications. The researcher's relationship and present employment at the school could create potential bias for data collection, analysis, and reporting. The researcher has not previously served in an evaluator or classroom observer capacity in the school previously, so the participants may feel uneasy during the classroom observations. Due to the length of time that each teacher has worked at the school and worked together with the researcher, participants may feel more comfortable providing honest responses during interviews.

Assumptions

Assumptions of this program evaluation consist of knowledge, training, and truthfulness of responses of teacher participants. It was assumed that teachers understand and apply technology-rich instruction in their classrooms per the school's guiding framework. It was also assumed that the site-based professional development prepares the teachers for implementation of technology-rich instruction. Responses from participants during surveys and interviews were assumed to be an accurate and truthful depiction. There was an underlying assumption, present in the research and guiding this evaluation, that technology-rich instruction promotes deeper learning and the acquisition of key 21st century skills.

Ethical Considerations

The Program Evaluation Standards, developed by the Joint Committee on Standards for Educational Evaluations, provide a framework for guiding educational evaluations (Mertens & Wilson, 2012). The five main attributes of the Program Evaluation Standards (utility, feasibility, propriety, accuracy, and meta-evaluation) are important considerations guiding in the development of this program evaluation. Utility standards describe key aspects regarding how the evaluation is useful and will be used (Mertens & Wilson, 2012). As this program evaluation was grounded in the pragmatic paradigm, the intended use was to serve the needs of the stakeholders. Consent forms included the evaluation's purpose, confidentiality practices, and described how the formative information will be shared with stakeholders at the conclusion of data collection. Feasibility standards provide guidelines for efficiency, practical, context-based procedures, and the utilization of project management strategies. Propriety standards focus on the ethics, morality, legality, and professionalism of the evaluation (Mertens & Wilson, 2012). To uphold propriety standards and mitigate potential ethical issues, the consent forms clearly disclosed the purpose the study and data use procedures. Participants were protected through confidentiality and the removal of personally identifiable information. Classroom observation data was shared with each participant, but the intended use of data was for the program evaluation only. Accuracy standards outline the importance of trustworthy, reliable, and valid information, data collection, analysis, and conclusions (Mertens & Wilson, 2012). Member checking, triangulation, the use of a classroom observation protocol, detailed descriptions, and recording interviews helped ensure accuracy standards were met and the data was credible, valid, and reliable.

The research proposal was reviewed by an academic committee consisting of experts in the field of educational research and K-12 education. After review, the program evaluation proposal was submitted to the William & Mary Education Institutional Review Committee (EDIRC) for approval. After approval was gained from the EDIRC, permission was gained from the CRA school administrator and school division. Consent forms were provided to teachers and the school administrator prior to participation.

CHAPTER 4

FINDINGS

This program evaluation examined the implementation of technology-rich instruction as reported and observed by teachers in a public charter high school. Technology-rich instruction is a curricular component provided in the school's foundational and promotional literature as a vehicle to provide engaging and authentic instruction targeting an at-risk population of students. The data collected were analyzed to determine teacher knowledge and use of technology-rich instruction practices as compared to best practices published in extant literature. The school's foundational and promotional document was analyzed and coded to reveal the intended learning design framework of the school and alignment with research-based technology-rich instruction guidelines. Teacher surveys were used to provide data on teacher's knowledge, perceptions, and overall technology integration. Teacher interviews were coded, analyzed, and used to provide data on the stated instructional strategies of the school, their own knowledge about technology-rich instruction and the types of technology-rich strategies they currently use in their classrooms. Classroom observations were conducted using the TIM (FCIT, 2019b) to determine the level and types of research-based technology-rich instruction practices that are being implemented in the school. This chapter contains the qualitative analysis of the data and is organized by evaluation question.

Evaluation Question 1: How well do CRA's stated instructional strategies align with research-based, technology-rich guidelines?

CRA's stated instructional strategies moderately align with research-based, technology-rich guidelines. The school's informational charter document described instructional practices, strategies and beliefs that portray some of the key features of research-based, technology-rich instruction. During semi-structured interviews, teachers were unable to definitively list technology-rich instruction as a distinctive characteristic in the school's curriculum, but they did however describe two technology-rich features that also appeared in the charter document and two other technology-rich features that were absent from the charter document. A priori codes, selected based on themes present in technology integration best practices, were used to analyze the school's charter document and teacher interviews. The a priori codes selected were student-centered, authentic, collaborative, constructive, active learning and multiple representations and expressions. The charter document was read and coded using the a priori codes listed. The informational charter document is a nine-page document that includes the school's mission statement, belief statements, description, curriculum, instructional program, program goals and objectives, governance and operations, the student uniform policy, and the student application process. All sections were read, but only the belief statements, description, curriculum, and instructional program yielded codable material using the a priori codes. The other sections of the charter document described information about the school's operations, governance, and annual goals and objectives, not specific aspects of teaching and learning.

Of the six a priori codes used, only three were found within the document: authentic (learning), student-centered and collaborative. Authentic learning was mentioned the most, totaling six times throughout the document. Collaboration and student-centered instruction were both discussed two times. Collaboration was discussed as occurring in two different environments, one between students and then collaboration among staff. The first belief statement listed in the charter document is that "all activities will be student-centered" and likewise a variety of student-centered instructional strategies were listed first within the instructional program section as a method for engaging the school's at-risk population. It is also important to note that while technology-rich instruction was not an a priori code, it was stated three times within the charter document. The emphasis on technology-rich instruction found in this document prompted this formative program evaluation by indicating its importance in the school's programming. The code first appeared within the school's belief statements. In this section, technology was described as the foundation to enhance academics and career preparation. This belief statement was coded because it aligns with research-based technology integration functions and purposes where technology is described as a tool to support active learning and help students develop 21st century skills necessary for life and work (ISTE, n.d.-a; Office of Educational Technology, 2017; VDOE, 2020c; World Economic Forum, 2015). The second and third technology-rich instruction codes appeared in the instructional program section of the charter document within the narrative section and at the end of a list of student-centered practices. The narrative portion identifies technology-rich instruction as a key concept that CRA will focus its instructional practices. As a student-centered practice, technology-rich instruction is defined and described at the end of the section as, "an array of technological learning experiences facilitating student learning and modeling current technology". While the benefits and purpose of technology-rich instruction presented in the charter document align with research, the statements presented are vague and do not completely operationalize, describe, or define technology-rich instruction.

Teacher Interview Questions 1, 2a and 2b were used as another source of data to determine alignment between CRA's stated instructional strategies and research-based technology integration guidelines. The interviews were recorded, transcribed, and then coded. Similar to the document analysis, the interviews were coded using the same a priori codes. However, descriptive coding was also employed to categorize emerging themes. Table 4 contains the frequency of codes found within each analyzed artifact for Evaluation Question 1. Interview Questions 1, 2a and 2b seek to provide information about unique pedagogies and practices found within school as well as any known references to technology-rich instruction in the school's curriculum.

Interview Question 1 asked teachers about pedagogies and practices that make CRA unique. Prior to providing teachers with specific information found in the curriculum it was important to ask them about their perceptions of the school's curriculum and overall focus. Emerging themes from this interview question include workplace readiness skills, small class sizes, and innovation. All five teachers mentioned technology in their responses to the question but supplied varying degrees of use. Two of the teachers discussed how the school has innovatively used and integrated technology before other schools. Two teachers also discussed students working towards and gaining Career and Technical Education (CTE) industry certifications as an important practice. The remaining teacher indicated that technology isn't necessarily included in standard practice, but a more distinguishing trait for the school was the individualized instruction. Three of the five teachers discussed student-centered learning and individualized instruction as unique traits of CRA. Student-centered learning was described by teachers as "coming up alongside them where they are used to failing" and "identifying you know areas that different students need more help with in a way that in a more traditional school probably would not be typical." Two teachers also mentioned small class sizes as a unique trait of the school. After coding the interviews and determining emerging codes of workplace readiness skills, small class sizes and innovation, the charter document was examined for presence of these themes. The charter document specifically states an emphasis on knowledge transfer, careers, employment opportunities, occupational training, and other authentic experiences such as mentorships, internships, mock interviews, and apprenticeships, which fall under the theme of workplace readiness skills. Small class sizes are explicitly stated as a program objective and listed as a component of their instructional program. With the exception of the emerging innovation code, workplace readiness skills and small class sizes were also themes present throughout the charter document.

Interview Questions 2a and 2b were focused on CRA's stated instructional practices. Three of the five teachers discussed a web-design and computer focused curriculum when asked about specific refences in CRA's curriculum and only one teacher indicated that they knew it was likely in the curriculum but was not aware of specific wording. All teachers interviewed, representing 5 out of 6 content teachers (83%), requested clarification for that question which led into Question 2b where the definition listed within the charter document was provided to teachers, and they were asked if it prompted them to recall any specifics from the curriculum. In response to Question 2b, teachers provided specific examples of technology use in classrooms but did not discuss the charter document. The principles of UDL were not referenced during interviews or found within the charter document.

Table 4

Code Frequency for Document Analysis and Interview Questions for Evaluation Question 1

Source	Active	Authentic	Collaborative	Constructive	Principles of UDL	Student-Centered
Charter document	0	6	2	0	0	2
Teacher 1	0	1	0	0	0	0
Teacher 2	0	2	0	0	0	0
Teacher 3	1	3	0	0	0	1
Teacher 4	0	0	0	0	0	1
Teacher 5	0	0	0	1	0	1
Totals	**1**	**12**	**2**	**1**	**0**	**5**

Note. Only a priori codes are listed. UDL = Universal Design for Learning

Evaluation Question 2: How does CRA teachers' knowledge and perceptions about technology-rich instruction compare to recommended standards for best practices as published in extant literature?

Questions 2, 3a, 3b, and 3c from the teacher interviews provided information about teachers' knowledge of the technology integration construct and technology-rich instruction as they have learned about it from different professional development opportunities. The answers to these interview questions were coded using the previous a priori codes and any emerging descriptive codes. The Perceptions of Technology Use section of the teacher survey was used to further inform the interview data for this evaluation question by elucidating their thoughts on the usefulness of technology for various pedagogies, practices, and long-term benefits. Based on interview data, individual teachers have little knowledge about the recommended standards for technology-rich instruction best practices. Teacher surveys indicated that they are aware of the capabilities of the various technological resources for classroom use.

As a synthesized construct, technology-rich instruction facilitates active, student-centered learning and knowledge construction while utilizing technological resources or platforms (Bower

& Vlachopoulos, 2018; Dondlinger et al., 2016; FCIT, 2019b). During the semi-structured interviews, teachers were asked for their definition of technology-rich instruction. Their coded responses are displayed in Table 5. In their definitions, three of the five teachers identified at least one key component of technology-rich instruction as demonstrated by the a priori codes present. While none of their answers provided the educational terminology, their responses highlighted student-centered learning, active learning, constructive learning, and authentic learning. A descriptive code from earlier, workplace readiness skills, also appeared in 2 of the 5 teachers' definitions. One of the 5 teacher's definitions included technology use, but only in terms of how the teacher uses it for instruction. Technology-rich instruction is more focused on how the students are using technology to learn and not how the teacher uses it for passive instruction, productivity purposes, or lesson design. No teachers mentioned, referenced, or provided examples of the UDL principles (multiple representations and expressions).

Table 5

Technology-Rich Instruction Definition Code Presence During Teacher Interviews

Teacher	Active	Authentic	Collaborative	Constructive	Principles of UDL	Student-centered	Workplace readiness skills
1						X	
2	X			X			X
3		X		X			
4							
5							X

Note. A priori and descriptive codes are displayed. An "X" indicates teacher interview described the coded term. A blank value indicates that quality was not described throughout interview questions listed. UDL = Universal Design for Learning

Questions 3a, 3b, and 3c sought to ascertain technology-rich instructional strategies teachers learned and professional development sources. This series of questions also provided another opportunity for teachers to discuss technology-rich instructional strategies they have knowledge of and use. Most notably, four of the five teachers discussed learning technology-rich strategies from an informal network of teachers either within the school or the school division. Two of the 5 teachers further cited instructional examples coded as authentic learning experiences. One of those teachers also mentioned classroom technology activities involving student collaboration and constructive learning. Two of the teachers discussed presenting professional development targeting the use of technology in the classroom. The frequency of codes produced for teacher responses to Interview Questions 3a, 3b, and 3c are listed in Table 6. Another commonality shared among participant responses was occurred when they were asked to provide examples of technology-rich instruction strategies they learned. When asked this question, teachers discussed the use of technological tools, applications, or resources, not specific strategies, or examples of how they use those resources. As one of teacher said in their interview about professional development, "it tends to be focused more on the new tool rather than the instructional strategies that you would use the tool with." They go on to further discuss how they often leave those meetings without a clear picture of how to incorporate the technology effectively into classroom instruction. This quote and response represent a summary of the teacher interview responses for those questions.

Table 6

Code Frequencies for Teacher Responses From Interview Questions 3a, 3b, and 3c.

Teacher	Active	Authentic	Teacher Collaboration	Student Collaboration	Constructive	Principles of UDL	Student-centered	Workplace readiness skills
1			1					
2								1
3		1	1	1	1			
4			2					
5	1	2	1					
Totals	**1**	**3**	**5**	**1**	**1**			**1**

Note. Descriptive and a priori codes are displayed. A blank value indicates that quality was not described throughout interview questions listed. UDL = Universal Design for Learning

The Perceptions of Technology Use component of the teacher survey captures the teachers' feelings and perceptions towards technology use and technology skills in the classroom. In the survey the teachers were presented with statements regarding technology use in the classroom and technology skills. They were asked to respond to each statement based on a Likert scale ranging from strongly disagree, disagree, neutral, agree and strongly agree. All five teachers agreed or strongly agreed with the statement that technology is a useful classroom tool for student collaboration. It is important to note that while most of the teachers agree that technology is a useful collaboration tool, only one of the five teachers mentioned student collaboration in their responses. Four out of 5 teachers agreed or strongly agreed that technology is essential for students' success in school and the workplace. Four out of five teachers also agreed or strongly agreed that technology is helpful for linking learning activities to the real world and providing opportunities for students to connect new information to their prior knowledge. Teacher agreement with these statements regarding technology use and applications, demonstrates their knowledge and awareness of technological capabilities in the classroom as they pertain to learning life-long skills and removing physical and geographic barriers for learning.

Evaluation Question 3: What research-based technology-rich strategies do teachers indicate are being used in the classroom?

Interview Questions 4 and 5 queried teachers at what technology use looks like in their classroom, both from an instructional perspective and strategies they use to engage students. The interview responses were coded using the previous a priori codes and descriptive codes. The second part of the survey, Technology Integration, sought to further inform the interview responses by asking teachers to rate the frequency with which they and their students use technology in the classroom. Based on the survey data, all teachers indicated they use technology for instructional purposes regularly, with 3 out of 5 teachers indicating they use multiple times per day. Survey responses reveal that student use of technology occurs at least once a week within each teachers' classroom. The teacher interview responses provided examples of how teachers integrate technology that highlight some components of research-based technology-rich instruction strategies.

Question 4 asked teachers to describe what it would look like in their classroom if they were using technology. In response, all teachers described the technology and/or technological tools they use regularly for instruction. All five teachers identified using one or more Microsoft applications, such as Teams, Word, PowerPoint, or Excel. Four out of 5 teachers also mentioned Canvas as a place where students access and retrieve assignments online.

Teacher responses to Question 5 identified how students in classrooms are using and engaging with technology. All teacher responses contained information highlighting at least two of the a priori codes, which represent key features of technology integration. Coded responses for

Interview Question 5 are displayed in Table 7. All five teachers described student technology use in their classroom as being constructive, with students being involved with creation or inquiry-based learning. Four of the 5 teachers discussed students being actively engaged in using a technological tool or resource. Four teachers also provided examples of how students use technology authentically in their classes. Some examples cited include creating websites and logos for local businesses, tracking, and maintaining bank transactions in an Excel spreadsheet, and critically investigating sources on the internet. Goal setting was a new code that emerged during one teacher's response to Question 5. This was the only time a teacher mentioned students responsible for setting goals and monitoring progress via technology throughout the entirety of the interviews. The goal-directed activity described by the teacher was also coded as authentic because students were using productivity software to monitor their own progress. Another code that appeared in response to Question 5 was workplace readiness skills, which also appeared in previous interview responses and within the charter document. As seen in Table 7, teachers reported active learning, authentic learning, constructive learning, and one instance of goal-directed learning. Consistent with most previous interview and survey responses, the a priori codes for collaboration and multiple representations and expressions were not mentioned. The presence of the code indicates teacher attention to that learning environment characteristic but does not provide enough information to describe the level of integration or student autonomy. For instance, one teacher described technology use in the current classroom as, "showing a lot of PowerPoints and students are using Canvas all the time." This quote indicates that the teacher is using technology and that students are using technology but does not provide enough information to determine how actively or constructively it may be integrated. Similarly, another teacher indicated that they "use Teams every day." Microsoft Teams allows for meetings and collaboration, but the teacher did not describe specifically how Teams was used. Another persistent theme during this part of the interview was that all teachers mentioned a different classroom environment from previous years, with some describing a virtual teaching environment or a hybrid teaching environment, where some students attend virtually and some are face to face in the classroom. One teacher described their classroom as, "doing the blended learning thing, where we're doing things at home and we get students in the classroom at the same time. So, we're constantly using the computer for something or other."

Table 7

Teacher Response Codes to Interview Questions 4 and 5

Teacher	Active	Authentic	Constructive	Principles of UDL	Student-centered	Goal setting	Workplace readiness skills
1	X		X				
2		X	X				X
3	X		X				X
4	X	X	X			X	
5	X	X	X				

Note. Descriptive and a priori codes from interview question responses are listed. An "X" indicates the presence of the code during interviews. A blank value indicates that quality was not described throughout interview questions listed. UDL = Universal Design for Learning

The Technology Integration part of the teacher survey sought to determine how often teachers integrate technology for a variety of instructional purposes. For each activity or instructional purpose listed, teachers rated their frequency based as occurring not at all, once a month or less, once per week, several times a week, and every day or multiple times a day. All teachers reported integrating technology at least weekly for individual instruction, instructional delivery, assessment of student learning, and as a communication tool. Most teachers, 4 out of 5, indicated they are using technology in the classroom as a productivity tool for teaching and for instructional delivery. These instructional activities portray more characteristics found in passive learning, with the teacher being the primary user of technology (FCIT, 2019b). While those frequently used activities are a component of passive learning, they align with teacher responses to Interview Question 4 where teachers described the types of technology they use. In alignment with interview responses, 4 out of 5 teachers are not using technology at all or less than once a month for cooperative groups. This survey data aligns with teacher interviews because only one teacher mentioned student collaboration in association with technology-rich instruction. Four out of 5 teachers indicate that they integrate technology as a research tool and as a tool for students to use in planning and managing projects at least weekly. Allowing opportunities for students to use technology as a research tool provides opportunities for active, constructive, and authentic learning. According to the TIM, integrating technology as a research tool could rate anywhere from the adoption level to the transformative level of integration (FCIT, 2019b). Student use of technology for planning and managing projects provides a goal-directed learning environment for students, which is another key feature found on the TIM (FCIT, 2019b) and student-centered learning (ISTE, n.d.-b). On the survey, 4 of the 5 teachers reported using technology as a tool for students to use in planning and managing projects at least once a week, with some indicating several times per week or every day. Although four of the teachers indicated the regular use of technology for that student learning purpose, only one teacher mentioned and described planning and goal setting during the interviews. In general, the survey data revealed more frequent teacher use of technology, than student use of technology in the classroom.

Evaluation Question 4: What research-based, technology-rich instruction practices are being implemented in the classrooms at CRA?

During classroom observations, teachers demonstrated little use of technology-rich instruction practices. Two classroom observations for each teacher were conducted to provide data on the technology-rich instruction implemented in classrooms. Classroom observations lasted the entire 90-minute class period and were scheduled at the convenience and request for each teacher. Of the 10 total observations, 3 took place from a remote setting. Due to the Coronavirus pandemic, schools began the 2020-2021 school year in a remote environment. The remote environment consisted of teachers providing classroom instruction via Microsoft Teams meetings and the Canvas learning management system. Beginning in January 2021, select grade levels and students were given the option to return to schools to participate in in-person learning. Of the 57 total CRA students, 63% returned to in-person learning, 26% remained in the virtual setting, while 11% were not given the option because they graduated early or participated in an early college program. To accommodate the virtual and in-person students, teachers were required to provide classroom instruction through Microsoft Teams through the end of the school year. The remote classroom observations were conducted through the already established Microsoft Teams meeting for the class. In every classroom, there was a mixture of virtual and in-person students. Therefore, teachers presented instruction, directions, and activities through the class Teams meetings to provide online and in-person students' access. The TIM, developed by the FCIT (2019b), was used to classify and categorize the classroom observations in terms of the level of integration for each characteristic of a meaningful learning environment: active, collaborative, constructive, authentic, and goal-directed.

The TIM Lesson Observation Tool (TIM-O) is found within the TIM tools website and was used to complete each classroom observation. Observers have the option to choose a matrix-based observation or a question-based observation. The question-based observation was used for each of these teacher observations for consistency and reliability. Copies of the observation questions found on the TIM-O were not included here because information was proprietary and required a subscription for use. The series of questions asked varied in number depending on the answer to the previous question. However, each question-based observation began with the use of technology in any fashion and then proceeded to ask questions about how students were engaged with the lesson via each of the TIM's characteristics of the learning environment (active, collaborative, authentic, goal-directed). The TIM-O was described as useful for face-to-face or virtual lessons (FCIT, 2019a), thereby demonstrating consistency between the face-to-face and remote observations. Detailed notes were taken during the observation to ensure trustworthiness of the data (Mertler, 2017).

A completed matrix with a selection for each level of technology integration per characteristic of the learning environment was produced following the classroom observation. Observation data for all teachers during each of the two lessons are aggregated in Table 8. Apart from one feature, all lessons observed were either entry level or adoption level. Entry level technology integration is defined by complete teacher use of technology to deliver curriculum and instruction to students. Adoption level technology integration is characterized by procedural use of technology, where the teacher provides students with directions for the conventional use of technology (FCIT, 2019b). For collaborative learning, all lessons were characterized as entry level because during observations all students worked independently. In contrast to the interviews, authentic learning appeared as entry level for seven of the ten observations. Entry level authentic learning is characterized by student use of technology that is unrelated to the world outside the classroom (FCIT, 2019b). Goal-directed learning was also observed as entry level for eight out of ten lessons because teachers provided directions and monitored student progress. Active and constructive learning were consistently at the adoption level of technology integration and also appeared frequently throughout the interviews. These constructs were consistently had the highest level of integration, but in terms of student technology use, the adoption level is still defined by teacher direction. Only one teacher reached the adaptation level of integration during a lesson for active learning because they provided students with choices in some of their technology tools and presentation. Holistically, these results indicate learning that is directed and guided by the teacher, with little opportunity for the students to explore and lead their own learning. Four out of the 5 teachers had very little variability between lessons, having only one feature different between the first and second lesson.

Table 8

Aggregated Teacher Observations on the TIM

Teacher (Lesson)	Learning Type				
	Active	Collaborative	Constructive	Authentic	Goal-Directed
1 (1)	Adoption	Entry	Entry	Entry	Entry
1 (2)	Adoption	Entry	Adoption	Entry	Entry
2 (1)	Adoption	Entry	Adoption	Entry	Adoption
2 (2)	Adoption	Entry	Adoption	Entry	Entry
3 (1)	Adoption	Entry	Adoption	Adoption	Entry
3 (2)	Adoption	Entry	Adoption	Entry	Entry
4 (1)	Adoption	Entry	Adoption	Adoption	Entry
4 (2)	Adoption	Entry	Adoption	Entry	Entry
5(1)	Adaptation	Entry	Adoption	Adoption	Adoption
5 (2)	Adoption	Entry	Adoption	Entry	Entry

Note. Each characteristic of the learning environment was rated using the TIM with levels ranging from lowest to highest integration: entry, adoption, adaptation, infusion and transformation.

Summary of Findings

The findings of this evaluation indicate little alignment or knowledge of research-based technology-rich instruction. The stated instructional program at CRA, as seen in the document analysis, discusses specifically using technology-rich instruction, but only goes on to describe three of the six major characteristics found in research-based technology-rich instruction. Sampled teachers, consisting of five out of the six content teachers (83%), were also largely unaware of the stated technology-rich instruction curriculum at CRA. However, they were able to describe other key features of the charter school as they were outlined in the document analysis.

Similarly, teachers possessed little knowledge of the technology-rich instruction. During semi-structured interviews, only three of the five teachers discussed at least one facet of technology-rich instruction. In contrast, survey responses on teachers' perceptions of technology use indicate that teachers agree and acknowledge the importance of technology for authentic learning and collaboration, features that were scarcely mentioned or entirely omitted from interview responses. Professional development for CRA teachers, an important activity and output present in the logic model (see Figure 2), was discussed as occurring primarily through an informal network of teachers located at the charter school or within the school division. Formal professional development opportunities were indicated to focus on new technological tools, applications, or resources instead of specific ways to integrate technology into a content area.

Teacher survey and interview responses also provided data on the regularity of integration and the different ways they integrate technology into the classroom. Survey responses indicated more regular and daily use of technology integration for students than was seen during classroom observations. All teachers described using technology daily, most notably through

Microsoft applications. In providing examples of technology integration in the classroom, all teachers mentioned at least two of the main components of research-based technology-rich instruction, as seen through a priori coding. Notably, all teachers described constructivist learning activities using technology and four out of five teachers emphasized active learning.

Classroom observations revealed that most teachers were implementing technology-rich instruction at similar levels of integration, entry level and adoption level. Entry level integration is characterized by teacher delivery of information, or individual, procedural use of technology. Adoption integration level describes an environment where students use technology tools, but only in guided, conventional ways (FCIT, 2019b). Therefore, the observation data does not substantiate the constructive and active learning mentioned throughout the interviews. Student collaboration was observed as entry level throughout all the classroom observations, indicating students were always working independently. Teacher interviews provide further support for entry level collaboration in the classroom as only one teacher mentioned student collaboration. Conversely, a collaborative learning environment was indicated as an instructional strategy in the charter document and teachers indicated in their survey responses that they agree or strongly agree that technology is useful for student collaboration. This qualitative data demonstrates a discrepancy between what teachers indicate are happening and what is happening in classrooms. Chapter 5 will further discuss these findings, including practical and programmatic recommendations and suggestions for future research and evaluations for improvement.

CHAPTER 5

RECOMMENDATIONS

Technology-rich instruction is a prominent feature found in both national and state educational plans and policies. Both recognize the importance and effectiveness of utilizing technology to engage students in personalized and deeper learning experiences that prepare them to meet 21st century life and workplace expectations (Office of Educational Technology, 2017; VDOE, 2020b). The purpose of this evaluation was to provide formative feedback to staff of a public charter high school regarding their knowledge and implementation of technology-rich instruction. CRA, a public charter high school, was created and exists to support at-risk students in grades nine through twelve. CRA lists technology-rich instruction as an important instructional activity used to engage students in learning and provide them with an academic, social and career preparatory education. Studies indicate key components for success with at-risk students include technology-rich instruction or technology integration replete with interactive learning, the use of technology for exploration and creation, teacher support, multiple representations of ideas and peer collaboration (Darling-Hammond et al., 2014). This evaluation sought to identify teachers' knowledge about technology-rich instruction and determine the levels and types of integration present in CRA classrooms. Findings from the study and recommendations for the program and future evaluations are provided in this chapter.

Summary of Major Findings

The program theory forming the foundation of this evaluation was that teachers engage in collaborative, site-based professional development about technology-rich instruction which produces a short-term outcome where students are engaged in technology-rich instruction in the classrooms. This program theory (Figure 2) is based on assumptions that staff understand and apply technology-rich instruction in their classrooms and that the site-based professional development provided by the school or school division prepares teachers for technology-rich instruction implementation. This evaluation found the foundational and promotional charter document lacking clarity and specificity regarding technology-rich instruction. The guiding document listed some components of technology-rich instruction but did not adequately or operationally define technology-rich instruction. The findings of this evaluation also provide evidence that teachers lack comprehensive knowledge regarding all elements of technology-rich instruction. Following the logic model, if there is a lack of technology-rich instruction knowledge, then teachers could not adequately design and implement lessons utilizing technology and students would not be engaged in technology-rich activities that deepen learning. This gap was revealed during the semi-structured interviews and further confirmed with the low levels of technology integration observed in classrooms. Therefore, the logic model presented in Figure 2 was built on assumptions that were not valid. Moving forward, CRA leadership will need to refine and redefine its processes and procedures to accurately reflect the program. A summary of the major findings, organized by evaluation question, is presented below.

Evaluation Question 1: How well do CRA's stated instructional strategies align with research-based, technology-rich guidelines?

The stated technology-rich instructional strategies presented in the foundational and promotional charter document demonstrate moderate alignment to research-based technology-rich guidelines. The document analysis and teacher interviews yielded five of the six essential components of technology-rich instruction: active, authentic, collaborative, student-centered, and constructive learning. Across all teacher interviews, four of the six technology-rich instruction components were discussed; however, independently teachers were only aware of one to three technology-rich instruction components. The charter document only contained references to three of the six technology-rich instruction components. Incongruence between teacher knowledge and stated strategies in the charter document were discovered within the collaboration construct as it was only mentioned in the charter document and not at all during teacher interviews. The principles of UDL, multiple means of representation and expression, were entirely absent from the interview responses and the charter document. Furthermore, teachers were largely unaware of the presence of technology-rich instruction in the foundational literature. An emerging theme from interviews was the school's focus on workplace readiness skills. The charter document did not directly reference workplace readiness skills as the teachers did, but it did describe preparing students for careers using a variety of techniques including technology.

Evaluation Question 2: How does CRA teachers' knowledge and perceptions about technology-rich instruction compare to recommended standards for best practices as published in extant literature?

Individual teachers displayed little knowledge about technology-rich instructional strategies found in published literature. Three of the five teachers discussed two aspects of technology-rich instruction, while two of the five teachers did not mention any of the major components (see Table 5). There was little diversity among teachers' knowledge, and none of the teachers mentioned collaboration or the principles of UDL. All teachers discussed their professional development occurring through informal learning networks, with some also mentioning site-based and division-wide professional development. Teachers consistently discussed learning about technology tools and platforms during professional development. A glaring absence from teacher professional development, reported outright by one of the teachers and likewise not mentioned during interviews, was the lack of pedagogical learning on how to use the technology in their content areas. In further support of this finding, survey responses indicate teachers understand the functionality of technology but do not embed it into lessons regularly. This incongruence may be due to the gaps in professional learning. Following the logic model, if teachers are not provided with sufficient technology-rich instruction professional development as an output, then it will not be observed properly as an outcome.

Evaluation Question 3: What research-based technology-rich strategies do teachers indicate are being used in the classroom?

Each teacher described classroom strategies and activities highlighting at least three components of technology-rich instruction (see Table 7). All teachers indicate they utilize constructive learning in their classrooms, with four out of five teachers also discussing active learning. Three of the five teachers also described authentic learning activities leveraging technology resources or tools. In alignment with previous evaluation question findings, no teachers described the principles of UDL or collaboration as technology-rich strategies they utilize in the classroom. Survey responses further support the lack of student collaboration in the classroom as four out of five teachers indicating using technology once a month or not at all for collaboration. Teachers also indicated through survey and interview responses that students use technology regularly. However, the sole use of technology does not indicate the quality, effectiveness, or student autonomy.

***Evaluation Question 4: What research-based, technology-rich instruction practices are being implemented in the classrooms at CRA*?**

Classroom observations revealed consistently low levels of technology integration, both between teachers and lessons. There was very little variance seen between each teachers' first and second observations with most levels of integration rating as entry and adoption. Entry and adoption levels of integration are characterized with mostly passive leaning techniques and little opportunities for student creation and choice (FCIT, 2019b). Active and constructive learning were observed at the adoption level of integration for nine out of the ten lessons. These characteristics of the learning environment appear to be an intentional component of instruction throughout the school, as those attributes were similarly mentioned several times throughout teacher interviews. Another consistency seen between interviews classroom observations and teacher interviews were the low levels of integration seen for collaboration and goal-directed learning. In every lesson, collaboration was observed as entry level, which is defined by individual use of technology (FCIT, 2019b). Goal-directed learning was observed at entry levels for nine out of the ten classroom observations. During one part of one teacher's lesson, adoption level goal-directed learning was observed as students were using technology to monitor their progress on learning objectives. Goal-directed learning at adoption level involved teacher direction and procedural or conventional use of technology tools (FCIT, 2019b). The classroom observations revealed teacher-driven, and teacher directed lessons and that teachers displayed consistently low levels of technology integration (according to the TIM).

Discussion of Findings

The results of this evaluation indicate that the charter document and teachers display a lack of comprehensive knowledge about technology-rich instruction and pedagogical techniques using technology tools and resources. When asked about the characteristics that make CRA unique, teachers described student-centered instruction and the intentional focus of workplace readiness skills throughout the school. They did not describe using technology as a platform to accomplish those goals. Preparing students for 21st century life and providing student-centered instruction are research-based benefits outlined for technology-rich instruction. This discrepancy points to an opportunity for teachers to learn about technology integration and new pedagogies that maximize learning outcomes while still providing opportunities for student-centered instruction and growing workplace readiness skills. A learning opportunity exists not only for the teachers, but the entire staff at CRA. Acknowledging these gaps, opportunities, processes, and procedures works to cultivate a learning organization (Senge, 2006).

Since the foundational and guiding document were missing important technology-rich instructional components, all staff would benefit from learning about technology-rich instruction and then collaboratively and operationally defining technology-rich instruction at CRA. A realistic vision and sustainable implementation require faculty and staff to learn about and build practical knowledge regarding technology-rich instruction. This collaborative learning is also important for creating a cohesive program and understanding that gives all teachers the knowledge and capacity to deliver. Programmatic improvements need to occur at the beginning by building capacity and knowledge for technology-rich instruction and then determining specific teacher needs and professional development opportunities. The foundational charter document, teacher interviews, teacher surveys, and classroom observations were all found to be missing several aspects of research-based, technology-rich instruction. These results point to the importance of developing a cohesive vision and building capacity and knowledge of staff with content specific professional development. It is clear that CRA teachers understand the school's purpose and possess knowledge on technological tools and resources; however, they are missing knowledge on how to blend and leverage technology tools in their content areas to support higher levels of student engagement and learning. These technology-based programmatic improvements are timely and necessary given the recent pandemic and its various impacts on school with regards to technology. Due to the COVID-19 pandemic, the school division adopted a one-to-one technology initiative with increasing efforts to move lessons and activities online instead of paper/pencil. This increasing reliance and use of technology creates an opportunity for teachers to continue learning and expanding their practices to better meet the needs of 21st century students.

Implications for Policy and Practice

The focus of this section is to provide recommendations that improve student learning and outcomes via technology-rich instruction. Technology-rich instruction is recognized in national and state policies as an essential component to contemporary classrooms for preparing students for post-secondary work and life (Office of Educational Technology, 2017; VDOE, 2020c). This recognition stems from a body of research detailing the importance and effectiveness of technology integration in equitably developing 21st century skills in students (Dede, 2014; ISTE, n.d.-c; Office of Educational Technology, 2017; World Economic Forum, 2015). Darling-Hammond et al. (2014) further described the importance of using technology for exploration and creation as an effective pedagogy to support at-risk students. At-risk students are CRA's targeted student population and technology-rich instruction is listed as an instructional element at CRA; therefore, as both a stated programmatic feature for CRA and found within national and state policies, technology-rich instruction is an important area for school improvement. Table 9 contains a brief summary of the evaluation's findings and related recommendations.

Table 9

Summary of Evaluation Findings and Recommendations

Findings	Related Recommendations	Supporting Literature
Technology-rich instruction not clearly defined in charter document or understood by teachers	Engage in strategic planning and rewrite components of charter document to align with research	Bolman & Deal, 2013; Bryson, 2020; Senge, 2006
Teachers unaware of all facets of technology-rich instruction	Provide teachers with professional development to understand the basic tenets of technology-rich instruction	FCIT, 2019b; National Implementation Research Network, n.d.; Office of Educational Technology, 2017; VDOE, 2020b
Low levels of technology integration observed in classrooms	Provide teachers with professional development about higher levels of technology integration and content-specific technology integration and implementation. Discuss observations with teachers, formative feedback, continue using matrix to measure growth	Benton-Borghi, 2013; CAST, 2018; Darling-Hammond et al., 2014; DiPaola & Wagner, 2018; Mishra & Koehler, 2006
Teachers indicate learning via informal networks	Build technology integration efficacy with vicarious experiences through peers	Hoy & Miskel, 2013; VDOE, 2020b

Note. FCIT = Florida Center for Instructional Technology; USDOE = United States Department of Education; VDOE = Virginia Department of Education

Recommendation 1

CRA's charter and marketing document should be updated to reflect current research and an operational definition of technology-rich instruction that is understandable by the CRA students, staff, families, and community. This update in documentation and understanding is a key step in strategic planning that will help shape and guide CRA to overcome future challenges, fulfill its purpose, and achieve its goals (Bryson, 2018). Revisiting the school's mission and vision with staff is an important leadership action to re-establish the purpose and clarify what the school should look like and how it should work to fulfill its goals (Bryson, 2018). Building a shared vision is also an important component for creating a learning organization. Developing a learning organization is critical for building staff capacity and promoting a school that nurtures collective, cohesive change via individual and team learning (Senge, 2006). During this strategic planning discussion, the school leadership should also bring relevant and recent research to further define, clarify, and operationalize technology-rich instruction. Collaboration among staff during this process is necessary to develop clear guidance and a vision for the school that would help bring cohesiveness, direction, and future success (Bolman & Deal, 2103; Bryson, 2018). School leadership should also present data from this evaluation concerning technology-rich instruction teacher knowledge and practices. Teachers indicated through interviews more technologically robust lessons than was observed. Providing this information to teachers demonstrates the discrepancy between knowledge and actions and provides an opportunity for teachers to assess their own practices based on the clarified mission and vision. This individual assessment using CRA's mission promotes strategic thinking, acting, and learning (Bryson, 2018). Following the clarification of mission and vision, the charter document should be updated to reflect the operational definition of technology-rich instruction and then sent out to the governing board for discussion and approval. As a charter school, CRA is required to hold meetings with its established governing board in order to make formal programmatic changes or updates. Upon approval from the governing board, CRA leadership should update the school website and send out new copies of the charter document to families and stakeholders.

Recommendation 2

Teacher interviews revealed that CRA teachers were unaware of all elements of technology-rich instruction. This perceived lack of teacher knowledge points to the importance of building teacher competency for technology-rich instruction. Following the Implementation Drivers Framework, which is an Active Implementation Framework used to facilitate and ensure success of initiatives, competency drivers consist of coaching, training, selection, and a fidelity assessment (National Implementation Research Network, n.d.). This program evaluation fulfilled the fidelity assessment component as it provided data about the extent to which technology-rich instruction was utilized as intended and the quality of teacher training for technology-rich instruction. The National Implementation Research Network (n.d.) defines active implementation training as "purposeful, skill-based, and adult-learning informed processes designed to support teachers and staff in acquiring the skills and information needed to begin using a new program or innovation" (Training section, para. 1). Prior to engaging in coaching, CRA teachers need to be provided knowledge about the basic tenets of technology-rich instruction. Specifically, they need to know the definition, purpose, and various pedagogical forms. The VDOE (2020b) also recognizes the importance building capacity and knowledge for teachers surrounding the effective use of educational technology as seen in the Educational Technology Plan for Virginia. In this plan, educational leaders are tasked with promoting cultures of innovation and innovative instructional practices via technology. The VDOE (2020b) states that technology should be integrated into professional learning opportunities and that leaders need to promote and provide professional development about educational technology, research, and educational innovations.

The TIM would serve as a relevant first source of information used to educate teachers about technology-rich instruction or technology integration. The TIM is a research-based framework that describes key components of technology-rich instruction and illustrates classroom implementation (FCIT, 2019b). Using the TIM during CRA professional development helps to maintain and common language and format for technology-rich instruction as it was used during their classroom observations. The ISTE standards, USDOE's National Technology Plan (2017), and the VDOE's Profile of a Graduate are other important resources that should be used when educating teachers on the definition, description, driving purpose, and practical implementation of technology-rich instruction. A synthesis of these resources as they relate to technology-rich instruction is provided in the background of Chapter 1 and the Characteristics of Technology Integration found in Chapter 2. Another important consideration for facilitating successful implementation outlined by the National Implementation Research Network (n.d.) is selection. While the current population of CRA teachers have been with the school for several years, when the time comes to hire new teachers, it will be important to update selection and hiring criteria. Technology integration experience was discussed as being screened for during interviews; however, new screening questions and criteria that more specifically gauge technology-rich instruction knowledge, experience, and practices should be created and used for effective staffing.

Recommendation 3

Classroom observations revealed that teachers are integrating technology at low levels (according to the TIM) and mainly engaging students in passive learning activities. To improve teaching and learning for students, the principal should engage in learning leadership, an integrated model of supervision, professional development, and evaluation (DiPaola & Wagner, 2018). This type of leadership is characterized by collegial relationships, where the principal facilitates teacher learning by providing objective feedback and facilitating reflection, goal setting and professional development ideas (DiPaola & Wagner, 2018). This process should take place simultaneously with peer learning and content-specific professional development to improve technology-rich instruction implementation in classrooms. Continuing classroom observations throughout the next school year and providing objective feedback to teachers using the TIM, will provide teachers with a consistent framework to gauge their lessons, personal learning, and student-centered learning. Prior to this process, it is important for teachers and staff to engage in the mission and vision discussion proposed in first recommendation, so teachers know the goals, methods for goal attainment, and understand the importance of providing technology-rich instruction for students.

CRA teachers require more and different professional development on technology-rich instruction to support sustainable implementation. According to the results of this evaluation, teachers are deficient in knowledge regarding several aspects of technology-rich instruction and how to effectively utilize technology in their content areas to support higher levels of student learning. These results align with a published needs analysis for technology integration, which revealed teachers were also lacking in technological pedagogical content knowledge that could be improved through specific, continuous professional development (Vatanartiran & Karadeniz, 2015). Mishra and Koehler (2006) discuss the importance of building capacity in teacher knowledge and skills individually and connectedly with regards to technology, pedagogy, content, and the intersection between each, known as TPACK. Using this theoretical framework (Figure 1) and understanding, it is argued that technology-focused teacher professional development should be context specific. As Mishra and Koehler (2006) state: “merely knowing how to use technology is not the same as knowing how to teach with it" (p. 1033). This technology-rich instructional knowledge deficiency was similarly described by one of the CRA teachers and echoed in several other interview responses where teachers recalled professional developments activities about technology tools, not pedagogy. Another program evaluation conducted within the same school division also yielded similar professional development deficits. Ellis (2014) found that following a Bring Your Own Technology (BYOT) initiative, teachers also reported receiving professional development on technology tools, not BYOT instructional practices. This observation points to a larger systemic issue found regarding professional development division wide. School division leadership will need to consider to methods and approaches for teacher professional development. Ellis (2014) similarly recommended providing teachers with professional learning opportunities that build their technological pedagogical content knowledge (TPACK).

Professional development and pedagogy should be further guided by the principles found in UDL to promote equity and access in the learning environment (CAST, 2018). Darling-Hammond et al. (2014) point to the importance of using the principles of UDL, specifically offering multiple modes of representation and expressions, to engage at-risk students in learning. Benton-Borghi (2013) further support this argument by incorporating the TPACK model within the UDL framework when providing professional development opportunities for teachers. As CRA teachers are individually responsible for an entire content area, it is important for the school leader to plan and coordinate opportunities for CRA teachers to participate in learning activities that are content specific. Providing teachers with professional development using the TPACK framework will support their individual learning and help them create lessons and utilize technology with higher levels integration (according to the TIM). Within these learning opportunities, it would also be productive to discuss collaboration with other content area teachers. During interviews, teachers mentioned the power of peer collaboration for their learning, but they neglected to mention student collaboration during classroom learning. This discrepancy would be an important discussion point about building foundational skills in students and the power of different pedagogical techniques for long-term student outcomes. Providing an opportunity for teachers to reflect will promote inquiry, awareness, and challenge current mental models. Understanding and changing mental models is a critical component for developing a learning organization and driving change (Senge, 2006).

Recommendation 4

Every teacher interviewed mentioned professional learning occurring through a network of peers, either within the school or school division. Some teachers also went on to explain that they found those professional development opportunities more valuable as they provided them with more knowledge and skills necessary for the classroom. In addition to building capacity in teachers' knowledge and skills surrounding TPACK, they should also be engaged in activities that will promote teacher self-efficacy. Self-efficacy is defined as an individual's judgement about their perceived ability to perform a task (Hoy & Miskel, 2013). As teachers mentioned learning comfortably from their peers, it would be further beneficial to provide opportunities for vicarious learning experiences and feedback. Vicarious learning experiences, or observing a peer successfully perform a task (Hoy & Miskel, 2013), could be orchestrated by pairing teachers with others in their content that are already successfully integrating technology at higher levels. Since there are no teachers at CRA currently integrating technology at high levels, other teachers outside the school will need to be selected for peer learning. Vertical teams, interdisciplinary teams, singletons who support, virtual teams, and structural change are identified as ways to provide professional learning opportunities for singleton teachers or teachers at small schools (Hansen, 2015). Virtual teams would be the most appropriate collaborative learning opportunity because CRA teachers are requiring specific content-based, technological professional development. Technology integration teacher experts could be identified within the school division by other high school principals or through a larger network of teachers that participate in conferences such as ISTE, Virginia Society for Technology in Education, or other content specific conferences. The FCIT could also be used for finding expert teachers for collaborative teaming. CRA supports a unique population of students and operates on a different schedule than other high schools within the division, thereby making collaboration within the division more difficult. CRA's school division will need to understand and work within those constraints, because a one-size fits all approach to professional development will not be able to meet the needs of CRA teachers. School division leaders will need to engage in systems thinking and understand that providing loosely coupled opportunities for CRA and teacher professional development throughout the division would allow opportunities for innovation, adaptation, and responsiveness (Weick, 1976).

Another possible peer learning experience could occur through the instructional technology resource teacher. The VDOE (2020b) recommends, in the Educational Technology Plan, that classroom teachers work with designated instructional technology staff to effectively integrate technology in their classroom and support student engagement.

Recommendations for Future Research

This program evaluation focused on technology-rich instruction in a public charter high school employed a case study design. The public charter high school has a small population of students and only twelve staff members. Though the findings gathered have limited generalizability, they are important for improving teaching and learning at CRA via technology-rich instruction and would also be useful when studying technology integration in other schools. The evaluation took place during an anomaly year where classroom consisted of virtual and in-person students due to the impacts of the COVID-19 pandemic. Future research should be aimed at continuing the classroom observations to determine if the levels of integration observed are typical in a year where all students are in physically present in the classroom. To maintain programmatic integrity, it will be important to repeat this process and also look at developing teacher training and professional development protocols for new teachers. Another area for future exploration would be to specifically look for the principles of UDL in CRA classrooms. The teachers did not mention using any of the strategies present in UDL nor did the charter document describe them. It would be important to determine if teachers possess knowledge around the principles of UDL, as they have been listed as an important pedagogical technique for ensuring equity and access to all learners in the classroom. Another avenue of research includes replicating this evaluation in other schools. Specific areas of interest and usefulness include other elementary and secondary schools found within the school division and or located in other areas of the state of Virginia. While CRA explicitly stated using technology-rich instruction, all the schools within the school division operate using the same strategic plan and one-to-one technology infrastructure. Effective use of technology is an important component of classrooms regardless of age or setting. Results produced from a division-wide evaluation may yield important growth opportunities or possible exemplar teachers to serve as mentors and/or examples to support professional learning. Furthermore, technology integration is a prominent feature within the VDOE’s policy for schools. As such, this evaluation could be used in other

Virginia public schools or charter schools to gauge teacher knowledge and levels of technology integration in classrooms.

Summary

As technology evolves, it continues to change the educational landscape in schools. Technology-rich instruction is an important pedagogy for students to prepare for life in the 21st century. It is a pedagogy defined by creativity, innovation, problem solving and teamwork. Each of these skills is an important competency for students to acquire to survive and thrive in our technology dependent world (Office of Educational Technology, 2017; World Economic Forum, 2015). Therefore, it is crucial for teachers to continue learning and growing alongside the technological changes. This study discovered the successes and growth opportunities for CRA teachers in the area of technology-rich instruction. The teachers were knowledgeable about technological tools and resources but need more learning opportunities on how to effectively incorporate technology in the classroom to promote active, student-centered learning. The school leader needs to provide opportunities for teachers to engage in meaningful and context specific professional development that will improve their knowledge of technology-rich instruction pedagogy via TPACK. Reflective discussions among staff are important for challenging existing mental models and promoting clarity, vision, and learning. When school leaders drive change by using capacity building, collaboration, and pedagogy they will achieve greater overall success (Fullan, 2014).

CRA teachers and staff serve an important purpose in working with at-risk high school students. Due to the unique student population, it is increasingly important for CRA teachers to provide engaging and meaningful instruction that will help prepare them for life after high school as independent, creative, and critical thinking citizens.

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APPENDIX A

Teacher Survey (Electronic Version)

TUPS — Perceptions of Technology Use (Status: Incomplete)

In this section, we are exploring how technology relates to you and your students.

Technology refers to hardware, software, and connectivity that allow students or teachers to search for, create, manipulate, or consume digital content.

Please read the following statements and select the one response that best reflects your level of agreement.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Technology is a useful classroom tool for student collaboration.	○	○	○	○	○
2. Technology skills are essential to my students' success in school.	○	○	○	○	○
3. Technology skills are essential to my students' success in their future workplace.	○	○	○	○	○
4. Technology is a helpful tool for linking learning activities to the world beyond the classroom.	○	○	○	○	○
5. Technology is a tool that allows students to have choice and ownership in their learning.	○	○	○	○	○
6. Technology changes my role as a teacher.	○	○	○	○	○
7. Technology is a useful tool for providing opportunities for students to connect new information to their prior knowledge.	○	○	○	○	○

TUPS — Technology Integration (Status: Incomplete)

This section helps us understand what technology use looks like in your classroom by asking how frequently you use a range of different pedagogical approaches.

Technology refers to hardware, software, and connectivity that allow students or teachers to search for, create, manipulate, or consume digital content.

Listed below are teaching modes in which technology may be used. Please select the response that best indicates how often you use technology in each teaching mode.

	Not at All	Once per Month or Less	Once per Week	Several Times per Week	Every Day	Multiple Times per Da
1. Small group instruction	○	○	○	○	○	○
2. Individual instruction	○	○	○	○	○	○
3. Cooperative groups	○	○	○	○	○	○
4. Independent learning	○	○	○	○	○	○
5. As an extension activity	○	○	○	○	○	○
6. As a reward	○	○	○	○	○	○
7. To tutor / for remediation	○	○	○	○	○	○
8. As a research tool for my students	○	○	○	○	○	○
9. As a tool for students to use in planning and managing projects (individual and group)	○	○	○	○	○	○
10. As a productivity tool for my instruction (e.g., to create charts, reports or other products)	○	○	○	○	○	○
11. As a student presentation tool (including multimedia)	○	○	○	○	○	○
12. Student discussion/communication	○	○	○	○	○	○
13. Instructional delivery	○	○	○	○	○	○
14. As a communication tool (e.g., email, electronic discussion)	○	○	○	○	○	○
15. To create online content for my students (web pages, blogs, etc.)	○	○	○	○	○	○
16. To assess student learning	○	○	○	○	○	○

APPENDIX B

Technology Integration Matrix

The Technology Integration Matrix
Table of Summary Descriptors

The Technology Integration Matrix (TIM) provides a framework for describing and targeting the use of technology to enhance learning. The TIM incorporates five interdependent characteristics of meaningful learning environments: active, collaborative, constructive, authentic, and goal-directed. These characteristics are associated with five levels of technology integration: entry, adoption, adaptation, infusion, and transformation. Together, the five characteristics of meaningful learning environments and five levels of technology integration create a matrix of 25 cells, as illustrated below.

LEVELS OF TECHNOLOGY INTEGRATION → / CHARACTERISTICS OF THE LEARNING ENVIRONMENT ↓	**ENTRY LEVEL** The teacher begins to use technology tools to deliver curriculum content to students.	**ADOPTION LEVEL** The teacher directs students in the conventional and procedural use of technology tools.	**ADAPTATION LEVEL** The teacher facilitates the students' exploration and independent use of technology tools.	**INFUSION LEVEL** The teacher provides the learning context and the students choose the technology tools.	**TRANSFORMATION LEVEL** The teacher encourages the innovative use of technology tools to facilitate higher-order learning activities that may not be possible without the use of technology.
ACTIVE LEARNING Students are actively engaged in using technology as a tool rather than passively receiving information from the technology.	**Active Entry** Information passively received	**Active Adoption** Conventional, procedural use of tools	**Active Adaptation** Conventional independent use of tools; some student choice and exploration	**Active Infusion** Choice of tools and regular, self-directed use	**Active Transformation** Extensive and unconventional use of tools
COLLABORATIVE LEARNING Students use technology tools to collaborate with others rather than working individually at all times.	**Collaborative Entry** Individual student use of technology tools	**Collaborative Adoption** Collaborative use of tools in conventional ways	**Collaborative Adaptation** Collaborative use of tools; some student choice and exploration	**Collaborative Infusion** Choice of tools and regular use for collaboration	**Collaborative Transformation** Collaboration with peers, outside experts, and others in ways that may not be possible without technology
CONSTRUCTIVE LEARNING Students use technology tools to connect new information to their prior knowledge rather than to passively receive information.	**Constructive Entry** Information delivered to students	**Constructive Adoption** Guided, conventional use for building knowledge	**Constructive Adaptation** Independent use for building knowledge; some student choice and exploration	**Constructive Infusion** Choice and regular use for building knowledge	**Constructive Transformation** Extensive and unconventional use of technology tools to build knowledge
AUTHENTIC LEARNING Students use technology tools to link learning activities to the world beyond the instructional setting rather than working on decontextualized assignments.	**Authentic Entry** Technology use unrelated to the world outside of the instructional setting	**Authentic Adoption** Guided use in activities with some meaningful context	**Authentic Adaptation** Independent use in activities connected to students' lives; some student choice and exploration	**Authentic Infusion** Choice of tools and regular use in meaningful activities	**Authentic Transformation** Innovative use for higher-order learning activities connected to the world beyond the instructional setting
GOAL-DIRECTED LEARNING Students use technology tools to set goals, plan activities, monitor progress, and evaluate results rather than simply completing assignments without reflection.	**Goal-Directed Entry** Directions given; step-by-step task monitoring	**Goal-Directed Adoption** Conventional and procedural use of tools to plan or monitor	**Goal-Directed Adaptation** Purposeful use of tools to plan and monitor; some student choice and exploration	**Goal-Directed Infusion** Flexible and seamless use of tools to plan and monitor	**Goal-Directed Transformation** Extensive and higher-order use of tools to plan and monitor

The Technology Integration Matrix was developed by the Florida Center for Instructional Technology at the University of South Florida, College of Education. For more information, example videos, and related professional development resources, visit **http://mytechmatrix.org**. This page may be reproduced by schools and districts for professional development and pre-service instruction.

APPENDIX C

Participant Informed Consent Form

I,_______________________________ , agree to participate in a research study regarding my experiences with the technology-rich instruction at a public charter high school. The purpose of this study is to provide feedback on technology-rich instruction, an intended outcome of the program. This study will explore charter documents, teacher perceptions and knowledge and practical application of technology-rich instruction.

As a participant, I understand that my participation in the study is purposeful and voluntary. All content teachers at the public charter high school will have the opportunity to voluntarily participate in the study. All volunteers will participate in one (1) survey, one (1) semi-structured interview and two (2) classroom observations.

I understand that the interviewer has been trained in the research of human subjects, my responses will be confidential, and that my name will not be associated with any results of this study. I understand that data will be collected using an audio recording device during interviews and then transcribed for analysis. Information from the audio recording and transcription will be safeguarded so my identity will never be disclosed. Reponses from the survey and data collected during the observations will be kept confidential and my name and other identifying information will not be associated with the results of the study.

I understand that there is no known risk or discomfort directly involved with this research and that I am free to withdraw my consent and discontinue participation at any time. I agree that should I choose to withdraw my consent and discontinue participation in the study that I will notify the researcher listed below, in writing. A decision not to participate in the study or to withdraw from the study will not affect my relationship with the researcher, the College of William and Mary generally or the School of Education, specifically.

If I have any questions or problems that may arise as a result of my participation in the study, I understand that I should contact Veronica Warwick, the researcher at 703-795-8839 or vewarwick@email.wm.edu, or Dr. Steven Staples, her dissertation chair at 757-221-2342 or srstap@wm.edu or Dr. Tom Ward, chair of EDIRC, at 757-221-2358 or EDIRC-L@wm.edu.

My signature below signifies that I am at least 18 years of age, that I have received a copy of this consent form, and that I consent to participate in this research study.

___________________________________ ________________________

Signature of Participant Date

___________________________________ ________________________

Signature of Researcher Date

THIS PROJECT WAS FOUND TO COMPLY WITH APPROPRIATE ETHICAL STANDARDS AND WAS EXEMPTED FROM THE NEED FOR FORMAL REVIEW BY THE COLLEGE OF WILLIAM AND MARY PROTECTION OF HUMAN SUBJECTS

COMMITTEE (Phone 757-221-3966) ON March 24, 2021 AND EXPIRES ON March 24, 2022).

APPENDIX D

Teacher Interview Protocol

Purpose of the Study: The purpose of this interview is to describe the technology-rich instruction practices present at the public charter high school. It will explore technology-rich instruction programming at the school level and teachers' knowledge, perceptions and implementation of technology-rich instruction. I appreciate your voluntary participation in this study and want to remind you that the interview is being recorded for purposes of transcribing the interview, but your answers will remain confidential.

Warm-up Questions:

1. How long have you been teaching at this school?
2. What subject do you currently teach and how long have you been teaching it?
3. According to Technology Use and Perceptions Survey, technology is defined as hardware, software, and connectivity that allows students or teachers to search for, create, manipulate, or consume digital content. Based on that definition, have you used technology in the classroom? If so, how long have you used technology in your classroom?

Interview Questions:

1. What types of pedagogies and practices make Cavill River Academy unique?
2. Technology-rich instruction is listed in Cavill River Academy informational and promotional literature. What is your definition or description of technology-rich instruction or technology integration?
    a. Are you aware of any references or specific uses of technology rich instruction in Cavill River Academy's curriculum? If so, can you describe them?
    b. Note: If candidates don't know or answer no, I will provide them with a prompt using the definition of technology-rich instruction from the marketing documents: The

literature provided to prospective parents defines technology-rich instruction as "an array of technological learning experiences facilitating student learning and modeling current technology". Does this quote prompt you to recall any references or specific uses of technology-rich instruction in the school's curriculum? If so, please describe.

3. Have you been presented with instructional strategies specifically about technology-rich instruction or technology integration through your in-service or professional development at Cavill River Academy?
    a. If so, what instructional strategies have you been presented with?
    b. How have you used these strategies in your teaching practice?
        i. In what ways are students using technology?
    c. Have you received any information about technology-rich instruction from other sources besides site-based professional development?
4. What would it look like if I came into your classroom and you were using technology?
5. What are other strategies do you use or ways do you integrate technology?
6. Thank you for this valuable information. Is there anything else you would like to share?

Thank you for participating in this study. As a reminder, your responses will remain anonymous and confidential.

VITA

Veronica E. Warwick

Education

2016 – 2021 Doctor of Education; Educational Policy, Planning, and Leadership

The College of William and Mary

Williamsburg, VA

2008 – 2010 Master of Science in Education

Radford University

Radford, VA

2004 – 2008 Bachelors of Science in Biology

Radford University

Radford, VA

K-12 EXPERIENCE

2021 – present Assessment and Compliance Coordinator

High School

Virginia

2010 – 2021 Teacher

Public Charter High School

Virginia

2015 – 2020 Master Teacher

Virginia Space Grant Consortium