Innovation and Integration of Technology in the Classroom by Career and Technical Educators

by

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Abstract

In addition to content knowledge experts, educators must embrace the importance of technology in the classroom, have the skills and intention to *use* technology, and have the knowledge to *teach* students how to use technology and digital resources. While all educators are exposed to various types of technology training, technology training is typically general rather than customized. A better understanding of educators' Innovativeness and perceptions of importance and use of technology can provide information to develop more focused professional development, specifically tailored to support technology integration by all educators. The purpose of this research was to determine technology Innovativeness of secondary Career and Technical Education (CTE) educators and technology integration in classrooms. Using Rogers' diffusion of innovation theory (Rogers, 2003) and the International Society for Technology in Education for Educators Standards (ISTE•E) as a framework, the researcher designed survey, the *Innovativeness and Technology Integration Survey*, was developed. The survey was designed to investigate the relationships between CTE educator characteristics, Innovativeness, and technology perceptions. Data analyses found that levels of Innovativeness significantly affected levels of integration. CTE program, certification type, and gender also affected level of integration significantly: Business/Marketing educators had higher levels of integration compared to Family and Consumer Science and Health Science educators; educators with a traditional Master's level teacher certification rated importance of technology significantly higher than educators with a BA/MA Equivalent Technical Education certification; female educators had higher rates of

technology integration than male educators. Focusing professional development and technology training on Innovativeness and/or CTE program could increase educators' technology integration and competency to support student technology engagement. Institutional and alternative education programs should consider incorporating information about the ISTE•E Standards in their courses for all types of educator certifications. Additional research is recommended to determine types of technology resources used by educators and students and preferred professional development and training methods.

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My mother, Sarah Alley, for her unwavering love and support and sharing her love for teaching and education;

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All my love.

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List of Abbreviations

Ag	AgriScience Education
ALSDE	Alabama State Department of Education
ALSBOE	Alabama State Board of Education
B/M	Business/Marketing Education
CTE	Career and Technical Education
FACS	Family & Consumer Science Education
ESEA	Elementary and Secondary Act of 1965
EETT	Enhancing Education Through Technology
ESSA	Every Student Succeeds Act
HS	Health Science Education
JROTC	Junior Reserve Officer Training Corps.
ISTE	International Society for Technology in Education
NETP	National Educational Technology Plan
NETS	National Education Technology Standards
SREB	Southern Regional Education Board
T/T/I	Technical/Trade/Industry Education
USDOE	United States Department of Education

Chapter 1. Nature of the Problem

> I've come up with a set of rules that describe our reactions to technologies:
>
> (1) Anything that is in the world when you're born is normal and ordinary and is just a natural part of the way the world works.
>
> (2) Anything that's invented between when you're fifteen and thirty-five is new and exciting and revolutionary and you can probably get a career in it.
>
> (3) Anything invented after you're thirty-five is against the natural order of things.
>
> (Adams, p. 95)

Douglas Adams' quote from *The Salmon of Doubt* (2002) reminds us how technology can affect us through the generations. There is often a wide range of acceptance, knowledge, and use concerning technology among students, parents, and educators. Despite where we fall in Adams' (2002) description, as educators, we need to be "technology knowledgeable" and model 21st century skills for our students. Students need to learn in a way that is relevant to the world around them which means that today's students need to use technology.

Technology in the classroom is a topic that has been talked about for decades. It is commonly accepted that enhanced learning and academic success can be the result of the use of technology in the classroom (Brode, 2005; Chen, Lambert, & Guidry, 2010; Lowther, Inan, Strahl, & Ross, 2008; Molnar, 1997; Rutten, Van Joolingen, & Van Der Veen, 2012). However, it is difficult to stay ahead of new and evolving technology. The pace of technology advancement tasks educators to constantly refine and adapt skills in order to incorporate new technology into their classrooms, lab spaces, and work areas (Office of

Educational Technology - US Department of Education, 2017). Very simply stated by Pynoo et al. (2011), "technology can be a challenge for teachers" (p. 568).

Technology Integration

For students to acquire 21st century skills, which includes digital literacy and fluency, and be career and college ready, educators need to work with, use, and teach technology. Technology must be integrated into classrooms at every level and it is up to the educator to find the time on their own to explore and discover new ways to use current technology and learn new technology resources. (Pynoo et al., 2011)

The use of technology and digital tools by Career and Technical Education (CTE) educators in the public-school system is common and usually expected. It includes work-related administrative activities such as using email to stay connected with administration, colleagues and parents, and software to maintain student records. It includes specific digital technology resources used within each program area, such as specialized equipment, type of computer (such as PC versus Mac), and software programs. It also includes integrating technology into pedagogical and instructional strategies. This integration is of particular concern since integrated technology and digital tools should enhance the learning process, positively impacting academic and career success (Bebell & Dwyer, 2010; Halverson & Smith, 2009; Kopcha, 2010; McKnight et al., 2016; Tamim, Bernard, Borokhovski, Abrami, & Schmid, 2011).

Redmann and Kotrlik (2004) remarked that "CTE teachers are the most active in exploring the potential of using technology in the teaching/learning process, and in adopting technology for regular use in instruction, but are not very active experimenting with technology or with advanced technology integration" (p. 3). Moeller and Reitzes (2011) reported that while 60 percent of all educators say that they use technology in the classroom, "only 8 percent of teachers fully integrate technology into the classroom" (p. 5). McCombs (2011) found that educators generally only incorporated projects that required the use of technology about once a quarter. Also, these projects relied on the skills that students already had instead of requiring students to learn new skills, thus having little to no impact on increasing student technology competencies. While we consider students—elementary through college—as being tech savvy, research indicates that at least "…43 percent of students feel unprepared to use technology as they look ahead to higher education or their work life" (Moeller & Reitzes, 2011, p. 5). A review of literature did not identify any updated studies regarding technology preparedness and high school students.

Educators often set the tone for student technology use in the classroom; they have a central role they play concerning students' regard, respect, and attitude toward technology (Hu, Clark, & Ma, 2003). Pynoo et al. (2011) concluded that, "to maximize the use of the digital learning environment, the usefulness should be demonstrated, while school boards or principals should strongly encourage educators to (or start to) use the digital learning environment" (p. 568). Two ways that can help educators in their efforts to integrate technology is through policy and standards development and professional development.

Technology Standards & Quality Indicators

There is a long history of accountability, curriculum standards, and guideline development in education (Cochran-Smith, Piazza, & Power, 2013; Darling-Hammond, 2010; Darling-Hammond & Falk, 1997; Figlio & Loeb, 2011). This includes implementing, integrating, and using technology. National and state level organizations and policymakers have made recommendations and developed standards and laws over the past 25 years concerning technology skills and integration that should take place in the classroom. In 1994, a national comprehensive approach for improving technology and its use in schools was initiated and the U.S. Department of Education (USDOE) was given the responsibility to support states and school districts to improve student academic success through the use of technology by the current and prior incarnations of the *Elementary and Secondary Act of 1965* (ESEA; SETDA, 2017). The first National Education Technology Plan (NETP) was reported on in 1996 with an emphasis on 1) training for educators to use computers, 2) putting "modern multimedia computers" and the "information superhighway" in every classroom, and 3) access to software programs and online resources for students and educators (Riley, 1996). The NETP has been updated every four to six years since then. The latest NETP, *Reimagining the Role of Technology in Education: 2017 National Education Technology Plan Update*, calls to action policy makers, leaders, administration, educators, and the public to help schools with issues such as 1) adopting approaches of technology use for informal learning experiences that align with formal ones, 2) providing all schools with resources to support using technology in ways that will improve academic learning on a daily basis, 3) helping to close the digital use divide between students who are able to use technology in creative ways to support learning and those that only use it passively, and 4) making sure that the focus on providing internet access to all does not overshadow preparing educators to be able to integrate technology pedagogically in their classrooms (Office of Educational Technology - US Department of Education, 2017). The Office of Educational Technology, within the USDOE, has indicated that starting in 2017, a substantial change will take place with reports being developed every year due to the rapid change of technology (Department of Education, 2015).

Even before the first NETP report in 1996, the International Society for Technology in Education (ISTE), which was founded in 1979 in Eugene, Oregon, was concerned about the use of technology in classrooms. The ISTE initially developed a set of standards specifically targeting technology skills for students in 1998 which had a national and international focus. These standards were called the National Educational Technology Standards or NETS. The organization felt it important that U.S. technology skills be relevant on an international level so standards were created to help develop a "level playing field" for all students (EdSurge, 2017; International Society for Technology in Education, 2017b). One of the earliest reports concerning technology standards is the "National Educational Technology Standards (NETS): A Review of Definitions, Implications, and Strategies for Integrating NETS into K–12 Curriculum" (Roblyer, 2000). This report explained the importance of the NETS in an era of accountability, the challenge of technology integration, and gave examples of curriculum strategies to incorporate technology in the classroom at various levels.

The NETS have been updated regularly and expanded over the years. Now the standards are called the ISTE Standards and there are five specific sets—ISTE Standards for Students (ISTE•S), ISTE Standards for Educators (ISTE•E; previously ISTE Standards for Teachers), ISTE Standards for Education Leaders (ISTE•EL; formerly ISTE Standards for Administrators), ISTE Standards for Coaches (ISTE•C), and ISTE Standards for Computer Science Educators (ISTE•CSE). Along with these specific standards, there is a set of Essential Conditions that ISTE specifies as being important to "effectively leverage technology for learning" ("ISTE Standards Essential Conditions," 2009, n.p.). A copy of the ISTE•E Standards and the Essential Conditions are located in Appendix A. These standards are used throughout the world in more than 50 countries, as well as, in some aspect in all 50 states (International Society for Technology in Education, 2019; Snelling, 2016).

There have been three main revisions of the ISTE Standards within the past three years: The ISTE•S in 2016, the ISTE•E in 2017, and ISTE•EL in 2018. These revisions have changed the focus of the Standards from specific technology usage for delivering content for student learning *to* using technology to empower learners (International Society for Technology in Education, 2019; R. Smith, 2017). Of specific importance are the ISTE•E Standards which promote the use and integration of technology to enhance and challenge teaching practice and traditional approaches, promote collaboration with colleagues, parents, students and other stakeholders, and promote an atmosphere which encourages student engagement with their own learning (International Society for Technology in Education, 2017a). While states throughout the U.S. have used the standards in some form or fashion, a few have adopted the new Student and/or Educator Standards. As of 2019, these include Connecticut (Student and Educator), Rhode Island (Student and Educator), Texas (Educator), Vermont (Student), Michigan (Student), Wisconsin (Student), New Hampshire (Educators), Washington (Students), Idaho (Students), Wyoming (Students), New Mexico (Students), Mississippi (Students), Alabama (Students) (International Society for Technology in Education, 2019), and Oregon and New York in the process of adopting either the Student or Educator Standards (N. Rivas, personal communication, December 12, 2017).

Alabama began taking a serious look at technology in the classroom in 1995 with the establishment of the Governor's Information Technology Commission. This commission had the purpose of establishing guidelines, policies and equipment standards that were to be followed by state executive agencies, state education agencies, and public schools (Riley, 1996). In 1996, Alabama was one of a few states that did not have technology plans in place. However, Alabama is now a leader regarding technology standards in classrooms. In March 2018, Alabama was one of only eight states that had approved a set of Computer Sciences Standards for Students with the formal adoption of the *Alabama Course of Study: Digital Literacy and Computer Science* (Alabama State Department of Education, 2018a;

Richardson, 2018). These standards are established for grades K–12, including CTE, with standard "strands" in the areas of computational thinker, citizen of a digital culture, global collaborator, computing analyst, and innovative designer (Alabama State Department of Education, 2018a). In the development of these standards, the ISTE Standards for Students were used, but not directly adopted, as several other states have done (International Society for Technology in Education, 2019; Richardson, 2018).

Quality Indicators and Frameworks

In addition to specific technology standards, quality indicators in CTE have been established. These indicators provide frameworks for CTE programs to guide the rigor of program development and implementation. There are two main national initiatives: Perkins Program of Study Framework (Perkins Collaborative Resources Network, 2019) and Association for Career and Technical Education (ACTE) Quality CTE Program of Study Framework (Imperatore & Hyslop, 2018). With regard for technology, both frameworks call for the integration of employability and communications skills related to technology for students, industry approved credentials and certifications for students, and professional development for educators to ensure content knowledge and skills, and activities that foster innovative teaching and learning strategies.

Alabama Technology Standards and Program Rigor

In addition to these technology standards for the classroom, Alabama also has state administrative code which provides a framework for program rigor (Alabama State Department of Education, 2006), similar to the quality indicators provided by the Perkins Program of Study Framework and the ACTE Quality Program of Study framework (Imperatore & Hyslop, 2018; Perkins Collaborative Resources Network, 2019). The code provides that industry credentials be established as appropriate and that educators use validated instructional strategies and resources including equipment, tools, and software. It also states that professional development be sustained and comprehensive improving the effectiveness of educators through coaching of "instructional techniques and skill development, and strengthening the use of a variety of instructional and assessment approaches to enhance student engagement and maximize learning for all students" (Alabama State Department of Education, 2006, p. 443). The new standards provided through the Alabama Course of Study: Digital Literacy and Computer Science as well as the regulations provided in the administrative code should help drive professional development in Alabama that will offer excellent opportunities for educators to improve and refine their technology skills in order to provide the best classroom integrated technology experiences for students.

Professional Development

In addition to making sure that policy and standards are appropriate and timely for technology integration, professional development can help educators with technology integration in classrooms. It is a means by which administration and policymakers can provide necessary time and resources to support educators in their effort to implement and integrate technology resources. This is a first step to successful technology integration in classrooms. Educators must to be willing and have the time to use technology effectively in their teaching to have it make an impact on learning (Lawless & Pellegrino, 2007; McKay & McGrath, 2000). To do this, educators need on-going professional development in both technology skills and pedagogy to become effective users of technology. By having the necessary skills and supports, educators can take advantage of the extensive variety of technology resources that are available to them and integrate them pedagogically.

There has been considerable research concerning professional development and technology related integration for educators. Kim, Kim, Lee, Spector, and DeMeester (2013) found that professional development can have a positive impact on technology integration through changing educators' beliefs in the importance of technology in the classroom. Albion, Tondeur, Forkosh-Barush, and Peeraer (2015) in their study of educators in four different counties, found that generally, it is important that the goal of technology professional development be in learning with technology to affect change in pedagogical practices. Smith (2012), in reviewing research concerning innovation and diffusion of technology, found the following factors are important to facilitate technology use and integration through a school or district: creation of environments that 1) stimulate innovative practices, 2) facilitate change through diffusion of innovative practices, 3) cultivate a feeling of teacher ownership of innovative practices, 4) support different timeframes, 5) provide different support levels, 6) provide the necessary infrastructure, and 7) disseminate appropriate and necessary information. This type of support through professional development sets up win-win situation; as educators increase technology self-efficacy, they will realize opportunities to increase their use of technology in their teaching (Gentry, Thomas, Baker, Witfield, & Garcia, 2014).

Diffusion of Innovation/Theoretical Framework

How technology is observed and used by educators in the classroom can be looked at through the diffusion of innovation theory. Medlin (2001) and Parisot (1995) suggested that the diffusion of innovation theory is the most appropriate to use when investigating technology in educational environments. Rogers (2003) explained in the diffusion of innovation theory that people react differently to new ideas, practices, or objects due to their differences in individual innovativeness. He proposed that individuals can be classified into several adopter categories (Rogers, 2003). Moore and Benbasat (1991) and Moore (1999), applying the adopter categories to the area of technology innovation, explained how individuals belonging to each adopter category will react differently to the introduction of a new technology resources. Individuals share common characteristics and values with regard to the adoption of an innovation. These adopters of technology categories are Innovators, Early Adopters, Early Majority Adopters, Late Majority Adopters, and Laggards or Traditionalists. Figure 1 provides a visual representation of each of these categories.

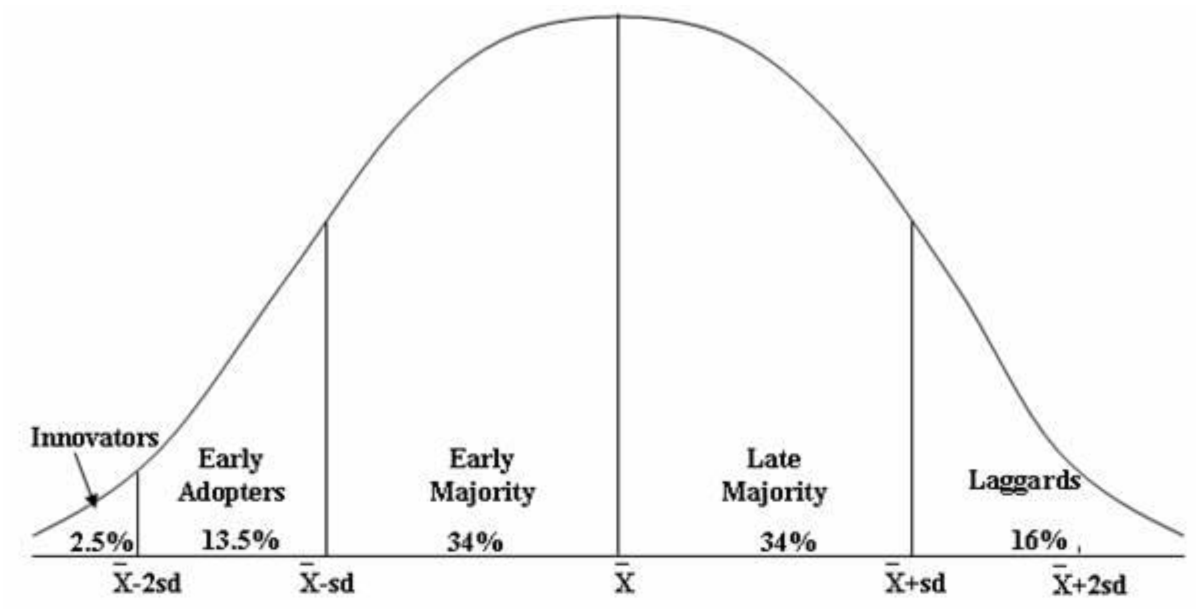


Figure 1. Adopter Categorization on the Basis of Innovation. (Rogers, 2003, p. 281)

The first category of Innovativeness includes those people who are considered Innovators or techies. They are the first to adopt and use new technology resources (the first 2.5%; Figure 1). These people generally have the ability to understand and use complex technical knowledge. They are venturesome and want to be up-to-date with the latest technology. They can also manage a high degree of uncertainty concerning a new technology, whether it be how to use the technology, technical issues that require troubleshooting, and other unforeseen issues. They are not discouraged by setbacks when an idea or new technology does not prove successful. Often Innovators are considered rash, daring, and risk-takers (Geoghegan, 1994; Rogers, 2003).

The second category of Innovativeness is the Early Adopters. They make up the next 13.5% (Figure 1) of people who adopt and use new technology resources. Early Adopters are similar to Innovators, however, they prefer more certainty in their use of new ideas and technology resources. While they adopt and use new technology resources early, they wait until there is more information to make an informed decision about the usefulness and success of a new technology. These people are also role models for the Early and Late Majority who want to see a stamp of approval by the Early Adopters (Geoghegan, 1994; Rogers, 2003).

The third category of Innovativeness is the Early Majority. They make up the next 34% (Figure 1) of people who adopt and use new technology resources. These people are comfortable with technology and adopt technology just before the average person and are an important link in the diffusion process between the very early and very late adopters. They make a very deliberate choice to use technology, choosing the wait-and-see attitude, and their decision-making period to use technology is longer than the first two categories. While the Early Majority are important for the interconnectedness in the diffusion system, they are seldom considered innovation leaders (Geoghegan, 1994; Rogers, 2003).

The Late Majority is the fourth category of innovative technology adopters. These people are considered the skeptics. They make up the next 34% (Figure 1) and are fairly identical to the Early Majority however they are less comfortable with technology. Accepting technology late in the game, it usually takes peer pressure to motivate them to adopt technology. These people want to feel safe about adoption and want a “preassembled, ready-to-run technology solution” (Geoghegan, 1994; Rogers, 2003, p. 284).

The Laggard or Traditionalist is the final category of innovative technology adopters (Figure 1). For the purpose of this dissertation, the term Traditionalist will be used because it better describes educators who prefer and insist on the "old school" approach. These people are the last to adopt technology, if they ever do. Suspicious is often a term that is used to describe Traditionalists. Traditional values are strong, and they usually look to the past for effective solutions and do not like change (Geoghegan, 1994; Rogers, 2003).

Understanding educators' level of Innovativeness can give insight into CTE educators' intention and ability to adopt and use technology resources. Hurt, Joseph, and Cook (1977) explained that the Innovativeness scale "is designed to measure an individual's willingness-to-change" (p. 63). This change of focus from the innovation to the individual is useful when thinking about providing professional development programs to educators. "People are more likely to adopt an innovation if the innovation offers them a better way to do something or some other advantages, is compatible with their values, beliefs and needs, and is not too complex, can be tried out before adoption, and has observable benefits" (Rogers, 2003, p. 195). Kim et al. (2013) found that Innovativeness had an impact on the level of technology integration, despite educators being given the same level of professional development and technical and pedagogical assistance. Being aware of Innovativeness can help decision-makers, including educators, administration, and policymakers determine and plan professional development that will increase technology integration in CTE classrooms.

Statement of the Problem

To be a successful in the 21st century with evolving technology resources and globalization of economies, students need to be digitally literate and fluent. Educators need to be able to use and integrate technology in their pedagogy to help students achieve academically, setting them up to be career and college ready. Levy and Murname (2004), labor economists, argue that "over the long run, better education is the best tool we have to prepare the population for a rapidly changing job market" (p. 13). Barr and Sykora (2015) agreed stating,

> Future innovation in education and technology will continue to disrupt virtually every industry and enterprise, presenting challenges as well as unprecedented opportunities for economic growth and human development. Education has not fully leveraged these innovations to advance technology-powered pedagogy, and yet, educators in every country are being called upon to prepare students for a world where they can adapt, contribute, and thrive. (p. 4)

The effort to teach students to be digitally literate and fluent, as well as, use technology to support academic success is not an effort that one class or course is responsible for, but all classes across the curriculum including CTE courses. The role and purpose of CTE has been explained as,

> … to prepare all students for a lifetime of success. Career and Technical Education courses provide ALL students opportunities to prepare for secondary and post-secondary education, career preparation and advancement, meaningful work, and active citizenship. (Irving Independent School District, 2017, n.p.)

Also, Alabama defines a prepared high school graduate as having the skills and knowledge to enroll and be successful in a four- or two-year college or technical school and exhibit the desire to be a life-long learner. A high school graduate should also be able to apply their knowledge to real world situations, be able collaborate and work with peers to problem solve, and be able to communicate effectively (Education, 2012). A prepared high school graduate is ready to become a productive citizen, finding their way through the world of work and continued education.

In today's world, a large part of being prepared is the ability to understand, use and problem solve with technology. To help students achieve the goal of digital literacy and fluency, educators must embrace the importance of technology use, have the skills and intention to *use* technology in their programs and curriculum, and have the knowledge to *teach* students how to use technology and digital tools. To help guide the effort to use and teach technology resources, guidelines, such as the ISTE•E Standards, should be used. The ISTE Standards for Educators are a guide that educators can use to ensure that they have the skills to use technology in the classroom, are creating a classroom culture that champions technology use, and are presenting opportunities and experiences for students to be technology literate and fluent, as well as, academically successful using technology. Educators should be modeling for colleagues and students work and learning with technology that reflects creative thinking and problem solving, and promote digital and global responsibility and citizenship (International Society for Technology in Education, 2017a).

In addition to being content knowledge experts in classrooms, educators must be competent in using and integrating technology in their classrooms. In order to provide adequate and exceptional training to ensure that all CTE educators integrate technology to benefit their students, it is important to understand CTE educators' beliefs and desires to use technology and integrate technology, as well as, understand how prepared they perceive they are to integrate technology in their classrooms.

Therefore, the statement of the problem is that educators vary in their Innovativeness, level of knowledge and experience, and belief of importance of technology. A better understanding of educators' Innovativeness and perceptions of importance and use of technology will provide information to develop more focused professional development, specifically tailored to support technology integration by all educators.

Purpose of the Study

The purpose of this research was to determine technology Innovativeness of secondary CTE educators and technology integration in classrooms. Using the ISTE•E Standards as a framework, perceived technology importance and frequency of use was determined. The study also investigated relationships between CTE educator characteristics, Innovativeness, and technology perceptions. The ISTE•E Standards are located in Appendix A.

Research Questions

1) What are the Innovativeness adopter categories of CTE educators?
2) Is there a significant relationship between secondary CTE programs and Innovativeness?
3) Is there a significant relationship between secondary CTE educators' perceived technology importance and educator characteristics (Innovativeness, CTE program, certification type, teaching experience, age, and gender)?
4) Is there a significant relationship between secondary CTE educators' perceived frequency of use of technology in their classroom and educator characteristics (Innovativeness, CTE program, certification type, teaching experience, age, and gender)?

Statement of Significance

There is a gap in the research concerning secondary CTE educators and technology use and integration over the past ten years. Kotrlik and Redmann (2009) reported on technology adoption and integration by CTE programs in Louisiana including 1) AgriScience Education, 2) Business Education, 3) Family and Consumer Sciences Education, 4) Health Occupations Education, 5) Marketing Education, 6) Technology Education, and 7) Trades and Industries Education. Their recommendations included evaluation studies that address technology adoption and integration and identifying appropriate educator training. This research will contribute to the current body of literature regarding Career and Technical Education educators' use of technology in secondary CTE programs and begin to help close that gap. While research can be found concerning integrating technology into the classroom and the ISTE Standards at the secondary level (Barron, Kemker, Harmes, & Kalaydjian, 2003; Irving & Bell, 2004; Quellmalz & Kozma, 2003; Thomas & Knezek, 2008), no research can be found specifically regarding CTE, technology use, and ISTE Standards implementation. It will also expand the body of information concerning individual Innovativeness of secondary CTE educators, which has not been specifically studied with regard to adopter categories. With data to help more fully understand CTE educators' use of technology and how important they feel that technology is in their classrooms, as well as, their Innovativeness or *willingness-to change*, it will be easier to facilitate discussions and professional development trainings to raise awareness of the value of technology integration in CTE classrooms. Policymakers, school administrators in secondary education and CTE, college professors, and educators will be better informed about factors that facilitate technology integration and state and national standards. Better decisions can be made regarding technology and the needed relevant training to use technology in the classroom, ultimately resulting in students being better prepared for college and the workplace with 21^{st} century skills.

Definitions of Terms

21^{st} Century Skills.

Core competencies such as collaboration, critical thinking, global awareness, digital literacy, and problem solving that advocates believe students need to be successful in the today's society. Many feel that these skills should be taught in a school setting along with other core subjects. (Partnership for 21st Century Learning, 2015; Rich, 2010).

BA/MA Equivalent Technical Education (ETE) Certification.

Bachelor level teacher certification, BA ETE, is achieved by 1) a passing score on the Occupational Proficiency Assessment and basic skills assessment, and 2) work experience in area being taught and/or degree; it is renewable. Master's level teacher certification, MA ETE, is achieved by 1) holding or be eligible for the BA ETE renewable certification and 2) official transcripts with completed courses in specific areas or an earned Bachelor's degree with specific coursework completed; it is renewable (Alabama State Department of Education, 2018b).

Career and Technical Education.

The Alabama State Board of Education has defined Alabama's CTE programs as,

> …programs [that] develop the talents and skills of students in classroom setting that are rigorous, progressive and certified to international standards. Students have the opportunity to explore career options in more than 215 courses offered statewide and can earn advanced diplomas and college credit (Education, 2012, p. 186).

Class A Certification.

Alabama Professional Educator Certificate Level – Master's degree (Alabama State Department of Education, 2018d).

Class AA Certification.

Alabama Professional Educator Certificate Level – Sixth-year/Education Specialist degree (Alabama State Department of Education, 2018d).

Class B Certification.

Alabama Professional Educator Certificate Level – Bachelor's degree (Alabama State Department of Education, 2018d).

College and Career Readiness.

The Alabama Department of Education explains that,

> Being college and career ready means that a high school graduate has the English and Mathematics knowledge and skills necessary to either (1) qualify for and succeed in entry-level, credit-bearing college courses without the need for remedial coursework, or (2) qualify for and succeed in the postsecondary job training and/or education necessary for their chosen career (i.e. technical/vocation program, community college, apprenticeship or significant on-the-job training)" (Education, 2012, p. 152).

Digital Fluency.

Miller and Bartlett (2012) explained that digital fluency refers to being able to effectively select and proficiently use a variety of technology tools to achieve a desired outcome. They suggest that digital fluency is made up of three components: Net-savviness, critical evaluative techniques, and diversity.

Digital Literacy.

The American Library Association's digital-literacy task force explains digital literacy as, "the ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills" (Heitin, 2016, n.p.).

Digital Technology Resources.

"A term used to describe the use of digital resources to effectively find, analyze, create, communicate, and use information in a digital context. This encompasses the use of web 2.0 tools, digital media tools, programming tools, and software applications" (Wineman, 2015).

Emergency Certificate.

Certificate allowing a person to teach for one scholastic year who has a Bachelor's degree or license; cannot have held a Temporary Certification (Alabama State Department of Education, 2018d).

Individual Innovativeness.

Rogers (2003) explains Innovativeness as the degree to which an individual is willing to adopt new ideas. Geoghrgan (1994) describes this in terms of technology as the willingness to incorporate "information technology into the instructional process" (n. p.).

Provisional Certificate in a Career and Technical Teaching Field (PCCT)

Previously referred to as the Career and Technical Alternative Baccalaureate-Level Certificate (CT ABC). Leads to a Class B or Class A Professional Educator Certificate. Must have 1) a BA/BS or MA/MS, 2) passing Praxis scores or a given number of semester hours in the teaching field (if no Praxis test available), 3) earned credit in required coursework or completion of Session A of the Career and Technical Education Teacher Certification Program (CTE TCP), 4) earned credit in the remaining required coursework, and 5) and edTPA passing score (Alabama State Department of Education, 2018d).

Technology Integration.

Technology integration is,

> …the incorporation of technology resources and technology-based practices into the daily routines, work, and management of schools… It is important that the integration be routine, seamless, and both efficient and effective in supporting school goals and purposes… The process of technology integration is one of continuous change, learning, and (hopefully) improvement… (Forum of Educational Statistics, 2003, p. 75).

Technology Resources.

Technology or technology resources refers to the computer, specialized software, digital media, networking-based communication systems and other equipment and the infrastructure that is needed for support (Forum of Educational Statistics, 2003). It also includes web resources.

Temporary Certificate.

Certificate allowing a person to teach for one scholastic year and have appropriate licensure, if teaching area requires it; cannot have held an Emergency Certification (Alabama State Department of Education, 2018d).

Limitations

Limitations are the conditions under which conclusions may be hindered and that are beyond the control of the researcher. The limitations for this study may have included the response rate of individual CTE programs, using a self-reported questionnaire, and the possibility of not being able to clarify questions of respondents due to anonymity.

Delimitations

Delimitations are the boundaries beyond which the study is concerned. This study involved all secondary CTE educators that teach at least one Career Cluster course in the state of Alabama teaching grades 9–12. The CTE Career Clusters selected are those identified by the Department of Education in the state of Alabama and are identified in Appendix B.

Chapter 2. Literature Review

The literature examined in this chapter reviews the importance of technology in classrooms, the factors that influence technology use, educators' individual Innovativeness, and policies and activities to help educators better integrate technology in their classrooms. This research study was designed to determine technology Innovativeness of secondary CTE educators in Alabama and their technology integration, as determined by perceived technology importance and frequency of use. This review provides a foundation and framework for the study. The review begins by discussing technology adoption and integration. The second section reviews technology plans and standards in education, including the ISTE Standards, National Education Technology Plan (NETP) and the Alabama State Department of Education (ALSDE) Technology Plan. The third section reviews CTE frameworks and quality indicators at both national and state levels. The fourth section includes professional development in education. The last section will provide a more in-depth discussion of Everett Rogers' diffusion of innovation theory, which provided the theoretical framework for the research.

Technology Adoption and Integration

Access and Integration in the Classroom.

Technology is in classrooms. Nearly 100% of all public schools have internet access. Internet access was available in 94% of instructional classrooms in 2005 (Wells & Lewis, 2007) and 98% of classrooms in 2008 (National Center for Educational Statistics, 2015). In 2005, the ratio of students to instructional computers with internet access was 3.8 to 1, which was a decrease from 12.1 to 1 in 1998 and 4.4 to 1 in 2003 (Wells & Lewis, 2007, p. 6). In addition, Wells and Lewis (2007) found that there were no differences in school internet access across school characteristics. While access is now commonly available, adoption and integration have increased at the same rate and are hampered by various obstacles (Gray, Thomas, Lewis, & Tice, 2010). Lebens, Graff, and Mayer (2009) found that two common reasons for low technology adoption and integration were limited access of equipment and limited training. Other studies have observed additional explanations that affect integration. Inan and Lowther (2010) found that technology integration was influenced by readiness to use technology, exposure to various tools to use in the classroom, and the need for technical support in the classroom setting. Wohleb, Skinner, and White (2013) found that high school business/marketing educators integrated technology in varying degrees, with teaching experience being an important factor in the depth of integration. Williams (2015) cited significant differences between educators' attitudes related to technology integration and their teaching level with elementary level educators having more positive attitudes about technology integration than high school or middle school educators. Wade, Abrami, and Sclater (2005) also studied elementary and secondary educators, and through focus groups, found that familiarity with computers predicted greater comfort with technology, and with that greater comfort also came greater technology integration in the classroom. Wetzel (1993) and Russel, O'Dwyer, Bebell, and Tao (2007) also found that higher self-efficacy of computer use did affect classroom use, however, warned that personal use of technology does not necessarily transfer into classroom integration.

Regardless of the issues of why technology is not adopted or used, technology integration in the classroom is important for students. There is a push for more student-centered, project-based, hands-on instruction allowing for students to take more control of their learning, across disciplines and grade levels. The National Science Task force on Cyberlearning reported that several studies indicated a strong connection between this type of constructivist approach and technology and that educators with a belief that students learn through experiences and engagement were more likely to integrate technology into their pedagogy (Borgman et al., 2008). Studies show that when used correctly, technology has the potential to enhance classroom experiences through: 1) shifting educator and students roles where educators are more facilitators and guides, 2) engaging students through more active participation and decision making, 3) creating more time for educators to work with students individually, 4) shifting to more small group instruction from large groups, inviting more collaboration and problem solving workgroups, and 5) engaging students in more individualized, self-regulated, and motivated instruction (Borgman et al., 2008; McKnight et al., 2016).

When computers started making their way into classrooms, the topics of computer science and how computers were used in classrooms revolved around operating systems and programming, as well as, drill and practice of information (Pisapia, 1994). Today, while programming and coding are still important, students need to be more involved in collaborative, project-based learning experiences where they can use higher-order thinking skills to problem-solve (Klopfer, Osterweil, Groff, & Haas, 2009). This constructivist approach that includes authentic and real world learning, student self-awareness and self-regulation, and learner relevant content and skills is often seen in secondary CTE classrooms (Hersperger, Slate, & Edmonson, 2013). It is common for project-based learning to include "rigorous projects [that] are carefully planned, managed, and assessed to help students learn key academic content, practice 21st century skills (such as collaboration, communication, and critical thinking), and create high-quality, authentic products and presentations" (Buck

Institute for Education, 2018). Technology resources allow students to be more active in their own education, have more control over their information gathering, and communicate with peers and experts at times other than strictly school hours (Digital Learning Task Force, 2013). Through these self-regulated type activities, which promote the highest form of cognitive engagement (Corno & Mandinach, 1983), students can obtain a high degree of self-efficacy, personal control, and autonomy, all of which businesses are looking for in their employees (Gray et al., 2010; Department of Education & Office of Educational Technology, 2010).

Impact on Student Outcomes.

Ensuring that students are career and college ready has been the mantra for years and a focus of measuring student outcomes (ACT, 2012; USDOE, 2010). There has been high expectations of improving student achievement through the use of technology in the classroom. The results over the past twenty-five years have been varied. Some studies show that technology can positively impact student achievement, particularly when used in a collaborative student-center environment (Brode, 2005; Chen et al., 2010; Halverson & Smith, 2009; Lowther et al., 2008; North Central Regional Educational Lab (NCREL), 2005; Rutten et al., 2012; Schacter, 1999). In fact, in the 1990s, there was a strategic shift toward more technology in the classroom because of the possibilities of enhanced learning (McCoy, 1999). Bebell and O'Dwyer (2010) found that when students had access to their own computers, positive student achievement was realized. Other studies, however, have found no significant impact on student outcomes due to technology integration, particularly related to cost effectiveness. Several studies in various countries indicate that investment in technology generated only limited educational gains (Angrist & Lavy, 2002; Belo, Ferreira, & Telang, 2013; Leuven, Lindahl, Oosterbeek, & Webbink, 2007). In the U.S., Goolsbee and Guryan (2006) looked at schools who received funds through the federal E-Rate subsidy program for internet access. They found that while these schools had increased rates of internet connectivity, they did not necessarily have measurable increases in test scores or other academic outcomes.

However, the measure of cost effectiveness is not always appropriate in an educational setting. Goolsbee and Guryan (2006) note that using technology may help students build skills that are not measured through ordinary assessment. The fact is that students need to be able to use and understand technology and have the ability to problem-solve and work with others, in addition to having good skills in writing, reading, and mathematics.

Studies have also indicated that technology can increase student engagement (Harper & Milman, 2016; Murphy, 2016). Denker (2012) found that the use of clickers, hand-held devices, or student computers to obtain student responses throughout a lesson had a significant positive impact on student engagement. Papstergiou (2009) gave a specific example of positive student outcomes in a CTE program finding that digital game-based learning had a positive impact on student motivation and thus educational effectiveness in a secondary computer science classroom. Huizenga, ten Dam, Voogt, and Admiraal (2017) also found that educators who use digital gaming in their classrooms experience greater student engagement and cognitive learning outcomes.

Technology Plans and Standards

Policymakers recognize the importance of technology in education, as reflected by the inclusion of technology standards in educational reform. There has been identifiable effort through adopting standards and legislation to help educators, as well as students, close the gap concerning academic success and technology use and knowledge. During the past twenty-five years, several national initiatives have undertaken the tasks to help improve students' outcomes through the use of technology as well as improve students' digital literacy and fluency. These have taken the form of global, national and state standards, governmental initiatives and mandates, and technology and professional organizations' position statements, quality indicators, and best practices.

ISTE Standards.

The International Society for Technology in Education (ISTE) was established in 1979 in Eugene, Oregon. It was organized to establish goals and objectives for technology use in education. The first ISTE Standards, known as the "National Educational Technology Standards" or NETS, were published in 1998 and focused on students. The organization has grown substantially since then and has made considerable contributions with global impacts in the area of technology standards for students, educators, administrators, coaches, and specialized areas such as computer science. The ISTE Standards help educators and students "…focus [their] energies on research and media literacy, creativity, collaboration, problem solving, and critical thinking" (ISTE standards, 2015, n.p.). Technology and innovative instructional strategies give educators opportunities to help students be prepared "…not only to use these new tools, but also foster the habits of mind that will enable them to keep up in this changing world" (ISTE standards, 2015, n.p.).

There was an update of the ISTE Standards for Teachers in 2008. They were revised in June 2017 and titled the ISTE Standards for Educations (ISTE•E). This new set has seven standards which are broken into categories or substandards. Appendix A lists each specific standard.

The first standard of "Learner" is concerned with the educator improving the teaching practice that leverages technology to enhance student achievement through setting professional learning goals and staying current on relevant research. The second standard of "Leader" revolves around the educator seeking opportunities for leadership that empowers student achievement through improving teaching and learning through technology. The third standard of "Citizenship" deals with inspiring students to be a responsible and an active part of the digital society through teaching, practicing, and modeling appropriate online behaviors and fostering digital literacy and fluency. The fourth standard of "Collaborator" involves educators actively collaborating with students, colleagues, parents, administrators, and others involved in the positive educational experience of students and fostering real world and authentic learning opportunities that leverage technology. The fifth standard of "Designer" establishes educators as creators of personalized learning experiences, authentic learner driven activities, and digital learning environments that engages students and fosters learning. The sixth standard of "Facilitator" revolves around supporting the 2016 ISTE Standards for Students through fostering a culture of student learning ownership, creative and responsible expression and communication, and learning opportunities that challenge students to effectively problem-solve and innovate. The seventh standard of "Analyst" is related to the notion that educators should understand and use data to drive decisions about effective instructional strategies and student support (ISTE, 2017).

The revised ISTE Standards for Educators brings a new challenge for educators to actively use and integrate technology into classroom pedagogy on an everyday basis. Doing this requires educators to be knowledgeable and effective in their own technology use. Several national and state initiatives drive these activities.

Federal Government Initiatives and the National Education Technology Plan.

The U.S. Department of Education was given the responsibility in the 1990s to develop a national comprehensive approach for improving technology support to states and school districts. The goal was and still is to improve student academic success through the use of technology by the current and prior incarnations of the *Elementary and Secondary Act of 1965* (State Educational Technology Directors Association, 2017). As part of ESEA, the Enhancing Education Through Technology (EETT) Program was initiated in 1994 to promote and support academic achievement through the use of technology in classrooms (State Educational Technology Directors Association, 2017). Also in the 1990s, the Goals 2000 Educate America Act established the Office of Educational Technology to provide leadership for educational transformation through technology ("Goals 2000: Educate America Act, H.R. 1804, 103rd Cong.," 1994). The National Education Technology Plan (NETP), supported by the Office of Educational Technology, was first put together in 1996 and has been updated regularly to keep pace with the changes that are seen in states and school districts. The newest mandate, given the increase in technology changes, is that the Office of Education Technology will be updating the NETP on a smaller, yearly scale as of the 2017 update (Department of Education, 2015).

Reimaging the Role of Technology in Education is the 2017 update of the NETP. Some of the recommendations in the report include: 1) ensure that students and educators have access to technology and the internet both at school and outside of school, 2) support the development and use of open-resource learning tools, 3) develop sustainable infrastructure plans for upgrading technology and internet access, 4) establish strategic plans that support technology to improve learning, and 5) provide professional development that is powered by technology to enhance instructional practices and increase educators' ability to create engaging learning activities for students to improve student outcomes (Office of Educational Technology - US Department of Education, 2017).

Through the reauthorization of the ESEA in late 2015, the Every Student Success Act (ESSA) provides for a greater role by the states, broadens the definitions of academic achievement, and provides funds for school technology (Office of Educational Technology, 2018). The Bill and Melinda Gates Foundation (2015) reported that fifty-six percent of educators felt that digital tools helped them be better educators. The ESSA has a goal of improving that number. The new grant program in the ESSA, the Student Support and Academic Enrichment Grant program, provides at least $1.65 billion to support technology and innovative strategy initiatives at the state and district levels. One of the most important features of the ESSA is that it recognizes that not all students learn the same way or at the same rate. There are provisions that encourage a more personalized learning approach for all students using technology. It also provides for professional development for educators to update their skills to be able to provide better technology integrated learning experiences for students (Mesecar, 2015; Office of Educational Technology, 2018).

CTE has also been affected by the ESSA. Many states have plans that expand college and career readiness in their high schools, also indicating how this might be measured. Several states indicate that federal funds should be used to support CTE and career preparedness, but only a few states describe details on activities to support career readiness, STEM (science, technology, engineering, and mathematics), and dual enrollment programs. Only twenty-eight states use language that include college and career graduate definitions, and only thirteen of those states connect these definitions and visions with long-terms goals. Alabama is one of these states and,

> … aspires to have prepared graduates and create multiple pathways to careers and higher education. To meet these aspirations, the state set a goal that all students in the classes of 2021–2024 will meet at least one college or career readiness indicator,

> and that all students in the classes of 2025–2030 will meet at least one college-readiness indicator and one career readiness indicator. (Advance CTE, 2017)

As more states decide to ready their graduates as career and college prepared, the role of CTE will come more into focus and the numbers of students taking CTE courses will increase. Technology use by students and educators in these courses will be ever more important.

Alabama State Department of Education Technology Plans and Standards.

In addition to national plans and standards, each state has their own plans and standards that they use to further improve the use of technology and academic success. From Alabama's first Governor's Information Technology Commission in 1995, work continues in the state to bring technology skills and 21st century practices into the classroom. In 2012, the Alabama State Board of Education (ALSBOE) developed a strategic plan called Alabama State Board of Education Plan 2020. This document specifies goals and objectives for schools, districts, higher education, and teacher qualifications. One objective in the ALSBOE Plan 2020 is that, "Schools and Systems are resourced to create a 21st century learning environment for their students including infrastructure, building renovations/improvement, and technology" (ALSBOE, 2012, n.p.). It also specifies that educators should have schedules that permit collaboration and the funds should be provided for districts to provide needed technology resources (ALSBOE, 2012). Also, a set of Alabama Quality Teaching Standards has been established with Standard 3 addressing literacy, which includes, "To improve student learning and achievement, educators use knowledge of effective oral and written communications, reading, mathematics, and technology to facilitate and support direct instruction, active inquiry, collaboration, and positive interaction" (Education, 2012, p. 58). In addition, in Alabama's Continuum for Instructional Leader Development, Standard 6 specifies that an Instructional Leader "Plans, implements, and evaluates the effective integration and current technologies and electronic tools in teaching, management, research, and communication" (Education, 2012, p. 109). The ALSBOE Plan 2020 also addresses CTE asserting that,

> Students will be engaged in quality career and technical education programs that are taught by effective educators who provide instruction that integrates Alabama's College- and Career-Ready Standards… content knowledge and skills needed for preparing students for their chosen career pathway and meets the employment needs of local, regional, state, and global economy. (Education, 2012, p. 169)

The ALSBOE Plan 2020 lists several risks in delivering standards including funds, lack of communication between teacher, administrators, and state officials, the need to increase the number of CTE programs, and lack of time for educators in their schedules for collaboration and professional development (Education, 2012).

In March 2018, the state voted to update Alabama's Technology Course of Study with the *2018 Digital Literacy and Computer Science Course of Study*. Governor Kay Ivey made the announcement at the 2018 Alabama Computer Science Education Summit in Montgomery, AL on March 14, 2018. The resources used to update the new course of study was the *2009 Alabama Course of Study: Technology Education*, the 2016 ISTE Standards for Students, Computer Science Teachers Association K–12 Computer Science Standards of 2017, the K–12 Computer Science Framework, documents from other states, and public and professional input. These standards relate to five content strands: 1) Computing analyst, 2) Computational thinker, 3) Citizen of a digital culture, 4) Innovative designer, and 5) Global collaboration (Richardson, 2018). They are comprehensive, including grades K–12, with a heavier tilt towards digital literacy in the earlier grades and the later grades moving more into the area of computer science. The standards seem to be set up to be used across all disciplines, however exactly how this will be done has yet to be determined (2018 Alabama Computer Science Education Summit, Alabama Digital Literacy/Computer Science Standards, Resources & Teaching Training session led by Dr. Richard Murphy). If this is the case, technology training for all educators in all grades and disciplines will be of the utmost importance in the coming months and years in Alabama.

CTE Frameworks and Quality Indicators

In addition to plans and standards, quality indicators and frameworks have been developed at both the national and state levels, and often at local levels, with established expectations and desirable characteristics of quality CTE programs. At the national level, CTE is structured according to the Perkins Program of Study Framework and the Association of Career and Technical Education (ACTE) Quality CTE Program of Study Framework. At the state level, the 2008 Alabama Course of Study: Career and Technical Education and the Alabama State Board of Education Administrative Code provide information and guidance for local and state programs.

Perkins Program of Study Framework.

The Carl D. Perkins Career and Technical Education (Perkins IV) Act of 2006 was amended by the Strengthening Career and Technical Education for the 21st Century Act when it was signed into law on July 31, 2018 (PCRN, 2019, n.p.). The purpose of the amended Perkins V Act, as it is now known, is,

> …to develop more fully the academic knowledge and technical and employability skills of secondary students… and to assist students in meeting such standards, including preparation for high skill, high wage, or in-demand occupations in current or emerging professions… providing individuals with opportunities throughout their lifetimes to develop, in conjunction with other education and training programs, the

knowledge and skills needed to keep the United States competitive. ("Carl D. Perkins Career and Technical Education Act of 2006", 2018, pp. 2–3)

The framework laid out by Perkins V contains ten supporting elements "that are viewed by CTE practitioners as instrumental for creating and implementing high quality, comprehensive programs of study" (Perkins Collaborative Resources Network, 2019). The ten elements are: 1. Legislation and Politics; 2. Partnerships; 3. Professional Development; 4. Accountability and Evaluation Systems; 5. College and Career Readiness Standards; 6. Course Sequences; 7. Credit Transfer Agreements; 8. Guidance Counseling and Academic Advisement; 9. Teaching and Learning Strategies; and 10. Technical Skills Assessments. Issues regarding technology are found in several of these elements, with Professional Development, College and Career Readiness Standards, and Teaching and Learning Strategies being the top three. Not only does Perkins V support rigorous college and career readiness standards for students that "incorporate essential knowledge and skills (e.g., academic, communication, and problem-solving skills), which students must master…" it also establishes that educators should provide "innovative and creative instructional approaches... [that] employ contextualized work-based, and problem-based learning approaches… [and] incorporate team-building, critical thinking, problem-solving, and communication skills" (PCRN, 2019, n.p.). In addition, it states that Professional Development should be an effort that is sustained and focused, providing for alignment and integration of academic and CTE curriculum and up-to-date content knowledge, and fostering innovative teaching and learning strategies.

ACTE Quality CTE Program of Study Framework.

While Perkins V provides a framework that works at a legislative and budget-funding level, there was a need to bring together and standardize the language concerning comprehensive, research based quality CTE programs across the country. The ACTE started a project in 2015 to consolidate and put together a framework that integrated best practices of 19 frameworks and quality indicators from across the U.S. (Hyslop & Imperatore, 2018). In 2018, ACTE published the 2018 ACTE Quality CTE Program of Study Framework to be used particularly at the local program level, guiding the implementation, improvement, and collaboration of high quality CTE programs using quality indicators. It contains 12 elements, which are: 1. Standards-aligned and Integrated Curriculum; 2. Sequencing and Articulation; 3. Student Assessment;, 4. Prepared and Effective Program Staff; 5. Engaging Instruction; 6. Access and Equity; 7. Facilities and Equipment; 8. Business and Community Partnerships; 9. Career Development; 10. Career and Technical Student Organizations (CTSOs); 11. Work-based Learning; and 12. Data and Program Improvement. As with the Perkins V framework, there are several elements in the ACTE framework where technology plays an important role. These include Prepared and Effective Program Staff, Engaging Instruction, Access and Equity, Facilities and Equipment, Standards-aligned and Integrated Curriculum, Sequencing and Articulation, and Career Development. Technology is stressed for students in the areas of "employability skill standards that help students succeed in the workplace, such as problem-solving, critical thinking, teamwork, communications, and workplace etiquette" (Imperatore & Hyslop, 2018, p. 1). Employability knowledge and skills and access to technology are also supported for students. For educators, professional development is established as necessary and should help to "maintain up-to-date knowledge and skills across all aspects of an industry… and pedagogical knowledge and skills" (Imperatore & Hyslop, 2018, pp. 2–3). Specifically, the ACTE quality indicators express that instruction should "incorporate relevant equipment, technology and materials to support learning… that is flexible, differentiated, and personalized to meet the needs of a diverse student population" (Imperatore & Hyslop, 2018, p. 3).

Alabama Framework of Secondary Career and Technical Education.

There are two frameworks that local programs can use to design CTE curriculum and programs in Alabama. The Alabama State Board of Education Administrative Code for Career and Technical Education outlines the first framework for secondary CTE. This document is similar to the Perkins V document in that it outlines curriculum and instruction, professional development, and financial support, among others. It states that "Career and Technical Education (CTE) is a blend of academic, career-specific, general workplace, and life skills leading to further education and employment" (Alabama State Department of Education, 2006, p. 435). Not only does it specifically refer to providing instruction in "knowledge and skills necessary to manage the challenges of life and working in a diverse, global society" (Alabama State Department of Education, 2006, p. 437), it also establishes that instruction shall "incorporate research-based instructional strategies and a variety of assessments" (Alabama State Department of Education, 2006, p. 439). In addition, it states that professional development is a "comprehensive, sustained and intensive approach to improving the effectiveness of teachers… in raising student achievement… [and shall include] a variety of instructional and assessment approaches to enhance student engagement and maximize learning…" (Alabama State Department of Education, 2006, p. 443).

The second framework is the Alabama Course of Study: Career and Technical Education which defines career clusters, pathways, and coursework. It was designed using the administrative code, national standards documents, certification standards, and research based information from professional and academic journals. In its conceptual framework, position statements provide the elements or quality indicators. With specific reference to technology, it states that classrooms should have adequate equipment that is kept up-to-date, including software. "Maintaining up-to-date technology enhances students' learning environment as well as readies them for future career opportunities" (Morton, 2008, p. 4). Under Professional Development, is also establishes that,

> As technology and instructional methods continue to change, it is essential for teachers to take advantage of professional development and technical training opportunities to stay abreast of current trends and methods pertaining to their content areas and the industry represented. Teachers who continually expand their knowledge and skills are able to adjust to the learning environment to reflect current and emerging trends in teaching methods and learning styles. (Morton, 2008, p. 4)

As with the other frameworks, it establishes that students should be required to use innovative and critical-thinking skills during learning experiences that are project-based, require higher-order thinking skills, and communication and leadership skills (Morton, 2008).

Professional Development

One area in which all of these frameworks, standards, and plans have in common is the call for professional development and the need for technology training. Technology is transforming education. It can provide many opportunities for students and educators to enhance their classroom experiences; students can take more control of their own learning and educators have a platform to better target students learning styles and needs (Tondeur, Forkosh-Baruch, Prestridge, Albion, & Edirisinghe, 2016). With technology, literally the world is in your hands. However, for this to happen successfully, educators must understand how to use the technology in their classrooms, must be able to teach the technology they have in their classrooms, and be prepared to take on new technology challenges as it changes and advances. Not only do educators need quality professional development opportunities, they also need it to be sustained over time to allow new habits and abilities to take hold and stay informed on new technology resources that are available (Xie, Kim, Cheng, & Luthy, 2017). Effective professional development should follow these guiding principles:

1. Focus on pedagogy and content area technology integration,
2. Engagement by participants through reflection and problem solving,
3. Opportunities for educators to collaborate within and across disciplines, and
4. Sustained to promote and allow for continuous ongoing integration in the classroom. (Church, Bland, & Church, 2010; Education, 2012)

There are already expectations that educators will be involved in professional development and learning activities. In Alabama, the ALSDE specifies that "educators will receive professional development and tools to be effective in preparing all students to be college and career ready" (Education, 2012, p. 166). Professional development can include several activities such as web-based training, online seminars, college course, summer or after-school workshops, district level trainings and school-level workshops. Whatever the method, it is important that the delivery of the professional development allows for the intended goals to be met (National Research Center for Career and Technical Education, 2010).

To promote effective technology integration, barriers must be addressed. Educators must have attitudes and beliefs that accept change. Educators need to be able and willing to teach differently if technology is to help create a classroom that is student-centered, engaging, and collaborative in nature (Hixon & Buckenmeyer, 2009; Howard & Mozejko, 2015). Educators' fears must also be addressed. Studies indicate that some educators fear losing control if there is too much technology used in the classroom (Hannafin & Savenye, 1993; Howard & Mozejko, 2015), and more importantly, some have a fear of not being able to manage and use technology in their classrooms (Howard & Mozejko, 2015; Trucano, 2015). Self-efficacy and competence need to be addressed as well. Skinner and White (2004) noted that competency was "critical" to being able to implement technology in Business/Marketing education courses effectively.

To address these issues, professional development must be comprehensive. Hew and Brush (2007) identified three characteristics of effective professional development:

1. Focus on content (e.g., technology knowledge and skills, technology-supported pedagogy, knowledge and skills, and technology-related classroom management knowledge and skills),
2. Give teachers opportunities for "hands-on" work, and
3. Is highly consistent with teachers' needs. (p. 238)

However, the current "one-size-fits-all" type of professional development training that is usually available is not adequate to meet the needs of all educators (Hixon & Buckenmeyer, 2009). Hixon and Buckenmeyer call for a more personalized approach, focusing on educators' "fundamental beliefs about teaching and learning" in order to help teachers more fully integrate technology (p. 143).

Rogers (2003) suggested that to help educators with technology use and integration, training should be targeted by the level of Innovativeness that the educator possess. Xie et al. (2017) recommended that professional development is most beneficial to educators when it is related to their content areas and skill level. By addressing educators' Innovativeness, or willingness to change, and their skill level, professional development can be structured to meet the needs of all educators.

Diffusion of Innovation Theory

Everett Rogers' diffusion theory of innovation has been the theoretical framework for studies throughout many disciplines, including education (Goldsmith & Foxall, 2003;

Rogers, 2003). The broad and general definition that works for almost all situations is "An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers, 2003, p. 12). People within a community, such as educators within education, can be identified by their Innovativeness. According to Rogers, Innovativeness is understood to be "the degree to which individual or other unit of adoption is relatively earlier in adopting new ideas than other members of the system" (Rogers, 2003, p. 22). Hurt, et al. (1977) and Goldsmith (1991) explained that Innovativeness can be viewed as a willingness to change or try new things. There are four multilevel indicators that are measured by Innovativeness. These are: 1) ability to cope with change and uncertainty, 2) attitude towards change, 3) actual behavior to implement Innovativeness, and 4) communicating that implementation (Rogers, 2003).

The willingness to change can be divided into five adopter categories. The standard vocabulary in describing adopters are: Innovators, Early Adopters, Early Majority, Late Majority, and Laggards (Rogers, 2003). Geoghegan (1994) took these categories and described them in terms of educational technology adoption: 1) Innovators or techies are people who identify strongly with technology and are eager to use the newest available technology without hesitation, 2) Early Adopters or visionaries are people who are leaders and model for other members adoption of new technology resources after it is has been established as useful, 3) Early Majority or pragmatists also feel like they can handle new technology but have waited for it to be established and have proven advantages—they look to the early adopters for this information, 4) Late Majority or rationalists are people who will eventually adopt and use technology, but only after others have established its use, and they are generally not confident using technology even with practice, and 5) Laggards or traditionalists are people who will most likely never use or adopt new technology in their work-life unless it is absolutely necessary.

Several studies on Innovativeness have been conducted in the educational community. Sahin and Thompson (2006) studied faculty at a Turkey university and found that they predictably fell into Rogers' typology with roughly the same adoption rate as described by Rogers (2003), using the Innovativeness scale by Hurt, Joseph and Cook (1977). This typology includes a bell curve of a normal distribution with the first 2.5% being Innovators, the next 13.5% being the Early Adopters, the next 34% being the Early Majority, the Late Majority being the next 34%, and the remaining 16% being the Laggards. Rogers and Wallace (2011) found similar results with student teachers in the U.S., as well as, no significant relationships between gender, subject area, or certification level and Innovativeness. However, others studies have found significant relationships between individual Innovativeness and attitudes towards technology, gender, age, and experience (Albirini, 2006; Cavas, Cavas, Karaoglan, & Kisla, 2009; Salehi & Salehi, 2012). Jahanmir and Lages (2014) looked at characteristics of Late Adopters of innovations, those normally classified as Later Majority and Laggards. They developed a scale that could identify some of the issues concerning their "late adoption" of technology, which might lead to better and more informed ways to reduce their time for technology adoption. Capo and Orellana (2011) and Mutlu Bayraktar (2012) found that in the use of Web 2.0 tools by instructors, most instructors were Innovators, Early Adopters, and Early Majority and they also had a higher awareness of other technology tools available than Late Majority and Laggards. Fonti and Stevancevic (2014) found that for a group of European teachers, those that had more teaching experience were less innovative in their teaching methodology and that larger classes tended to use more technology innovations than smaller classes. It is also interesting to note that people do not usually self-identify themselves into the adopter category that they fall in when taking the Hurt, Joseph and Cook's Innovativeness scale (Medlin, 2001).

Summary

Technology is found everywhere in our everyday life. Students need to be 21st century prepared which means that they must be tech savvy and digitally literate and fluent to be successful in a growing national and global society. Technology is not something that students learn only at home or just in one class. National and state education standards, plans, and frameworks all agree that technology and skills related to technology, such as problem-solving, higher-order thinking, and critical thinking skills are important for all students in all classes. Educators then, in all classrooms, need to be able to use and teach with technology, as well as, feel comfortable actually teaching technology to students. While all educators are exposed to various types of technology training and professional development, most are a one-size-fits all type of environment. Researchers have found relationships between individual Innovativeness and attitudes towards technology, gender, age, and experience (Albirini, 2006; Cavas et al., 2009; Salehi & Salehi, 2012). It is important that enhanced structured professional development be developed by understanding educators' Innovativeness, their attitude towards the importance of classroom technology use, and how frequently they implement technology standards in their classrooms, specifically the ISTE•E Standards. By doing this, educators' technology use in classrooms can be improved providing classroom environments where technology is an integral part of teaching and learning.

Chapter 3. Methodology

The purpose of this study was to determine technology Innovativeness and integration by Career and Technical Education (CTE) educators in Alabama as determined by perceived technology importance and frequency of use. Educator characteristics, Innovativeness, and technology integration was also investigated. This chapter presents an overview of the methods that were used for this study. Detailed sections will discuss the research design, characteristics of the research population, participant sampling, instrument design, validity and reliability, procedures, data analysis plan, and limitations.

In order for research to be conducted using the response of human participants, researchers at Auburn University must have permission from the Institutional Review Board (IRB). The information that was approved by the IRB is located in the Appendix C and D. Appendix C contains the email version of the consent and information and the survey, along with the paper version of the same information. Appendix D contains the original IRB research protocol request and the request for modification.

Research Design

The research design is a quantitative descriptive and inferential research approach, surveying secondary CTE educators in Alabama. According to Picciano (2004), quantitative research relies on empirical data to describe relationships, compare relationships, and show relationships, through formulas, graphs, distributions, and tables, among and between identified variables. This research is also survey research which provides for the collection of information from individuals, such as a description of trends, attitudes, or options, through their responses to questions (Dillman, Smyth, & Christian, 2014). Survey research has several advantages including being able to ask consistent questions to populations of various sizes in a cost-effective manner (Gall, Gall, & Borge, 2005). The ability to administer surveys through the internet drastically reduces the cost and issues with mail or telephone surveys (Dillman et al., 2014). The survey for this study was designed in Qualtrics survey software and reformatted for a paper version using MS Word 2016.

Characteristics of Research Population

The participants for the study were 2017–2018 and 2018–2019 public secondary CTE educators and counselors in the state of Alabama. These educators taught at least one course in the designated Career and Technical Career Clusters as identified by the Alabama State Department of Education (ALSDE; Alabama Learning Exchange, 2017; Appendix B). Table B1 in Appendix B identifies the 16 different Career and Technical Career Clusters. There are 47 Career and Technical teaching fields, or C & T programs, identified by the ALSDE in which educators can be certified to teach within the 16 Career and Technical Career Clusters. Table B2 in Appendix B contains a list of those teaching fields.

Participant Sampling

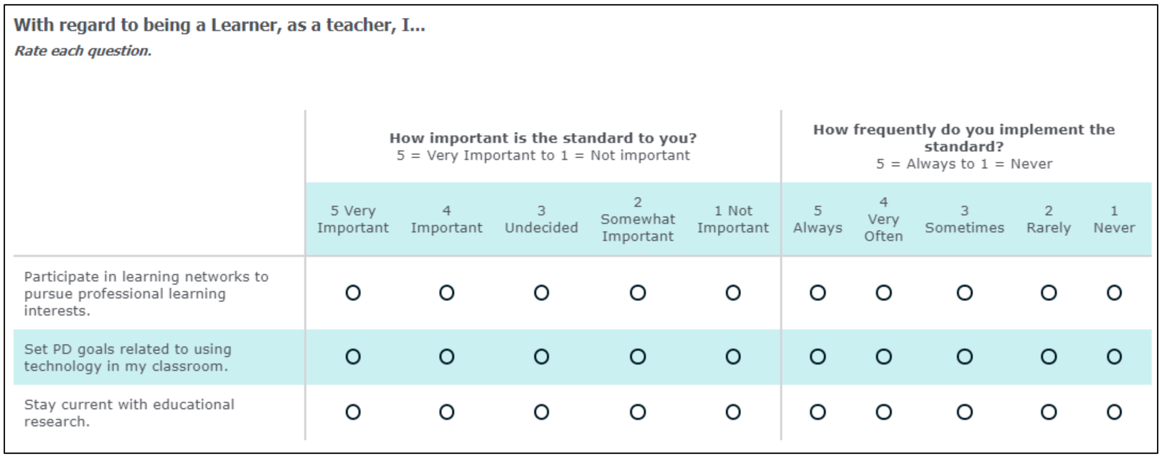
The sampling for this study included all CTE educators in Alabama. It has been estimated that there are about 3027 CTE educators in the state of Alabama (C. Wells, ALSDE, personal communication, February 12, 2018), with the smallest cluster being the Law, Public Safety, Corrections, and Security cluster with 52 identified educators (although "No Cluster Declared" had 19 educators indicated). With half of the Career and Technical Career Clusters having an educator count of below 100, a decision was made to include all identified CTE educators as possible participants for this research. Also, the ALSDE indicated that the CTE program educators' emails could not be separated since all CTE educators are in a single list-serve (C. Wells, ALSDE, personal communication, February 12, 2018).

Instrument Design

For this study, a survey instrument in the form of a self-reported questionnaire was the most viable option. Email was used to initially distribute the survey instrument designed in Qualtrics. A paper survey was also designed and used in the second phase of data collection, which included the researcher attending the 2018 Alabama Association of Career and Technical Education Professional Development Summer Conference in July 2018 and inviting all attendees to voluntarily complete the survey anonymously. Data was collected using a researcher-designed questionnaire titled Innovativeness and Technology Integration Survey or ITIS. The ITIS contained three sections: Section 1—Innovativeness Scale adapted from Hurt, et al. (1977; 2013) which identified Innovativeness adopter categories and a Self-ID of Innovativeness question; Section 2—Technology Importance and Frequency of Use Questionnaire, which was researcher developed using the ISTE•E Standards (International Society for Technology in Education, 2017a); Section 3—Educator Background and Demographics which identified demographic data. An explanation of each section can be found in the following paragraphs.

Section 1 of the ITIS contained 20 short statements and a five-point Likert-type scale, which was adapted from the original Individual Innovativeness Scale designed by Hurt, et al. (1977; 2013). For the 20 short statements, respondents were instructed to select the best rating for each statement: 5—Strongly Agree, 4—Agree, 3—Undecided, 2—Disagree, and 1—Strongly Disagree. Examples of the statements are: “My peers often ask me for advice or information using technology;” “I consider myself to be creative and original in my thinking and behavior;” and, “I am receptive to new ideas and new technology.” These statements were both positive and negative in nature and determine the Innovativeness of the participants. It also contained a self-reported Innovativeness question in which participants were asked to choose one of five statements which best described their level of Innovativeness. These statements were researcher-developed using Rogers' diffusion of innovation theory adopter category definitions (Rogers, 2003).

In Section 2, there were two columns of ratings, Column A and B, in which two separate questions were asked. Respondents were asked to determine the best rating for each technology related standard. The technology related standards were derived from the ISTE•E Standards and were divided by the established ISTE categories. These categories include Learner, Leader, Citizen, Collaborator, Designer, Facilitator, and Analyst. Column A contained the question "How important is the standard to you?" with ratings of: 5—Very Important, 4—Moderately Important, 3—Neutral, 2—Low Importance, and 1—Not Important. Column B contained the question "How frequently do you implement the standard?" with ratings of: 5—Always, 4—Very often, 3—Sometimes, 2—Rarely, and 1—Never. An example of the questions is in Figure 2. These statements determined technology importance and integration.



With regard to being a Learner, as a teacher, I...
Rate each question.

	How important is the standard to you? 5 = Very Important to 1 = Not important					How frequently do you implement the standard? 5 = Always to 1 = Never				
	5 Very Important	4 Important	3 Undecided	2 Somewhat Important	1 Not Important	5 Always	4 Very Often	3 Sometimes	2 Rarely	1 Never
Participate in learning networks to pursue professional learning interests.	O	O	O	O	O	O	O	O	O	O
Set PD goals related to using technology in my classroom.	O	O	O	O	O	O	O	O	O	O
Stay current with educational research.	O	O	O	O	O	O	O	O	O	O

Figure 2. Example of Section 2 of the ITI Survey concerning technology Importance and Integration as determined by using the ISTE Standards for Educators as a framework.

Section 3 included educator characteristics and demographic information such as age, gender, years of teaching experience, type of teacher certification held or completing, and teaching field or program area of certification.

Validity and Reliability

The quality of the research instrument is important for a researcher to make informed and accurate conclusions. Fraenkel and Wallen (2009) explain that, “Validity is the most important idea to consider when preparing or selecting an instrument to use” (p. 147). Validity is defined as, “referring to the appropriateness, correctness, meaningfulness, and usefulness of the specific inferences researchers make based on the data they collect” (p. 148). Along with the validity of an instrument, the reliability of an instrument is important as well. Fraenkel and Wallen (2009) also explain that reliability refers to the consistency of the instrument to provide accurate scores across several administrations or across sets of items (p. 147–159). Both validity and reliability of an instrument are important to “ensure that the inferences [researchers] draw, based on the data they collect, are valid and reliable” (Fraenkel & Wallen, 2009, p. 147).

The survey instrument was reviewed by on-campus and off-campus current and past Business/Marketing Ed., Agriculture Ed., and CTE graduate students in the Department of Curriculum and Teaching at Auburn University and the researcher's dissertation committee to "refine the questionnaire and locate potential problems in the interpretation or analysis of the data" (Gall et al., 2005, p. 133). These pre-participants were asked to review the survey for clarity of directions and definitions, and other concepts. The final instrument was revised to incorporate comments and recommendations of all pre-participants which provided for the development of a quality instrument (Dillman et al., 2014).

This survey relies heavily on self-reported measurements using Likert-type scales. Likert-type scales collect responses along a range of attitudes that have been labeled to describe a level of agreement (Woltz, Gardner, Kircher, & Burrow-Sanchez, 2012). Cronbach's alpha was used to measure internal consistency, or reliability, of the ITIS, with reliability coefficients being at least .70, for general acceptability (Gall et al., 2005, p. 140). Each of the first two sections was subject to Cronbach's alpha. Section 1 contains the Individual Innovativeness Scale adapted from the original by Hurt et al. (1977; 2013). The twenty items are scored with a Likert-type scale using five possible values that respondents scored according to the level of agreement: 5—Strongly Agree to 1—Strongly Disagree. Hurt et al. (1977) computed a coefficient alpha of .94 for the 20 items. Other research using the same scale by Goldsmith (1991) computed a coefficient alpha of .89 and Yorulmaz, Çokçalişkan, and Őnal (2016) had a coefficient alpha of .74. Section 2 contained statements in seven categories in which two questions were asked and respondents rated. The first question was "How Important is the standard to you?" 5—Very Important to 1— Not Important. The second question was "How frequently do you implement the standard?" with 5—Always to 1—Never.

Procedure

During the first phase of data collection, the Alabama State Department of Education (ALSDE) indicated that all educators teaching within a CTE program received an email which included, (1) a request to complete the survey, (2) a short informational letter which briefly explained the purpose of the survey, and (3) a link to the Qualtrics designed survey. The first page of the survey contained a more detailed information letter that described the study and outlined the procedures to follow. It also included a statement that indicated that they were giving permission to use the data if they proceeded with the survey. Since the survey was anonymous, all participants received a reminder follow-up email approximately five days after the initial email to encourage participants who did not respond to the first email.

A second phase of data collection was completed during the Alabama Association for Career and Technical Education (ALACTE) Professional Development Summer 2018 Conference during July 2018. This was conducted because the response rate was low for the emailed survey ($n = 33$). Participants were invited to complete the ITIS which included, (1) a title page, (2) an informational letter which explained the purpose of the survey (approved by Auburn University IRB; Appendix D), and (3) a printed version of the survey. After completion of the survey, participants were asked to return it to one of a number of boxes that were located around the conference site, so anonymity was maintained. Appendix C contains both the email and paper version of the survey and the corresponding letters.

Data Analysis Plan

For this research, the Statistical Pack for Social Science (SPSS) Statistics 24 was the statistical software used. Descriptive statistics summarized, organized, and described the collected data.

To analyze Research Question 1 (What are the Innovativeness adopter categories of CTE educators?), the following procedure identified by Hurt et al. (2013) was followed: Using the 20 questions in Section 1:

Step 1) Add the scores for items 4, 6, 7, 10, 13, 15, 17, 20;

Step 2) Add the scores for items 1, 2, 3, 5, 8, 9, 11, 12, 14, 16, 18, 19;

Step 3) Complete the following formula: Innovativeness = 42 + total score for Step 2—total score for Step 1.

Once the calculations were completed the Innovativeness score was used to place each participant into an adopter category:

Innovators: scores 80 and above

Early Adopters: scores between 69 and 79,

Early Majority: scores between 57 and 68,

Late Majority: scores between 47 and 56,

Traditionalists: scores below 46

The term "Traditionalist" was used rather than "Laggard" because it better describes educators who "like to teach old school." The range of the Innovativeness score is 14 to 94. An overall Mean and Standard Deviation for each Innovativeness category and program area was also reported. This data was compared to the self-identified Innovativeness adopter categories also located in Section 1 using Wilcoxon Signed Rank test.

To analyze Research Question 2 (Is there a significant relationship between secondary CTE programs and Innovativeness?), a Pearson Chi-Square test was used to determine a significant relationship between CTE program and Innovativeness. Because of sample size, CTE programs were consolidated into the CTE Career Clusters and the following program clusters used: AgriScience, Business/Marketing, Family and Consumer

Science, Health Science, Trade/Technical/Industry, JROTC, and Administration (including counselors and directors).

To analyze Research Question 3 (Is there a significant relationship between secondary CTE educators perceived technology importance and educator characteristics [Innovativeness, CTE program, certification type, teaching experience, age, and gender]?) and Research Question 4 (Is there a significant relationship between secondary CTE educators perceived frequency of use of technology in their classroom and identified characteristics [Innovativeness, CTE program, certification type, teaching experience, age, and gender]?), an Analysis of Variance (ANOVA) was used to determine if significant differences existed in the level of perceived technology importance or frequency of use and educator characteristics. Since the ANOVA does not provide information as to which mean is significantly different when there are more than two means, post hoc Bonferroni correction analysis for pairwise comparisons was used when a significant difference was found (Gall et al., 2005). An F value was reported with an alpha level of 0.05 set to determine statistical significance.

Limitations

There are several limitations related to this study. The first was the self-reported questionnaire. Self-reported answers can sometimes be exaggerated, respondents may be embarrassed to answer truthfully, or they may not answer all of the questions. It must be assumed that respondents were honest and consistent with the information they provided. The data was reviewed before analysis to determine if there was missing data. The second limitation was also related to the questionnaire being self-reported. While the survey was reviewed by experts and other educators before being sent to or filled out by participants and revisions made to correct issues of ambiguity and insufficient directions or information, since the survey was anonymous, it was impossible to answer questions related to the survey, if there were any. This may be important because not all CTE educators have the same level of experience and knowledge about technology, integration, and pedagogy. The third limitation was that the sample size of one or more Career and Technical Education program was not of sufficient number for appropriate analysis. It was necessary to group Career Cluster fields to have an appropriate sample size.

Summary

The purpose of this research was to determine the current state of Innovativeness of secondary CTE educators in Alabama as well as their technology integration as determined by their perceptions of technology importance and frequency of use in the classroom. All secondary CTE educators in Alabama were invited to participate in the study and answer a questionnaire that was researcher developed. The expert and peer reviewed survey contained Likert-type scales for participants to rate their perceptions to a number of statements, including 20 statements related to Innovativeness (adapted from Hurt et al. 2013), one self-reported statement of Innovativeness, 37 statements related to perception of technology importance and frequency of use, and eight demographic and teacher-related questions. The survey was anonymous. Upon receiving their completed survey, the data was securely stored and used for descriptive and inferential statistics.

Chapter 4. Statistical Analysis and Results

This study was designed to determine technology Innovativeness and integration of Career and Technical Education (CTE) educators in Alabama using a researcher-designed survey based on the review of literature. Innovativeness was determined using the Innovativeness Scale designed by Hurt, Joseph and Cook (1977; 2013) which contains 20 statements, both positive and negative in nature. Participants were asked to rate each statement on a scale of 1–5 with 1–Strongly Disagree and 5–Strongly Agree. The scores were then calculated using the following formula:

Step 1—Add the scores for items 4, 6, 7, 10, 13, 15, 17, 20;

Step 2—Add the scores for items 1, 2, 3, 5, 8, 9, 11, 12, 14, 16, 18, 19;

Step 3—Innovativeness = 42 + total score of Step 2 – total score of Step 1 (Hurt et al., 2013).

The Survey Calculated Innovativeness score was then placed into one of five adopter categories:

1 = Innovator: 80+

2 = Early Adopter: 69–79

3 = Early Majority: 57–68

4 = Late Majority: 46–56

5 = Traditionalist: < 46 (Hurt et al., 2013).

Participants were also asked to self-identify themselves into one of the five Innovativeness adopter categories by choosing one of five statements that were researcher developed using Rogers' diffusion theory adopter categories definitions (Rogers, 2003).

Technology integration was determined by using the ISTE•E Standards and asking participants about their perceived importance and frequency of use of the ISTE•E Standards, again using a scale of one to five. The first question was "How important is the standard to you?" with a rating of 5—Very Important and 1—Not Important. The second question was "How frequently do you implement the standard?" with a rating of 5—Always and 1—Never.

Relationships between educator characteristics, Innovativeness, and technology integration was also investigated. The characteristics included CTE program, type of teaching certificate held or completing, years of experience teaching in CTE, age, and gender.

The literature reviewed in Chapter 2 revealed that students need to be tech savvy, both efficient and proficient using technology, to be successful in a growing national and global society. Educators need to be able to use and teach with technology as well as feel comfortable teaching technology to students. While all educators are exposed to various types of technology training, most training is conducted in a one-size-fits all format. Researchers have found relationships between individual Innovativeness and attitudes towards technology, gender, age, and experience (Albirini, 2006; Cavas et al., 2009; Salehi & Salehi, 2012). Improved structured and focused professional development can be developed to increase all educators' technology use in classrooms by understanding educators' Innovativeness and technology integration as a measure of their attitudes towards the importance of classroom technology use, and how frequently they implement technology standards in the classroom. This chapter presents the analysis of data collected from secondary CTE educators in Alabama using the researcher-designed Innovativeness and Technology Integration Survey (ITIS).

Descriptive statistics, including frequencies, percentages, and means, ANOVA, Wilcoxon Signed Ranks test, and Chi-Square analysis was conducted in SPSS. Cronbach's alpha was used to determine reliability. Descriptive statistics and Wilcoxon Signed Ranks Test was used to analyze Research Question One. Descriptive statistics and Chi-Square analysis were used to analyze Research Question Two. Analysis of Variance and descriptive statistics were used to analyze Research Questions Three and Four.

Research Questions

Research Question One (RQ1).

What are the Innovativeness adopter categories of CTE educators?

The first section of the ITIS addressed RQ1 with 20 statements for participants to rate using a Likert-type scale of 1–5 (Survey Calculated Innovativeness). The first section of the ITIS also contained a self-perception question asking participants what they considered their Innovativeness to be (Self-ID Innovativeness); participants chose from one of five statements describing each adopter category. The Survey Calculated Innovativeness score was used to assign participants into one of the five adopter categories: Innovator, Early Adopter, Early Majority, Late Majority, and Traditionalist. Due to the negative nature of questions 4, 6, 7, 10, 13, 15, 17, 20, the scale was reversed in SPSS before Cronbach's alpha was calculated. Cronbach's alpha for the Innovativeness scale was .832 which indicated good internal consistency.

Using the Survey Calculated Innovativeness score of participants, analysis revealed an overall mean of 70.83 (*SD* = 9.16), with a minimum score of 44 and a maximum score of

92, which fell in the Early Adopter category with scores between 69 and 80. Table 1 provides descriptive statistics for the Self-ID and Survey Calculated Innovativeness adopter categories, including the expected frequencies according to Rogers' diffusion of innovation theory (Rogers, 2003). The Early Adopter category had the highest frequency and percentage; Survey Calculated had a frequency of 141 (44.9%) and Self-ID had a frequency of 142 (45.2%).

Table 1.

Innovativeness—Survey Calculated, Self-ID, Expected (n = 314)

Innovativeness Adopter Categories	Survey Calculated		Self-ID		Expected[a]	
	n	%	*n*	%	*n*	%
Innovator	51	16.2	27	8.6	8	2.5
Early Adopter	141	44.9	142	45.2	42	13.5
Early Majority	99	31.5	130	41.4	107	34.0
Late Majority	21	6.7	11	3.5	107	34.0
Traditionalist	2	.6	4	1.3	50	16

[a] Percentage from Rogers (2003).

The Wilcoxon Signed Rank test was performed to determine an association between the Self-ID and Survey Calculated Innovativeness. Upon review, the Late Majority and Traditionalist categories were combined into a one category, Late Adopter, due to small frequencies (Table 1). An association between Self-ID and Survey Calculated Innovativeness was observed, Z = -2.59, p = .010. Self-ID had a slightly higher mean rank score than Survey Calculated Innovativeness (average rank of 85.02 vs. average rank of 84.99). Table 2 provides a cross tabulation of the Self-ID and Survey Calculated Innovativeness of participants. The table indicates the number of participants that considered themselves at one level of Innovativeness (Self-ID) versus what their Survey Calculated

Innovativeness indicated. For example, 11 participants had a Self-ID and a Survey Calculated Innovativeness of Innovator. However, 33 participants had a Self-ID Innovativeness as Early Adopter but their Survey Calculated Innovativeness was actually Innovator, and six participants considered themselves in the Early Majority adopter category but their Survey Calculated Innovativeness was Innovator.

Table 2.

Cross Tabulation of Survey Calculated and Self-ID Innovativeness by Adopter Category

	Self-ID Innovativeness				
Survey Calculated Innovativeness	Innovator	Early Adopter	Early Majority	Late Adopter	Total
Innovator	11 (21.6%)	33 (64.7%)	6 (11.8%)	1 (2.0%)	51
Early Adopter	13 (09.2%)	73 (51.8%)	53 (37.6%)	2 (1.4%)	141
Early Majority	3 (3.0%)	33 (33.3%)	56 (56.6%)	7 (7.0%)	99
Late Adopter	0 (--)	3 (13.0%)	15 (65.2%)	5 (21.7%)	21

The Survey Calculated Innovativeness score was used for the remaining analysis due to objectivity.

Research Question Two (RQ2).

Is there a significant relationship between secondary CTE programs and Innovativeness?

The first and third sections of the ITIS addressed RQ2. The first section contained 20 statements for participants to rate using a Likert-type scale of 1–5 which were used to determine Innovativeness (Survey Calculated Innovativeness). The Survey Calculated

Innovativeness score was used to assign participants into one of four adopter categories: Innovator, Early Adopter, Early Majority, and Late Adopter. In the third section of the ITIS, participants indicated the CTE program in which they taught. CTE programs were divided into five categories including Business/ Marketing (B/M), Family and Consumer Science (FACS), Health Science (HS), Technical/Trade/Industry (T/T/I), and AgriScience, JROTC, and Administration (Ag/JROTC/Adm), including counselors and directors. For analysis, AgriScience was included with JROTC and Administration because of a participation rate (*n* = 13), which provided a more balanced count across CTE programs. Technical/Trade/ Industry programs included electronics, robotics, automotive technology, welding, cosmetology, building construction, carpentry, collision repair, drafting, plumbing, solar technology, electrical technology, industrial maintenance, architecture, engineering principles, public safety, HVAC&R, television production, technical theater, transportation, and STEM.

A Pearson Chi-Square test determined that there was not a significant association between CTE program and Innovativeness, $\chi^2(12, n = 310) = 16.33$, $p = .177$. A weak association was determined using Cramer's V ($\phi_c = .13$). Table 3 provides means and standard deviations of Innovativeness and CTE program. Table 4 contains a cross tabulation of Innovativeness adopter categories and CTE programs. For all CTE programs, the highest percentage of educators fell in the Early Adopter category.

Table 3.

Means and Standard Deviations of Innovativeness Score by CTE Program

CTE Program	*n*	*M*[a]	*SD*
Business/Marketing	71	72.30	8.46
Family & Consumer Sciences	52	69.00	8.38
Health Sciences	87	68.90	9.24
Technical/Trade/Industry	54	73.17	10.31
AgriScience/JROTC/Administration	46	71.52	8.72
Total	310	70.83	9.16

[a] Innovator: 80+; Early Adopter: 69–79; Early Majority: 57–68; Late Majority: 46–56; Traditionalist: < 46 (Hurt et al., 2013).

Table 4.

Frequency and Percentage of CTE Programs Across Innovativeness Adopter Categories

	Innovativeness Adopter Categories			
CTE Programs	Innovator	Early Adopter	Early Majority	Late Adopter
B/M	13	34	21	3
	(18.3%)	(47.9%)	(29.3%)	(4.2%)
FACS	4	24	20	4
	(7.7%)	(46.2%)	(38.5%)	(7.7%)
HS	11	37	30	9
	(12.6%)	(42.5%)	(34.5%)	(10.3%)
T/T/I	16	20	13	5
	(29.6%)	(37.0%)	(24.1%)	(9.3%)
Ag/JROTC/Adm	7	25	12	2
	(15.2%)	(54.3%)	(26.1%)	(4.3%)

Note. Business/Marketing (B/M), Family and Consumer Science (FACS), Health Science (HS), Tech/Trade/Industry (T/T/I), and AgriScience, JROTC, and Administration (Ag/JROTC/Admin).

Research question three (RQ3).

Is there a significant relationship between secondary CTE educators' perceived technology importance and educator characteristics (Innovativeness, CTE program, certification type, teaching experience, age, and gender)?

The third research question was analyzed using one-way ANOVA, with an alpha level of .05, to determine significant relationships between importance of the ISTE•E Standards and educator characteristics including Innovativeness, CTE program, type of certification held or completing, years of teaching experience in CTE, age, and gender. Section two of the ITIS included statements derived from the ISTE•E Standards and separated into the seven standard categories: Learner, Leader, Citizen, Collaborator, Designer, Facilitator, and Analyst. Participants rated the importance of each statement using a five-point Likert-type scale ranging from one to five, with 1—Not Important, 2—Somewhat Important, 3—Undecided, 4—Important, and 5—Very Important. Reliability was initially determined to be good, $\alpha_{overall} = .940$. Cronbach's alpha for each standard category are in Table 5. When the Leader Standard was removed due to an unacceptable alpha level ($\alpha = .315$), the overall alpha increased to .950.

Table 5.

Cronbach's Alpha for the Importance of the ISTE•E Standards

Standard	α	*n*	# of Items
Overall	.950[a]	292	37
Learner	.739	307	3
Leader	.315	308	3
Citizen	.918	310	7
Collaborator	.751	308	8
Designer	.911	309	5
Facilitator	.858	310	4
Analyst	.902	308	7

[a] α = .940 when including the Leader Standard.

Section three of the ITIS contained questions regarding educator characteristics including CTE program, teacher certification held or completing, years of teaching experience in CTE, age, gender, and knowledge of the ISTE•E prior to completing the survey. Table 6 provides descriptive statistics of participants.

Table 6.

Descriptive Statistics of Characteristics

Characteristics	*n*	%
CTE Program (*n* = 310)		
Ag, Food, Natural Resources	13	4.2
Business/Marketing	71	22.9
Family & Consumer Science	52	16.8
Health Science	87	28.1
Technical/Trade/Industry	54	17.4
JROTC/Administration	33	10.6
Teaching Certification (*n* = 303)		
Class B	63	20.8
Class A	110	36.3
Class AA	35	11.6
BA/MA Equiv. Tech Ed.	59	19.5
Provisional (PCCT)	14	4.6
Other[a]	22	7.3
Years Teaching Experience (*n* = 291)		
0–5	131	45.0
6–10	41	14.1
11–20	77	26.5
21–30	36	12.4
31–42	6	2.1
Age (years) (*n* = 297)		
21–30	12	4.0
31–40	60	20.2
41–50	107	36.0
51–60	83	27.9
61–72	35	11.8

Table 6 (continued).

Characteristics	*n*	%
Gender (*n* = 314)		
Female	241	76.8
Male	73	23.2
ISTE Knowledge (*n* = 304)		
Yes	131	43.1
No	173	56.9

[a] Other included Doctorate degree, RN and Associates degree (Health related), Certification with Teacher Ready program, Praxis in FACS, Service certification, JROTC certification, Emergency certification, CTE Temporary, and Substitute certification

Innovativeness (RQ3).

A one-way ANOVA was used to determine statistical significance between the importance of the ISTE•E Standards, the dependent variable, and Innovativeness, the independent variable. An alpha level of .05 was used for all analyses. Section one of the ITIS contained the Innovativeness Scale. Participants were asked to rate 20 statements on a scale of 1–5 with 1—Strongly Disagree and 5—Strongly Agree (Survey Calculated Innovativeness). Using the Innovativeness Scale formula, participant scores were calculated and placed into one of four categories: Innovator, Early Adopter, Early Majority, and Late Adopter. The categories Late Majority and Traditionalist were combined into the Late Adopter category due to the low frequency of the Traditionalist category. In section two of the ITIS, participants rated the importance of the ISTE•E Standards on a five point Likert-type scale ranging from one to five with 1—Not Important and 5—Very Important. The ISTE•E Standards seven categories are Learner, Leader, Citizen, Collaborator, Designer, Facilitator and Analyst.

Innovativeness - Overall ISTE•E Standards (RQ3).

Levene's test for equality of variance was found to be violated for the present analysis, $F_{(3, 310)} = 3.33$, p = .020. The one-way ANOVA of the importance of all ISTE•E Standards was significant, *Welch's* $F_{(3, 80.94)} = 16.71$, $p < .001$, indicating higher Innovativeness levels affected the increase in importance of all ISTE Standards. The estimated omega squared ($\omega^2 = .131$) indicated that approximately 13% of the total variation of importance of the measure of all ISTE•E Standards was attributable to Innovativeness level. Means, standard deviations, and post hoc comparisons, using the Games-Howell procedure, can be found in Table 7. These results indicated that Innovators had a significantly higher measure of importance of all ISTE•E Standards than Early Adopters (p = .032), the Early Majority ($p < .001$) and Late Adopters ($p < .001$). Also, the Early Majority ($p = .005$) and Late Adopters ($p < .001$) rated importance significantly lower than the Early Adopters. Late Adopters also rated importance statistically significantly lower than the Early Majority ($p = .031$).

Innovativeness - Learner ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 309)} = 2.24$, p = .083) indicating that the assumption underlying the ANOVA was met. The effect of the level of Innovativeness on importance of the Learner ISTE•E Standard was significant, $F_{(3, 309)} = 12.29$, $p < .001$, $\eta^2 = .107$, with higher Innovativeness levels indicating an increase in importance of the Learner ISTE•E Standard. The effect size was moderate with the level of Innovativeness accounting for about 11% of the variance in importance of the Learner ISTE•E Standard means. Means, standard deviations, and post hoc comparisons, using the Bonferroni correction, can be found in Table 7. Pairwise comparisons indicated that importance of the Learner ISTE•E Standard was statistically significantly lower for Early

Adopters (p = .009), the Early Majority (p = .001), and Late Adopters (p < .001) compared to Innovators. Also, when compared to the Early Adopters, the Late Adopters (p < .001) measure of importance of the Learner ISTE•E Standard was statistically significantly lower. In addition, Late Adopters (p = .005) had a statistically significantly lower measure of importance than the Early Majority. Early Adopters and the Early Majority measures were not statistically significantly different (p = 1.000).

Innovativeness - Leader ISTE•E Standard (RQ3).

Non-parametric analysis, Kruskal-Wallis H test, was conducted for the Leader ISTE•E Standard because Cronbach's alpha for these three questions was low (α = .315). These results indicated that there was a statistically significant difference in the measure of importance of the Leader ISTE•E Standard between the different Innovativeness levels, $\chi^2(3, n = 313) = 26.761$, p < .001. The effect size was η^2 = .077 indicating a moderate relationship between importance and level of Innovativeness. The mean ranks were as follows: Innovator (n = 51) = 200.07 (largest), Early Adopter (n = 140) = 162.44, Early Majority (n = 99) = 141.71, Late Adopter (n = 23) = 94.17 (smallest). Means, standard deviations, and post hoc comparisons, using Dunn's test, can be found in Table 7. Pairwise comparisons results indicated that Innovators rated importance statistically significantly higher than the Early Majority (p = .001), and Late Adopters (p < .001). Early Adopters did not rate importance statistically significantly different than Innovators (p = .059) and the Early Majority (p = .459), but did rate importance significantly higher than Late Adopters (p =.004). Also, the Early Majority did not have a statistically significant different rating of importance than Late Adopters (p = .127).

Innovativeness - Citizen ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 309)} = .96$, $p = .414$, indicating that the assumption underlying the ANOVA was met. The effect of the level of Innovativeness on importance of the Citizen ISTE•E Standard was significant, $F_{(3, 309)} = 10.30$, $p < .001$, $\eta^2 = .091$, with higher Innovativeness levels indicating an increase in importance of the Citizen ISTE•E Standard. The effect size was moderate with the level of Innovativeness accounting for about 9% of the variance in importance of the Citizen ISTE•E Standard means. Means, standard deviations, and post hoc comparisons, using the Bonferroni correction, can be found in Table 7. Pairwise comparisons indicated that importance was statistically significantly lower for the Early Majority ($p = .010$) and Late Adopters ($p < .001$) compared to Innovators. Also, the measure of importance of the Citizen ISTE•E Standard for Late Adopters was statistically lower than Early Adopters ($p < .001$) and the Early Majority ($p = .013$). While not statistically significant, the means of Innovators were higher than Early Adopters ($p = .816$) and the means of Early Adopters were higher than the Early Majority ($p = .125$).

Innovativeness - Collaborator ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 308)} = 2.61$, $p = .052$, indicating that the assumption underlying the ANOVA was met. The effect of the level of Innovativeness on the measure of importance of the Collaborator ISTE•E Standard was significant, $F_{(3, 308)} = 6.99$, $p < .001$, $\eta^2 = .064$, with higher Innovativeness levels indicating an increase in importance of the Collaborator ISTE•E Standard. The effect size was moderate with the level of Innovativeness accounting for about 6.5% of the variance in importance of the Collaborator ISTE•E Standard means. Means, standard deviations, and post hoc comparisons, using the Bonferroni correction, can be found in Table 7. Pairwise comparisons indicated that the measure of importance was statistically significantly lower for the Early Majority (p = .005) and Late Adopters (p < .001) compared to Innovators. Also, the measure of importance of the Collaborator ISTE•E Standard of Late Adopters was statistically significantly lower than Early Adopters (p = .015). There were no statistically significant differences in the measure of importance of the Collaborator ISTE•E Standard between Innovators and Early Adopters (p = .254), Early Adopters and the Early Majority (p = .341), and the Early Majority and Late Adopters (p = .368).

Innovativeness - Designer ISTE•E Standard (RQ3).

Levene's test for equality of variance was found to be violated for the present analysis, $F_{(3, 306)} = 6.16$, $p < .001$. The one-way ANOVA of importance of the Designer ISTE•E Standard was significant, *Welch's* $F_{(3, 81.01)} = 18.95$, $p < .001$, indicating higher Innovativeness levels affected the increase in importance of the Designer ISTE•E Standard. The estimated omega squared ($\omega^2 = .148$) indicated a large effect size and that approximately 15% of the total variation of importance of the Designer ISTE•E Standard measure was attributable to Innovativeness level. Means, standard deviations, and post hoc comparisons, using the Games-Howell procedure, can be found in Table 7. These results indicated that Innovators had a significantly statistically higher measure for importance of the Designer ISTE•E Standard than Early Adopters (p = .005), the Early Majority (p < .001), and Late Adopters (p < .001). Also, the Early Majority (p = .002) and Late Adopters (p < .001) had a significantly statistically lower measure of importance for the Designer ISTE•E Standard than Early Adopters. In addition, Late Adopters had a measure of importance of the Designer ISTE•E standard that was close to being considered significantly statistically lower than the Early Majority (p = .051).

Innovativeness - Facilitator ISTE•E Standard (RQ3).

Levene's test for equality of variance was found to be violated for the present analysis, $F_{(3, 307)} = 4.06$, $p = .008$. The one-way ANOVA of importance of the Facilitator ISTE•E Standard was significant, *Welch's* $F_{(3, 79.24)} = 11.98$, $p < .001$, indicating higher Innovativeness levels affected the increase of importance of the Facilitator ISTE•E Standard. The estimated omega squared ($\omega^2 = .096$) indicated that approximately 10% of the total variation of importance of the Facilitator ISTE•E Standard measure was attributable to Innovativeness level. Means, standard deviations, and post hoc comparisons, using the Games-Howell procedure, can be found in Table 7. The results indicated that Innovators had a statistically significantly higher measure of importance of the Facilitator ISTE•E Standard than the Early Majority ($p < .001$) and Late Adopters ($p < .001$). Also, the Early Majority ($p = .005$) and Late Adopters ($p = .001$) rated importance statistically significantly lower than Early Adopters. A statistically significant difference was not found between Innovators and Early Adopters ($p = .211$) or between the Early Majority and Late Adopters ($p = .092$).

Innovativeness - Analyst ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 307)} = 2.22$, $p = .086$, indicating that the assumption underlying the ANOVA was met. The effect of the level of Innovativeness on importance of the Analyst ISTE•E Standard was significant, $F_{(3, 307)} = 14.28$, $p < .001$, $\eta^2 = .122$, with higher Innovativeness levels indicating an increase in importance of the Analyst ISTE•E Standard. The effect size was moderate with the level of Innovativeness accounting for about 12% of the variance in importance of the Analyst ISTE•E Standard means. Means, standard deviations, and post hoc comparisons, using the Bonferroni correction, can be found in Table 7. Pairwise comparison analyses indicated that the measure of importance was statistically significantly lower for the Early Majority ($p <$

.001) and Late Adopters (*p* < .001) compared to Innovators. Also, the measure of importance for the Early Majority (*p* < .001) and Late Adopters (*p* < .001) was significantly lower than Early Adopters. Statistically significant differences were not found for the measure of importance of the Analyst ISTE•E Standard between Innovators and Early Adopters (*p* = .429) or the Early Majority and Late Adopters (*p* = .333).

Innovativeness Summary (RQ3).

Table 7 provides a summary of the statistical analyses of importance of the ISTE•E Standards and Innovativeness.

Table 7.

One-Way ANOVA (except where noted) of Innovativeness (IV) and Importance of the ISTE•E Standards (DV)

ISTE•E Standards	Innov. Group	Mean (SD)	*F*	*df*	*p*	ES[a]	Significant Groups
All ISTE•E Standards	Overall	4.27 (.52)	16.71[b]	3, 310	< .001	ω^2 = .131	
	1	4.55 (.45)					1 vs. 2*, 3***, 4***
	2	4.35 (.42)					2 vs. 3**, 4***
	3	4.13 (.56)					3 vs. 4*
	4	3.77 (.53)					
Learner	Overall	4.16 (.67)	12.29	3, 309	< .001	.107	
	1	4.51 (.51)					1 vs. 2**, 3**, 4***
	2	4.18 (.60)					2 vs. 4***
	3	4.08 (.73)					3 vs. 4**
	4	3.58 (.66)					
Leader	Overall	4.14 (.98)	26.76[c]	3, 310	< .001	.077	
	1	4.44 (.61)					1 vs. 3**, 4***
	2	4.17 (.61)					2 vs. 4**
	3	3.97 (.79)					
	4	3.97 (2.67)					
Citizen	Overall	4.43 (.57)	10.29	3, 309	< .001	.091	
	1	4.64 (.60)					1 vs. 3**, 4***
	2	4.50 (.50)					2 vs. 4***
	3	4.34 (.57)					3 vs. 4*
	4	3.94 (.59)					

Table 7 (continued).

ISTE•E Standards	Innov. Group	Mean (SD)	*F*	*df*	*p*	ES[a]	Significant Groups
Collaborator	Overall	4.12 (.66)	6.99	3, 308	< .001	.064	
	1	4.39 (.59)					1 vs. 3**, 4***
	2	4.16 (.53)					2 vs. 4*
	3	4.01 (.80)					
	4	3.73 (.66)					
Designer	Overall	4.28 (.69)	18.95[b]	3, 306	< .001	ω^2 =	
	1	4.68 (.49)				.148	1 vs. 2**, 3***, 4***
	2	4.40 (.55)					
	3	4.08 (.74)					2 vs. 3**, 4***
	4	3.58 (.81)					3 vs. 4*
Facilitator	Overall	4.38 (.59)	11.98[b]	3, 307	< .001	ω^2 =	
	1	4.65 (.57)				.096	1 vs. 3***, 4***
	2	4.48 (.46)					
	3	4.22 (.62)					2 vs. 3**, 4**
	4	3.87 (.64)					
Analyst	Overall	4.24 (.63)	14.28	3, 307	< .001	.122	
	1	4.53 (.51)					1 vs. 3***, 4***
	2	4.35 (.55)					
	3	4.04 (.66)					2 vs. 3***, 4***
	4	3.78 (.67)					

Note. Innovativeness Group #: 1—Innovator, 2—Early Adopter, 3—Early Majority, 4—Late Adopter. Likert-type scale: 5—Very Important to 1—Not Important.
[a] η^2 except where noted. [b] *Welch's F.* [c] Kruskal-Wallis *H.*
* $p < .05$, ** $p < .01$, *** $p < .001$.

CTE Program (RQ3).

A one-way ANOVA was used to determine statistical significance between importance of the ISTE•E Standards and CTE program. An alpha level of .05 was used for all analyses. In section two of the ITIS, participants rated importance of the ISTE•E Standards on a five point Likert-type scale ranging from one to five with 1—Not Important and 5—Very Important. The seven ISTE•E Standard categories are Learner, Leader, Citizen, Collaborator, Designer, Facilitator and Analyst. In section three of the ITIS, participants were asked to indicate the CTE program in which they taught. Because of low participation, AgriScience educators (n = 13) were combined with JRTOC/Administration, which included JROTC educators and CTE counselors and directors. This provided a more balanced count for ANOVA analysis. Abbreviations for CTE programs are as follows:

1—Business/Marketing: B/M

2—Family & Consumer Science: FACS

3—Health Science: HS

4—Technical/Trade/Industry: T/T/I

5—AgriScience, JROTC, and Administrators: Ag/JROTC/Adm.

CTE Program - Overall ISTE•E Standards (RQ3).

Levene's test for equality of variance was found to be violated for the present analysis, $F_{(4, 309)} = 5.42$, $p < .001$. The one-way ANOVA showed that CTE program had a statistically significant effect on importance of all ISTE•E Standards, *Welch's* $F_{(4, 139.06)} = 6.83$, $p < .001$. The estimated omega squared ($\omega^2 = .070$) indicated that approximately 7% of the total variation of importance of the overall ISTE·E measure was attributable to CTE program. Means, standard deviations, and post hoc comparisons, using the Games-Howell post hoc procedure, can be found in Table 8. The results indicated that the measure of importance of all ISTE•E Standards was statistically significantly lower for FACS (p = .007) and HS (p < .001) educators compared to B/M educators. There was not a statistically significant difference in the measure of importance of all ISTE•E Standards between B/M and T/T/I (p = .170), and B/M and Ag/JROTC/Adm. (p = .078) educators. Also, there were no statistically significant differences between educators in FACS programs and HS (p = .808), T/T/I (p = .963) or Ag/JROTC /Adm. (p = .991) programs. In addition, statistical significance was not found between HS educators and educators in T/T/I (p = .473) or

Ag/JROTC/Adm. (p = .593) programs, as well as, T/T/I and Ag/JROTC/Adm. programs (p = 1.000).

CTE Program - Learner ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 304)} = .79$, $p = .531$, indicating that the assumption underlying the ANOVA was met. The one way ANOVA showed that CTE program had a statistically significant effect on importance of the Learner ISTE•E Standard, $F_{(4, 304)} = 4.93$, $p = .001$, $\eta^2 = .061$. The effect size was moderate with CTE program accounting for about 6% of the variance in the importance of the Learner ISTE•E Standard means. Means, standard deviations, and post hoc comparisons, using the Bonferroni correction, can be found in Table 8. Pairwise comparisons indicated that importance of the Learner ISTE•E Standard was statistically significantly lower for FACS educators (p = .002) and HS educators (p = .003) compared to B/M educators. There was not a statistically significant difference found for the measure of importance of the Learner ISTE•E Standard between B/M educators and T/T/I educators (p = 1.000) and Ag/JROTC/Admin educators (p = .381). Also, there were no statistically significant differences in importance of the Learner ISTE•E Standard between educators in FACS programs and educators in HS (p = 1.000), T/T/I (p = .253) and Ag/JROTC/Admin (p = 1.000) programs. In addition, statistical significance was not found between HS educators and educators in T/T/I (p = .556) and AG/JROTC/Admin (p = 1.000) programs, as well as, T/T/I and AG/JROTC/Admin programs (p = 1.000).

CTE Program - Leader ISTE•E Standard (RQ3).

Non-parametric analysis, Kruskal-Wallis H test, was conducted for the Leader ISTE·E Standard because Cronbach's alpha for these three questions was low (α = .315). These results indicated that there was a statistically significant difference in the measure of importance of the Leader ISTE•E Standard between the different CTE programs, $\chi^2(4, n = 309) = 12.58$, $p = .014$. The effect size of $\eta^2 = .028$, indicated a small relationship between importance and CTE program. The mean ranks were as follows: B/M ($n = 70$) = 180.03 (largest), Ag/JROTC/Admin ($n = 46$) = 161.64, T/T/I ($n = 54$) = 159.20, FACS ($n = 52$) = 151.11, and Health Sciences ($n = 87$) = 131.07 (smallest). Means, standard deviations, and post hoc comparisons using Dunn's test, can be found in Table 8. The pairwise comparisons results indicated that Business/Marketing educators had a statistically significantly higher mean rank than Health Science educators ($p = .005$). No other statistically significant differences were found between educators in B/M and FACS ($p = .727$), T/T/I and Ag/JRTOC/Adm. ($p = 1.000$). Also, no statistically significant differences were found between educators in FACS and HS, T/T/I, and Ag/JRTOC/Adm. ($p = 1.000$). In addition, no statistically significant differences were found between Health Science educators and educators in T/T/I programs ($p = .650$) and Ag/JRTOC/Adm. ($p = .567$), as well as, T/T/I educators and educators in Ag/JROTC/Adm. ($p = 1.000$) programs.

CTE Program - Citizen ISTE•E Standard (RQ3).

Levene's test for equality of variance was found to be violated for the present analysis, $F_{(4, 304)} = 4.77$, $p = .001$. The one-way ANOVA showed that CTE program had a statistically significant effect on importance of the Citizen ISTE•E Standard, *Welch's* $F_{(4, 138.14)} = 6.03$, $p < .001$. The estimated omega squared ($\omega^2 = .061$) indicated that approximately 6% of the total variation of importance of the overall ISTE•E measure was attributable to CTE program. Means, standard deviations, and post hoc comparisons, using the Games-Howell post hoc procedure, can be found in Table 8. These results indicated that importance of Citizen ISTE•E Standard was statistically significantly lower for HS ($p < .001$) and T/T/I ($p = .011$) educators compared to B/M educators. There was not a statistically significant difference in importance between B/M and FACS (p = .750) and Ag/JROTC/Adm. (p = .276) educators. Also, no statistical significance was found for educators in the FACS program compared to HS (p = .617), T/T/I (p = .763), and Ag/JRTOC/Adm. (p = .998) programs. In addition no statistical significance was found for the measure of importance of the Citizen ISTE•E Standard for educators in HS programs compared to T/T/I (p = 1.000), and Ag/JRTOC/Adm. (p = .489) programs, as well as, educators in T/T/I compared to Ag/JRTOC/Adm. programs (p = .645).

CTE Program - Collaborator ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 304)} = 1.21$, $p = .305$, indicating that the assumption underlying the ANOVA was met. The one way ANOVA showed that CTE program did not have a statistically significant effect on importance of the Collaborator ISTE•E Standard, $F_{(4, 304)} = .93$, $p = .444$, $\eta^2 = .012$. Means and standard deviations of CTE programs can be found in Table 8.

CTE Program - Designer ISTE•E Standard (RQ3).

Levene's test for equality of variance was found to be violated for the present analysis, $F_{(4, 302)} = 2.93$, $p = .021$. The one-way ANOVA showed that CTE program had a statistically significant effect on importance of the Designer ISTE•E Standard, *Welch's* $F_{(4, 137.62)} = 8.31$, $p < .001$. The estimated omega squared ($\omega^2 = .087$) indicated that approximately 9% of the total variation of importance of the overall ISTE•E measure was attributable to CTE program. Means, standard deviations, and post hoc comparisons, using the Games-Howell post hoc procedure, can be found in Table 8. These results indicated that the measure of importance of Designer ISTE•E Standard was statistically significantly lower for FACS (p = .038), HS ($p < .001$) and Ag/JROTC/Adm. (p = .002) educators compared to B/M educators. There was not a statistically significant difference in the measure of importance of the

Designer ISTE•E between B/M, and T/T/I (*p* = .107) educators. Also, there were no statistically significant differences in the importance between educators in FACS programs and HS (*p* = .268), T/T/I (*p* = 1.000) and Ag/JROTC/Adm. (*p* = .815) programs. In addition, there were no statistically significant differences in importance between educators in HS programs and T/T/I (*p* = .407) and Ag/JROTC/Adm. (*p* = 1.94) programs, as well as T/T/I and Ag/JROTC/Adm. (*p* = .890) programs.

CTE Program - Facilitator ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 303)} = .97$, $p = .424$, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed that CTE program had a statistically significant effect on the measure of importance of the Facilitator ISTE•E Standard, $F_{(4, 303)} = 4.22$, $p = .002$, $\eta^2 = .053$. The effect size was small with the CTE program accounting for about 5% of the variance in importance of the Facilitator ISTE•E Standard means. Means, standard deviations, and post hoc comparisons, using the Bonferroni correction, can be found in Table 8. Pairwise comparisons indicated that the measure of importance of the Facilitator ISTE•E Standard was statistically significantly lower for HS educators (*p* = .001) compared to B/M educators. There was not a statistically significant difference in importance of the Facilitator ISTE•E Standard between B/M educators and FACS (*p* = .113), T/T/I (*p* = .862), and Ag/JROTC/Adm. (*p* = .444) educators. Also, there were no statistically significant differences in the measure of importance between educators in FACS programs and HS (*p* = 1.000), T/T/I (*p* = 1.000), and Ag/JROTC/Adm. (*p* = 1.000) programs. In addition, there were no statistically significant differences in importance between educators in HS programs and T/T/I (*p* = .575) and Ag/JROTC/Adm. (*p* = 1.000) programs, as well as T/T/I and Ag/JROTC/Adm. (*p* = 1.000) programs.

CTE Program - Analyst ISTE•E Standard (RQ3).

Levene's test for equality of variance was found to be violated for the present analysis, $F_{(4\ 304)}$ = 3.40, p = .010. The one-way ANOVA showed that CTE program had a statistically significant effect on importance of the Analyst ISTE•E Standard, *Welch's* $F_{(4,\ 138.20)}$ = 9.31, $p < .001$. The estimated omega squared (ω^2 = .097) indicated that approximately 10% of the total variation of importance of the overall ISTE•E measure was attributable to CTE program. Means, standard deviations, and post hoc comparisons, using the Games-Howell post hoc procedure, can be found in Table 8.

These results indicated that the measure of importance of the Analyst ISTE•E Standard was statistically significantly lower for FACS (p = .001) and HS (p < .001) educators compared to B/M educators. There was not a statistically significant difference in importance between B/M educators and T/T/I (p = .145) or Ag/JROTC/Adm. (p = .137) educators. Also, there were no statistically significant differences in the measure of importance of the Analyst ISTE•E Standard between educators in FACS programs and HS (p = .920), T/T/I (p = .630), and Ag/JROTC /Adm. (p = .621) programs. In addition, there were no statistically significant differences in importance of the Analyst ISTE•E Standard between educators in HS programs and T/T/I (p = .153) and Ag/JROTC/Adm. (p = .147) programs, as well as T/T/I and Ag/JROTC/Adm. (p = 1.000) programs.

CTE Program Summary (RQ3).

Table 8 contains a summary of the statistical analyses of importance of the ISTE•E Standards and CTE Program.

Table 8.

One-Way ANOVA (except where noted) of CTE Program (IV) and Importance of the ISTE•E Standards (DV)

ISTE•E Standards	CTE Prog. Group	Mean (SD)	*F*	*df*	*p*	ES[a]	Significant CTE Program
All ISTE•E Standards	Overall	4.27 (.52)	6.83[b]	4, 305	< .001	ω^2 = .070	
	1	4.49 (.39)					1 vs. 2**, 3***
	2	4.21 (.46)					
	3	4.12 (.56)					
	4	4.28 (.58)					
	5	4.26 (.51)					
Learner	Overall	4.16 (.67)	4.96	4, 304	.001	.061	
	1	4.41 (.63)					1 vs. 2**, 3**
	2	4.00 (.59)					
	3	4.02 (.68)					
	4	4.24 (.62)					
	5	4.15 (.74)					
Leader	Overall	4.13 (.98)	12.58[c]	4, 304	.014	.028	
	1	4.31 (.61)					1 vs. 3**
	2	4.02 (.82)					
	3	3.89 (.79)					
	4	4.35 (1.72)					
	5	4.18 (.61)					
Citizen	Overall	4.43 (.57)	6.03	4, 304	< .001	ω^2 = .061	
	1	4.66 (.43)					1 vs. 3***, 4*
	2	4.43 (.50)					
	3	4.30 (.58)					
	4	4.29 (.71)					
	5	4.47 (.55)					
Collaborator	Overall	4.13 (.67)	0.93	4, 304	.444	.012	
	1	4.24 (.56)					
	2	4.09 (.59)					
	3	4.05 (.83)					
	4	4.18 (.59)					
	5	4.10 (.63)					

Table 8 (continued).

ISTE•E Standards	CTE Prog. Group	Mean (SD)	*F*	*df*	*p*	ES[a]	Significant CTE program
Designer	Overall	4.28 (.69)	8.31[b]	4, 302	< .001	ω^2 =	
	1	4.60 (.50)				.087	1 vs. 2*, 3***, 5**
	2	4.30 (.61)					
	3	4.07 (.78)					
	4	4.29 (.71)					
	5	4.16 (.65)					
Facilitator	Overall	4.38 (.59)	4.22	4, 303	.002	.053	
	1	4.60 (.49)					1 vs. 3***
	2	4.33 (.55)					
	3	4.22 (.63)					
	4	4.42 (.62)					
	5	4.38 (.56)					
Analyst	Overall	4.24 (.63)	9.31	4, 304	< .001	ω^2 =	
	1	4.53 (.44)				.097	1 vs. 2**, 3***
	2	4.12 (.61)					
	3	4.02 (.69)					
	4	4.29 (.65)					
	5	4.29 (.59)					

Note. CTE Program Group #: 1—Business/Marketing, 2—Family and Consumer Sciences, 3—Health Sciences, 4—Technical/Trade/Industry, 5—AgriScience, JROTC, Administration. Likert-type scale: 5—Very Important to 1—Not Important.
[a] η^2 except where noted. [b] *Welch's F*. [c] Kruskal-Wallis *H*.
* $p < .05$, ** $p < .01$, *** $p < .001$.

Type of Teacher Certification Held or Completing (RQ3).

An ANOVA was performed to determine any statistically significant differences between importance of the ISTE•E Standards and type of educator certification held or completing. An alpha level of .05 was used for all analyses. In section two of the ITIS, participants rated importance of the ISTE•E Standards on a five point Likert-type scale ranging from one to five with 1—Not Important and 5—Very Important. The seven ISTE•E Standard categories are Learner, Leader, Citizen, Collaborator, Designer, Facilitator and

Analyst. In section three of the ITIS, participants were asked to indicate the type of teacher certification that they held or were in the process of completing. When more than one type of certification was listed, the higher certification related to teaching was used. The “Other” category includes Emergency, CTE Temporary, and Other certifications (Doctorates, RN and Associates [Health related], Certification with Teacher Ready program, Praxis in FACS, Service certification and JROTC certification). These were combined due to response rate.

Certification - Overall ISTE•E Standards (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(5, 297)} = .87$, $p = .499$) indicating that the assumption underlying the ANOVA was met. Analysis of Variance indicated that type of certification had a significant effect on importance of all ISTE•E Standards, $F_{(5, 297)} = 2.50$, $p = .031$, $\eta^2 = .040$. The effect size was moderate with the type of certification held or completing accounting for about 4% of the variance of importance of the overall ISTE•E Standard means. Means, standard deviations, and post hoc comparisons, using the Bonferroni correction, can be found in Table 9. Pairwise comparisons indicated that the measure of importance of all ISTE•E Standards was statistically significantly lower for educators with a BA/MA Equivalent Tech Ed. certification ($p = .022$) compared with educators with a Class A certification. There was not a statistically significant difference in the measure of importance of the overall ISTE•E Standards between Class B certification compared with Class A certification ($p = .300$), Class AA certification ($p = 1.000$), BA/MA Equivalent Tech Ed. certification ($p = 1.000$), PCCT certification ($p = 1.000$) and Other certification ($p = 1.000$). Also, there were no statistically significant differences in importance of all ISTE•E Standards between educators with a Class A certification and those with Class AA certification ($p = .957$), PCCT certification ($p = 1.000$), and Other certification ($p = 1.000$). In addition, there were no statistically significant differences ($p = 1.000$) in the measure of importance of all ISTE•E Standards between educators with Class AA certification, BA/MA Equivalent Tech Ed. certification, PCCT certification, and Other certification.

Certification - Learner ISTE•E Standard (RQ3).

Levene's test for equality of variance was found to be violated for the present analysis, $F_{(5, 296)} = 2.87$, $p = .015$. The one-way ANOVA showed that type of certification did not have a statistically significant effect on the measure of importance of the Learner ISTE•E Standard, *Welch's* $F_{(5, 74.13)} = 0.81$, $p = .546$, $\omega^2 = .003$. The effect size was insignificant. Means and standard deviations of certification types can be found in Table 9.

Certification - Leader ISTE•E Standard (RQ3).

Non-parametric analysis, Kruskal-Wallis *H* test, was conducted for the Leader ISTE•E Standard because Cronbach's alpha for these three questions was low ($\alpha = .315$). These results indicated that there was not a statistically significant difference in the measure of importance of the Leader ISTE•E Standard between the different types of educator certifications, $\chi^2(6, n = 302) = 8.00$, $p = .156$, $\eta^2 = .003$. The mean ranks were as follows: Class A ($n = 109$) = 169.35 (largest), Other ($n = 22$) = 146.66, BA/MA Equivalent Tech. Ed. ($n = 59$) = 143.84, Class AA ($n = 35$) = 143.30, Class B ($n = 63$) = 139.85, and Provisional PCCT ($n = 14$) = 125.32 (smallest). Means, standard deviations can be found in Table 9.

Certification - Citizen ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(5, 296)} = 1.71$, $p = .131$) indicating that the assumption underlying the ANOVA was met. Analysis of Variance indicated that type of certification had a significant effect on importance of the Citizen ISTE•E Standard, $F_{(5, 296)} = 3.55$, $p = .004$, $\eta^2 = .057$. The effect size was moderate with the type of certification accounting for about 6% of the variance of importance of the Citizen

ISTE•E Standard means. Means, standard deviations, and post hoc comparisons, using the Bonferroni correction, can be found in Table 9. Pairwise comparisons indicated that the measure of importance of the Citizen ISTE•E Standard was statistically significantly lower for educators with a BA/MA Equivalent Tech Ed. certification (p = .001) compared with educators with a Class A certification. While not statistically significantly different, the mean of the BA/MA Equivalent Tech Ed. Certification was lower than all other types of certifications. There was not a statistically significant difference in the measure of importance of the Citizen ISTE•E Standard between Class B certification compared with Class A certification (p = 1.000), Class AA certification (p = 1.000), BA/MA Equivalent Tech Ed. certification (p = .376), PCCT certification (p = 1.000) and Other certification (p = 1.000). Also, there were no statistically significant differences in importance of the Citizen ISTE•E Standard between educators with a Class A certificate and those with Class AA certification (p = 1.000), PCCT certification (p = 1.000), and Other certification (p = 1.000). In addition, there were no statistically significant differences between Class AA certification and BA/MA Technical Ed. certification (p = .474), PCCT certification (p = 1.000), and Other certification (p = 1.000). Similarly, there were no significant differences found between educators with a BA/MA Equivalent Tech. Ed. certification and a PCCT certification (p = .359) or Other certification (p = 1.000), as well as, PCCT certification and Other certification (p = 1.000).

Certification - Collaborator ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(5, 296)}$ = .67, p = .648, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed that type of certification did not have a statistically significant effect on the measure of importance of the Collaborator ISTE•E Standard, $F_{(5, 296)}$ = 1.62, p = .154, η^2 = .027. The effect size was small with the type of certification accounting for about 3% of the variance in importance of the Collaborator ISTE•E Standard means. Means and standard deviations of type of certification and importance of the Collaborator ISTE•E Standard can be found in Table 9.

Certification - Designer ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(5, 294)} = 1.06$, $p = .385$, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed that type of certification did not have a statistically significant effect on the measure of importance of the Designer ISTE•E Standard, $F_{(5, 294)} = 1.91$, $p = .093$, $\eta^2 = .031$. The effect size was small with the type of certification accounting for about 3% of the variance of importance of the Designer ISTE•E Standard means. Means and standard deviations of type of certification and importance of the Designer ISTE•E Standard can be found in Table 9.

Certification - Facilitator ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(5, 295)} = .30$, $p = .915$, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed that type of certification did not have a statistically significant effect on the measure of importance of the Facilitator ISTE•E Standard, $F_{(5, 295)} = 1.67$, $p = .141$, $\eta^2 = .028$. The effect size was small with the type of certification accounting for about 3% of the variance of importance of the Facilitator ISTE•E Standard means. Means and standard deviations of type of certification and importance of the Facilitator ISTE•E Standard can be found in Table 9.

Certification - Analyst ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(5, 296)} = 1.53$, $p = .179$, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed that type of certification did not have a statistically significant effect on the measure of importance of the Analyst ISTE•E Standard, $F_{(5, 296)} = 2.15$, $p = .060$, $\eta^2 = .035$. The effect size was small with the type of certification accounting for about 3.5% of the variance of importance of the Analyst ISTE•E Standard means. Means and standard deviations of type of certification and importance of the Analyst ISTE•E Standard can be found in Table 9.

Type of Certification Held or Completing Summary (RQ3).

Table 9 contains a summary of the statistical analyses of ISTE•E Standards and type of teacher certification held or completing.

Table 9.

One-Way ANOVA (except where noted) of Type of Certification (IV) and Importance of the ISTE•E Standards (DV)

ISTE•E Standards	Cert. Type Group	Mean (SD)	*F*	*df*	*p*	ES[a]	Significant Cert. Type
All ISTE•E Standards	Overall	4.27 (.52)	2.50	5, 297	.031	.040	
	1	4.20 (.49)					2 vs. 4*
	2	4.40 (.49)					
	3	4.21 (.48)					
	4	4.13 (.59)					
	5	4.24 (.64)					
	6	4.27 (.49)					
Learner	Overall	4.15 (.67)	0.81[b]	5, 296	.546	ω^2 = .003	
	1	4.12 (.61)					
	2	4.26 (.72)					
	3	4.09 (.54)					
	4	4.08 (.60)					
	5	4.14 (.55)					
	6	4.02 (.99)					
Leader	Overall	4.13 (.99)	8.00[c]	5, 297	.156	.007	
	1	3.99 (.77)					
	2	4.23 (.75)					
	3	4.06 (.62)					
	4	4.21 (1.67)					
	5	3.88 (.75)					
	6	4.08 (.72)					
Citizen	Overall	4.43 (.57)	3.55	5, 296	.004	.057	
	1	4.41 (.49)					2 vs. 4**
	2	4.56 (.56)					
	3	4.44 (.54)					
	4	4.18 (.64)					
	5	4.56 (.66)					
	6	4.43 (.50)					
Collaborator	Overall	4.13 (.67)	1.62	5, 296	.154	.027	
	1	4.00 (.65)					
	2	4.26 (.58)					
	3	4.08 (.93)					
	4	4.08 (.66)					
	5	3.97 (.79)					
	6	4.07 (.53)					

Table 9 (continued).

ISTE•E Standards	Cert. Type Group	Mean (SD)	*F*	*df*	*p*	ES[a]	Significant Cert. Types
Designer	Overall	4.28 (.69)	1.91	5, 294	.093	.031	
	1	4.23 (.66)					
	2	4.43 (.60)					
	3	4.13 (.76)					
	4	4.14 (.78)					
	5	4.24 (.82)					
	6	4.30 (.66)					
Facilitator	Overall	4.38 (.59)	1.67	5, 295	.141	.028	
	1	4.29 (.55)					
	2	4.49 (.59)					
	3	4.30 (.61)					
	4	4.27 (.61)					
	5	4.38 (.67)					
	6	4.44 (.60)					
Analyst	Overall	4.24 (.63)	2.15	5, 296	.060	.035	
	1	4.20 (.63)					
	2	4.37 (.59)					
	3	4.18 (.55)					
	4	4.06 (.69)					
	5	4.20 (.78)					
	6	4.33 (.57)					

Note. Certification Type Group #: 1—Class B, 2—Class A, 3—Class AA, 4—BA/MA Equivalent Tech Ed., 5—Prov. PCCT, 6—Other. Likert-type scale: 5—Very Important to 1—Not Important.
[a] η^2 except where noted. [b] *Welch's F.* [c] Kruskal-Wallis *H*.
* $p < .05$, ** $p < .01$.

Years Teaching Experience in CTE (RQ3).

An ANOVA was used to determine statistically significantly differences between importance of the ISTE•E Standards and years of teaching experience in CTE. An alpha level of .05 was used for all analyses. In section two of the ITIS, participants rated importance of the ISTE•E Standards on a five point Likert-type scale ranging from one to five with 1—Not Important and 5—Very Important. The seven ISTE•E Standard categories are Learner, Leader, Citizen, Collaborator, Designer, Facilitator and Analyst. Participants indicated in the third part of the ITIS their years of teaching experience in CTE by writing in the number of years that they had taught or were involved in CTE. The years of teaching experience ranged from 0 to 42 years, with a mean of 10.02 years (*SD* = 8.77). For analysis, years of teaching experience was combined into four categories: 0–5 years, 6–10 years, 11–20 years, and 21–42 years. Due to response rate, the categories of 21–30 years and 31–42 years were combined.

Teaching Experience - Overall ISTE•E Standards (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 287)} = 1.08$, $p = .359$, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed that years of experience did not have a statistically significant effect on the measure of importance of all ISTE•E Standards, $F_{(3, 287)} = 1.34$, $p = .261$, $\eta^2 = .014$. The effect size was insignificant. Means and standard deviations of years of experience and importance of all ISTE•E Standards can be found in Table 10.

Teaching Experience - Learner ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 286)} = 0.74$, $p = .532$, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed that years of experience did not have a statistically significant effect on the measure of importance of the Learner ISTE•E Standard, $F_{(3, 286)} = 0.88$, $p = .451$, $\eta^2 = .009$. The effect size was insignificant. Means and standard deviations of years of experience and importance of the Learner ISTE•E Standard can be found in Table 10.

Teaching Experience - Leader ISTE•E Standard (RQ3).

Non-parametric analysis, Kruskal-Wallis *H* test, was conducted for the Leader ISTE•E Standard because Cronbach's alpha for these three questions was low (α = .315). These results indicated that there was a statistically significant difference in the measure of importance of the Leader ISTE•E Standard between the different years of teaching experience categories, $\chi^2(3, n = 290) = 10.196$, $p = .017$. The effect size indicated that the proportion of variability of the ranked means of importance of the Leader ISTE•E Standard was small, $\eta^2 = .025$. The mean ranks were as follows: 11–20 years (*n* = 77) = 162.58 (largest), 21–42 years (*n* = 42) = 161.73, 6–10 years (*n* = 40) = 149.45, and 0–5 years (*n* = 131) = 129.05 (smallest). Means and standard deviations of years of experience and importance of the Learner ISTE•E Standard can be found in Table 10. Pairwise comparisons using Dunn's test indicated that educators with 0–5 years of experience had a statistically significant lower measure of importance than educators with 11–20 years of experience. No other pairs had statistically significant different measures including 0–5 years compared to 6–10 years (*p* = 1.000) and 21–42 years (*p* = .154); 6–10 years compared to 11–20 years (*p* = 1.000) and 21 – 42 years (*p* = 1.000); and 11–20 years and 21–42 years (*p* = 1.000).

Teaching Experience - Citizen ISTE•E standard (RQ3).

Levene's test for equality of variance was found to be violated for the present analysis, $F_{(3, 286)} = 3.89$, p = .010. The one-way ANOVA showed that years of experience did not have a statistically significant effect on the measure of importance of the Citizen ISTE•E Standard, *Welch's* $F_{(3, 112.65)} = 2.06$, $p = .110$, $\omega^2 = .011$. The effect size was insignificant. Means and standard deviations of years of experience and importance of the Citizen ISTE•E Standard can be found in Table 10.

Teaching Experience - Collaborator ISTE•E standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 286}$ = 1.91, p = .12, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed that years of experience did not have a statistically significant effect on the measure of importance of the Collaborator ISTE•E Standard, $F_{(3, 286}$ = 0.34, p = .800, η^2 = .004. Means and standard deviations of years of experience and importance of the Collaborator ISTE•E Standard can be found in Table 10.

Teaching Experience - Designer ISTE•E standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 285}$ = 0.62, p = .604, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed that years of experience did not have a statistically significant effect on importance of the Designer ISTE•E Standard, $F_{(3, 285)}$ = 0.77, p = .511, η^2 = .008. The effect size was insignificant. Means and standard deviations of years of experience and importance of the Designer ISTE•E Standard can be found in Table 10.

Teaching Experience - Facilitator ISTE•E standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 285)}$ = 1.07, p = .364) indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed that years of experience did not have a statistically significant effect on the measure of importance of the Facilitator ISTE•E Standard, $F_{(3, 285)}$ = 2.50, p = .060, η^2 = .026. The effect size was small with years of experience accounting for about 2.5% of the variance of importance of the Facilitator ISTE•E Standard means. Means and standard deviations of years of experience and the measure of importance of the Facilitator ISTE•E Standard can be found in Table 10.

Teaching Experience - Analyst ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 286)} = .01$, $p = .999$, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed that years of experience did not have a statistically significant effect on importance of the Analyst ISTE•E Standard, $F_{(3, 286)} = 0.95$, $p = .416$, $\eta^2 = .010$. The effect size was insignificant. Means and standard deviations of years of experience and importance of the Analyst ISTE•E Standard can be found in Table 10.

Years Teaching Experience Summary (RQ3).

Table 10 contains a summary of the statistical analyses of importance of the ISTE•E Standards and years of teaching experience.

Table 10.

One-Way ANOVA (except where noted) of Years of Teaching Experience (IV) and Importance of the ISTE•E Standards (DV)

ISTE•E Standards	Yrs Exp. Group	Mean (SD)	*F*	*df*	*p*	ES[a]	Significant Yrs. Exp. Groups
All ISTE•E Standards	Overall	4.27 (.52)	1.34	3, 287	.261	.014	
	1	4.25 (.55)					
	2	4.18 (.51)					
	3	4.36 (.50)					
	4	4.27 (.45)					
Learner	Overall	4.14 (.67)	0.88	3, 286	.451	.009	
	1	4.09 (.71)					
	2	4.11 (.60)					
	3	4.24 (.61)					
	4	4.15 (.70)					
Leader	Overall	4.12 (.99)	10.20[c]	3, 286	.017	.025	
	1	3.95 (.75)					1 vs. 3*
	2	4.39 (1.94)					
	3	4.23 (.70)					
	4	4.21 (.72)					
Citizen	Overall	4.44 (.55)	2.06[b]	3, 286	.110	ω^2 = .011	
	1	4.39 (.60)					
	2	4.34 (.54)					
	3	4.55 (.49)					
	4	3.48 (.45)					
Collaborator	Overall	4.14 (.66)	0.34	3, 286	.800	.004	
	1	4.14 (.75)					
	2	4.07 (.56)					
	3	4.19 (.63)					
	4	4.10 (.49)					
Designer	Overall	4.28 (.68)	0.77	3, 285	.511	.008	
	1	4.24 (.73)					
	2	4.23 (.66)					
	3	4.38 (.66)					
	4	4.28 (.63)					

Table 10 (continued).

ISTE•E Standards	Yrs Exp. Group	Mean (SD)	*F*	*df*	*p*	ES[a]	Significant Yrs. Exp. Groups
Facilitator	Overall	4.38 (.57)	2.50	3, 285	.060	.026	
	1	4.36 (.60)					
	2	4.24 (.55)					
	3	4.52 (.52)					
	4	4.33 (.56)					
Analyst	Overall	4.25 (.63)	0.95	3, 286	.416	.010	
	1	4.26 (.63)					
	2	4.13 (.63)					
	3	4.32 (.62)					
	4	4.18 (.64)					

Note. Years of Experience Group # — 1: 0–5, 2: 6–10, 3: 11–20, 4: 21-42. Likert-type scale: 5—Very Important to 1—Not Important.
[a] η^2 except where noted. [b] *Welch's F*. [c] Kruskal-Wallis *H*.
* $p < .05$, ** $p < .01$.

Age (RQ3).

A one-way ANOVA was used to determine statistical significance between importance of the ISTE•E Standards and age. An alpha level of .05 was used for all analyses. In section two of the ITIS, participants rated importance of the ISTE•E Standards on a five point Likert-type scale ranging from one to five with 1—Not Important and 5—Very Important. The seven ISTE•E Standard categories are Learner, Leader, Citizen, Collaborator, Designer, Facilitator and Analyst. Participants indicated in the third part of the ITIS the year they were born. For analysis, age was then calculated and placed into five categories: 21–30 years, 31–40 years, 41–50 years, 51–60 years, 61–70 years. The range of age was from 26 to 70 years with the mean age being 47.80 years (*SD* = 9.66).

Age - Overall ISTE•E Standards.

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 292)} = 0.38$, $p = .825$, indicating that the assumption underlying the ANOVA was met. The one-way

ANOVA showed that age did not have a statistically significant effect on the measure of importance of all ISTE•E Standards, $F_{(4, 292)} = 0.72$, $p = .582$, $\eta^2 = .010$. The effect size was insignificant. Means and standard deviations of age and importance of all ISTE•E Standards can be found in Table 11.

Age - Learner ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 291)} = 0.66$, $p = .617$, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed that age did not have a statistically significant effect on the measure of importance of the Learner ISTE•E Standard, $F_{(4, 291)} = 0.70$, $p = .593$, $\eta^2 = .010$. The effect size was insignificant. Means and standard deviations of age and importance of the Learner ISTE•E Standard can be found in Table 11.

Age - Leader ISTE•E Standard (RQ3).

Non-parametric analysis, Kruskal-Wallis *H* test, was conducted for the Leader ISTE•E Standard because Cronbach's alpha for these three questions was low ($\alpha = .315$). These results indicated that there was not a statistically significant difference in the measure of importance of the Leader ISTE•E Standard between age categories, $\chi^2(4, n = 296) = 4.77$, $p = .312$, $\eta^2 = .003$. The mean ranks were as follows: 21–30 years ($n = 12$) = 182.92 (largest), 61–70 years ($n = 35$) = 158.07, 51–60 years ($n = 83$) = 153.93, 31–40 years ($n = 60$) = 148.85, and 41–50 years ($n = 106$) = 137.00 (smallest). Means and standard deviations of age and importance of the Leader ISTE•E Standard can be found in Table 11.

Age - Citizen ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 291)} = 0.78$, $p = .542$, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed that age did not have a statistically significant effect on the measure of importance of the Citizen ISTE•E Standard, $F_{(4, 291)} = 0.44$, $p = .780$, $\eta^2 = .006$. The effect size was insignificant. Means and standard deviations of age and importance of the Citizen ISTE•E Standard can be found in Table 11.

Age - Collaborator ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 291)} = 0.40$, $p = .809$, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed that age did not have a statistically significant effect on the measure of importance of the Collaborator ISTE•E Standard, $F_{(4, 296)} = 0.30$, $p = .877$, $\eta^2 = .004$. The effect size was insignificant. Means and standard deviations of age and importance of the Collaborator ISTE•E Standard can be found in Table 11.Table 11.

Age - Designer ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 289)} = 1.05$, $p = .381$, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed that age did not have a statistically significant effect on the measure of importance of the Designer ISTE•E Standard, $F_{(4, 294)} = 2.03$, $p = .090$, $\eta^2 = .027$. The effect size was small with age accounting for about 3% of the variance of importance of the Designer ISTE•E Standard means. Means and standard deviations of age and importance of the Designer ISTE•E Standard can be found in Table 11.

Age - Facilitator ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 290)} = 0.42$, $p = .797$, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed that age did not have a statistically significant effect on the measure of importance of the Facilitator ISTE•E Standard, $F_{(4, 290)} = 0.36$, $p = .837$, $\eta^2 = .005$. The effect size was insignificant. Means and standard deviations of age and importance of the Facilitator ISTE•E Standard can be found in Table 11.Table 11

Age - Analyst ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 291)} = 0.65$, $p = .629$, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed that age did not have a statistically significant effect on the measure of importance of the Analyst ISTE•E Standard, $F_{(4, 291)} = 1.25$, $p = .292$, $\eta^2 = .017$. The effect size was insignificant. Means and standard deviations of age and importance of the Analyst ISTE•E Standard can be found in Table 11.Table 11

Age Summary (RQ3).

Table 11Table 11 contains a summary of the statistical analyses of importance of the ISTE•E Standards and age.

Table 11.

One-Way ANOVA (except where noted) of Age (IV) and Importance of the ISTE•E Standards (DV)

ISTE•E Standards	Age Group	Mean (SD)	*F*	*df*	*p*	ES[a]
All ISTE•E Standards	Overall	4.27 (.52)	0.72	4, 292	.582	.010
	1	4.43 (.59)				
	2	4.28 (.55)				
	3	4.22 (.50)				
	4	4.27 (.51)				
	5	4.33 (.51)				
Learner	Overall	4.15 (.66)	0.70	4, 291	.593	.010
	1	3.92 (.84)				
	2	4.14 (.67)				
	3	4.12 (.63)				
	4	4.18 (.67)				
	5	4.26 (.71)				
Leader	Overall	4.09 (.98)	4.77[b]	4, 292	.312	.003
	1	4.36 (.76)				
	2	4.10 (.70)				
	3	4.01 (.63)				
	4	4.10 (.80)				
	5	4.14 (.79)				
Citizen	Overall	4.43 (.58)	0.78	4, 291	.780	.006
	1	4.57 (.62)				
	2	4.46 (.61)				
	3	4.38 (.58)				
	4	4.43 (.59)				
	5	4.45 (.50)				
Collaborator	Overall	4.12 (.67)	0.30	4, 291	.877	.004
	1	4.27 (.62)				
	2	4.12 (.67)				
	3	4.10 (.74)				
	4	4.09 (.60)				
	5	4.19 (.67)				

Table 11 (continued).

ISTE•E Standards	Age Group	Mean (SD)	*F*	*df*	*p*	ES[a]
Designer	Overall	4.28 (.68)	2.03	4, 289	.090	.027
	1	4.63 (.60)				
	2	4.33 (.72)				
	3	4.16 (.68)				
	4	4.37 (.63)				
	5	4.24 (.74)				
Facilitator	Overall	4.38 (.58)	0.36	4, 290	.837	.005
	1	4.46 (.69)				
	2	4.36 (.60)				
	3	4.35 (.58)				
	4	4.39 (.60)				
	5	4.48 (.50)				
Analyst	Overall	4.24 (.62)	1.25	4, 291	.292	.017
	1	4.52 (.66)				
	2	4.27 (.65)				
	3	4.18 (.60)				
	4	4.20 (.63)				
	5	4.35 (.56)				

Note. Age Group #—1: 21–30 years, 2: 31–40 years, 3:41–50 years, 4: 51–60 years, 5: 61–70 years. Likert-type scale: 5—Very Important to 1—Not Important.
[a] η^2. [b] Kruskal-Wallis *H*.

Gender (RQ3).

Analysis of Variance was used to determine statistical significance between the importance of the ISTE•E Standards and gender. An alpha level of .05 was used for all analyses. In section two of the ITIS, participants rated importance of the ISTE•E Standards on a five point Likert-type scale ranging from one to five with 1—Not Important and 5—Very Important. The seven ISTE•E Standard categories are Learner, Leader, Citizen, Collaborator, Designer, Facilitator and Analyst. Participants indicated their gender in the third part of the ITIS. Females accounted for 76.8% of the sample and males for 23.2%.

Gender - Overall ISTE•E Standards (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(1, 312)} = 2.01$, $p = .158$, indicating that the assumption underlying the ANOVA was met. Analysis of Variance showed that gender had a statistically significant effect on the measure of importance of all ISTE•E Standards, $F_{(1, 312)} = 10.31$, $p = .001$, $\eta^2 = .032$, with females indicating a higher perceived importance than males (Table 12). The effect size was small with gender accounting for about 3% of the variance of importance of all ISTE•E Standard means.

Gender - Learner ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(1, 311)} < 0.01$, $p = .961$, indicating that the assumption underlying the ANOVA was met. Analysis of Variance showed that gender did not have a statistically significant effect on the measure of importance of Learner ISTE•E Standard, $F_{(1, 311)} = 2.29$, $p = .131$, $\eta^2 = .007$ (Table 12Table 12). The effect size was insignificant.

Gender - Leader ISTE•E Standard (RQ3).

Non-parametric analysis, Mann-Whitney *U* test, was conducted for the Leader ISTE·E Standard because Cronbach's alpha for these three questions was low ($\alpha = .315$). These results indicated that there was not a statistically significant difference in the measure of importance of the Leader ISTE•E Standard between gender, $U = 7670.50$, $p = .102$, $\eta^2 = .003$. The mean ranks were as follows: Female ($n = 240$) = 161.54 (largest), and Male ($n = 73$) = 142.08 (smallest). Table 12 contains the means and deviations for gender and importance of the Leader Standard.

Gender - Citizen ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(1, 311)} = 1.92$, $p = .167$) indicating that the assumption underlying the ANOVA was met. Analysis of Variance showed that gender had a statistically significant effect on the measure of importance of the Citizen ISTE•E Standard, $F_{(1, 311)} = 14.34$, $p < .001$, $\eta^2 = .044$, with females indicating a higher perceived importance of the Citizen ISTE•E Standard than males (Table 12Table 12). The effect size was small with gender accounting for about 4.5% of the variance of importance of the Citizen ISTE•E Standard means.

Gender - Collaborator ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(1, 310)} =0\ .30$, $p =$ .585) indicating that the assumption underlying the ANOVA was met. Analysis of Variance showed that gender had a statistically significant effect on the measure of importance of the Collaborator ISTE•E Standard, $F_{(1, 310)} = 6.75$, $p = .010$, $\eta^2 = .021$, with females indicating a higher perceived importance of the Collaborator ISTE•E Standard than males (Table 12Table 12). The effect size was small with the gender accounting for about 2% of the variance of importance of the Collaborator ISTE•E Standard means.

Gender - Designer ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(1, 308)} = 0.30$, $p =$ .584, indicating that the assumption underlying the ANOVA was met. Analysis of Variance showed that gender had a statistically significant effect on the measure of importance of the Designer ISTE•E Standard, $F_{(1, 308)} = 11.27$, $p = .001$, $\eta^2 = .035$, with females indicating a higher perceived importance of the Designer ISTE•E Standard than males (Table 12Table 12). The effect size was small with gender accounting for about 3.5% of the variance of importance of the Designer ISTE•E Standard means.

Gender - Facilitator ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(1, 309)} < 0.01$, $p =$ .977, indicating that the assumption underlying the ANOVA was met. Analysis of Variance showed that gender had a statistically significant effect on the measure of importance of the Facilitator ISTE•E Standard, $F_{(1, 309)} = 4.96$, $p = .027$, $\eta^2 = .016$, with females indicating a higher perceived importance of the Facilitator ISTE•E Standard than males (Table 12Table 12). The effect size was negligible.

Gender - Analyst ISTE•E Standard (RQ3).

The test for homogeneity of variance was not significant, *Levene's* $F_{(, 309)} = 1.16$, $p = .282$, indicating that the assumption underlying the ANOVA was met. Analysis of Variance showed that gender had a statistically significant effect on the measure of importance of the Analyst ISTE•E Standard, $F_{(1, 309)} = 6.25$, $p = .013$, $\eta^2 = .020$, with females indicating a higher perceived importance of the Analyst ISTE•E Standard than males (Table 12Table 12). The effect size was small with gender accounting for about 2% of the variance of importance of the Analyst ISTE•E Standard means.

Gender Summary (RQ3).

Table 12Table 12 contains a summary of the statistical analyses of importance of the ISTE•E Standards and gender.

Table 12.

One-Way ANOVA (except where noted) of Gender (IV) and Importance of the ISTE•E Standards (DV)

ISTE•E Standards	Gender	Mean (SD)	*F*	*df*	*p*	ES[a]
All ISTE•E Standards	Overall	4.27 (.52)	10.31	1, 312	.001	.032
	Female	4.32 (.50)				
	Male	4.10 (.57)				
Learner	Overall	4.16 (.67)	2.29	1, 311	.131	.007
	Female	4.19 (.66)				
	Male	4.06 (.84)				
Leader	Overall	4.14 (.98)	7670.5[b]	1, 311	.102	.008
	Female	4.50 (.55)				
	Male	4.21 (.79)				
Citizen	Overall	4.43 (.57)	14.34	1, 311	< .001	.044
	Female	4.50 (.55)				
	Male	4.21 (.58)				
Collaborator	Overall	4.123(.66)	6.75	1, 310	.010	.021
	Female	4.18 (.67)				
	Male	3.95 (.63)				
Designer	Overall	4.28 (.68)	11.27	1, 308	.001	.035
	Female	4.35 (.66)				
	Male	4.05 (.71)				
Facilitator	Overall	4.38 (.59)	4.96	1, 309	.027	.016
	Female	4.42 (.58)				
	Male	4.25 (.59)				
Analyst	Overall	4.24 (.63)	6.25	1, 309	.013	.020
	Female	4.29 (.61)				
	Male	4.08 (.67)				

Note. Likert-type scale: 5—Very Important to 1—Not Important.
[a] η^2. [b] Mann-Whitney *U*.

Research Question Four (RQ4).

Is there a significant relationship between secondary CTE educators' perceived frequency of the use of technology and educator characteristics (Innovativeness, CTE program, Certification Type, Teaching Experience, Age, and Gender)?

The fourth research question was analyzed using one-way ANOVA, with an alpha level of .05, to determine significant relationships between the frequency of use of the ISTE•E Standards and various educator characteristics including Innovativeness, CTE program, type of teacher certification, years of teaching experience, age, and gender. In section two of the ITIS, participants rated the frequency of use of the ISTE•E Standards on a five-point Likert-type scale ranging from one to five, with 5—Always, 4—Very Often, 3—Sometimes, 2—Rarely, and 1—Never. The seven ISTE•E Standards are Learner, Leader, Citizen, Collaborator, Designer, Facilitator, and Analyst. In section three of the ITIS, participants provided information related to teacher characteristics. Table 6 provided descriptive statistics for educator characteristics. Cronbach's alpha was found to be .940 with the Leader Standard included. The Cronbach's alpha for the Learner Standard was found to be .357, and was removed from the analysis. The final Cronbah's alpha was .948 and all alphas can be found in Table 13.

Table 13.

*Cronbach's Alpha for the Frequency of Use of the ISTE·T Standards**

Standard	α	*n*	# of Items
Overall	.948[a]	272	37
Learner	.357	292	3
Leader	.835	297	3
Citizen	.697	294	7
Collaborator	.893	287	8
Designer	.909	292	5
Facilitator	.872	290	4
Analyst	.892	286	7

[a] α = .940 when including the Learner Standard

Innovativeness (RQ4).

A one-way ANOVA was used to determine statistical significance between the frequency of use of the ISTE•E Standards, the dependent variable, and Innovativeness, the independent variable. An alpha level of .05 was used for all analyses. Section one of the ITIS contained the Innovativeness Scale. Participants were asked to rate 20 statements on a scale of 1–5 with 1—Strongly Disagree and 5—Strongly Agree (Survey Calculated Innovativeness). Using the Innovativeness Scale formula, participant scores were calculated and placed into one of four categories: Innovator, Early Adopter, Early Majority, and Late Adopter. The categories Late Majority and Traditionalist were combined into the Late Adopter category due to the low frequency of Traditionalist. In section two of the ITIS, participants rated the frequency of use of the ISTE•E Standards on a five point Likert-type scale ranging from one to five with 1—Never and 5—Always. The ISTE•E Standards seven categories are Learner, Leader, Citizen, Collaborator, Designer, Facilitator and Analyst.

Innovativeness - Overall ISTE•E Standards (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 299)} = 0.034$, $p = .991$) indicating that the assumption underlying the ANOVA was met. Using a one-way ANOVA, the effect of the level of Innovativeness on the measure of the frequency of use of the all ISTE•E Standards was significant, $F_{(3, 299)} = 11.05$, $p < .001$, $\eta^2 = .100$), with higher Innovativeness levels indicating an increase in the frequency of use of all ISTE•E Standards. The effect size was moderate with the level of Innovativeness accounting for about 10% of the variance of the frequency of use of the all ISTE•E Standard means. Means, standard deviations, and post hoc comparisons, using the Bonferroni correction, can be found in Table 14. Pairwise comparisons indicated that the measure of the frequency of use of all ISTE•E Standards was statistically significantly lower for the Early Majority ($p < .001$) and Late Adopters ($p < .001$) compared to Innovators. Also, the Early Majority ($p = .014$) and Late Adopters ($p = .001$) rated frequency of use significantly lower than Early Adopters. However, the measure of the frequency of use of all ISTE•E Standards by Late Adopters was not significantly different than the Early Majority ($p = .270$), and Early Adopters were not significantly different compared to Innovators ($p = .256$).

Innovativeness - Learner ISTE•E Standard (RQ4).

Non-parametric analysis, Kruskal-Wallis *H* test, was conducted for the Learner ISTE•E Standard because Cronbach's alpha for these three questions was low ($\alpha = .357$). These results indicated that there was a statistically significant difference in the measure of the frequency of use of the Learner ISTE•E Standard between the different Innovativeness levels, $\chi^2(3, n = 298) = 27.42$, $p < .001$. The effect size indicated that the proportion of variability of the ranked means of the frequency of use of the Leader ISTE•E Standard was $\eta^2 = .083$, indicating a moderate relationship between importance and level of

Innovativeness. The mean ranks were as follows: Innovator (*n* = 49) = 193.43 (largest), Early Adopter (*n* = 132) = 150.16, Early Majority (*n* = 96) = 140.95, Late Adopter (*n* = 21) = 81.93 (smallest). Means, standard deviations, and post hoc comparisons using Dunn's test can be found in Table 14. Pairwise comparisons indicated that Innovators had a statistically significantly higher rating of the measure of the frequency of use of the Learner Standard than Early Adopters ($p = .014$), the Early Majority ($p = .003$), and Late Adopters ($p < .001$). Also, Early Adopters and Late Adopters were significantly different ($p = .004$), as well as, the Early Majority and Late Adopters ($p = .023$). Early Adopters and the Early Majority ($p = .454$) did not have a statistically significant difference in importance.

Innovativeness - Leader ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 297)} = 1.15$, p = .330, indicating that the assumption underlying the ANOVA was met. The effect of the level of Innovativeness on the measure of the frequency of use of the Leader ISTE•E Standard was significant, $F_{(3, 297)} = 7.01$, $p < .001$, $\eta^2 = .066$, with higher Innovativeness levels indicating an increase in the frequency of use of the Leader ISTE•E Standard. The effect size was moderate with the level of Innovativeness accounting for about 6.5% of the variance in the frequency of use of the Leader ISTE•E Standard means. Means, standard deviations, and post hoc comparisons, using the Bonferroni correction, can be found inTable 14 Table 14. Pairwise comparisons indicated that the mean scores of the Leader ISTE•E Standard frequency of use was statistically significantly lower for the Early Majority ($p = .001$) and Late Adopters ($p = .005$) compared to Innovators. There were no statistically significant differences found between Innovators and Early Adopters ($p = .242$). Also, the measure of the frequency of use of the Leader ISTE•E Standard of the Early Majority and Late Adopters was not statistically significant different ($p = 1.000$). In addition, while not statistically significant, the means of Early Adopters were higher than the Early Majority (p = .054) and Late Adopters (p = .139).

Innovativeness - Citizen ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 293)} = 0.12$, p = .949) indicating that the assumption underlying the ANOVA was met. The effect of the level of Innovativeness on the measure of the frequency of use of the Citizen ISTE•E Standard by educators was significant, $F_{(3, 293)} = 7.40$, $p < .001$, $\eta^2 = .070$, with higher Innovativeness levels indicating an increase in the frequency of use of the Citizen ISTE•E Standard. The effect size was moderate with the level of Innovativeness accounting for about 7% of the variance of the frequency of use of the Citizen ISTE•E Standard means. Means, standard deviations, and post hoc comparisons, using the Bonferroni correction, can be found in Table 14. Pairwise comparisons indicated that the mean score of the Citizen ISTE•E Standard frequency of use was statistically significantly lower for Late Adopters (p = .001) compared to Innovators, as well as, compared to Early Adopters (p = .001). While was not statistically significant, the measure of the frequency of use of Citizen ISTE•E Standard by educators was higher for Innovators compared to Early Adopters (p = 1.000) and the Early Majority (p = .069), as well as, Early Adopters compared to the Early Majority (p = .063). In addition, there was not a significant statistical difference between the Early Majority and Late Adopters (p = .108).

Innovativeness - Collaborator ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 288)} = 0.68$, p = .563) indicating that the assumption underlying the ANOVA was met. The effect of the level of Innovativeness on the measure of the frequency of use of the Collaborator ISTE•E Standard was significant, $F_{(3, 288)} = 4.71$, $p = .003$, $\eta^2 = .047$, with higher Innovativeness levels indicating an increase in the frequency of use of the Citizen ISTE•E Standard. The effect size was moderate with the level of Innovativeness accounting for about 5% of the variance in the frequency of use of the Collaborator ISTE•E Standard means. Means, standard deviations, and post hoc comparisons, using the Bonferroni correction, can be found in Table 14. Pairwise comparisons indicated that the mean score of the Collaborator ISTE•E Standard frequency of use was statistically significantly lower for the Early Majority (p = .024) and Late Adopters (p = .014) compared to Innovators. There was not a statistically significant difference between Innovators and Early Adopters (p = .920). Also, the means of the Early Adopters compared the Early Majority (p = .286) and Late Adopters (p = .105) were not statistically significant different as well as the means of the Early Majority and Late Adopters (p = 1.000).

Innovativeness - Designer ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 289)} = 0.51$, p = .676) indicating that the assumption underlying the ANOVA was met. The effect of the level of Innovativeness on the measure of the frequency of use of the Designer ISTE•E Standard was significant, $F_{(3, 289)} = 11.98$, $p < .001$, $\eta^2 = .111$, with higher Innovativeness levels indicating an increase in the frequency of use of the Designer ISTE•E Standard. The effect size was moderate with the level of Innovativeness accounting for about 11% of the variance of the frequency of use of the Designer ISTE•E Standard means. Means, standard deviations, and post hoc comparisons, using the Bonferroni correction, can be found inTable 14 Table 14. Pairwise comparisons indicated that the mean score of the Designer ISTE•E Standard frequency of use was statistically significantly lower for the Early Majority (p < .001) and Late Adopters (p < .001) compared to the Innovators. Also, the mean of the Early Adopters was significantly higher than the Early Majority (p = .051) and Late Adopters (p <

.001). In addition, the measure of the frequency of use of the Designer ISTE•E Standard was statistically significantly lower for Late Adopters (p = .049) compared to the Early Majority. There was not a statistically significant difference between Innovators and Early Adopters (p = .141).

Innovativeness - Facilitator ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 288)}$ = 1.05, p = .372, indicating that the assumption underlying the ANOVA was met. The effect of the level of Innovativeness on the measure of the frequency of use of the Facilitator ISTE•E Standard was significant, $F_{(3, 288)}$ = 7.61, p < .001, η^2 = .073, with higher Innovativeness levels indicating an increase in the frequency of use of the Facilitator ISTE•E Standard. The effect size was moderate with the level of Innovativeness accounting for about 7.5% of the variance in the frequency of use of the Facilitator ISTE•E Standard means. Means, standard deviations, and post hoc comparisons, using the Bonferroni correction, can be found in Table 14.Table 14 Pairwise comparisons indicated that the mean score of the Facilitator ISTE•E Standard frequency of use was statistically significantly lower for the Early Majority (p = .006) and Late Adopters (p = .001) compared to Innovators. There was also a statistical significance noted between the measure of the frequency of use of the Facilitator ISTE•E Standard with Early Adopters having an increased use over Late Adopters (p = .004). There was not a statistically significant difference between Innovators and Early Adopters (p = .966), Early Adopters compared the Early Majority (p = .062), as well as, the means of the Early Majority and Late Adopters (p = .371).

Innovativeness - Analyst ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 286)}$ = 0.54, p = .656, indicating that the assumption underlying the ANOVA was met. The effect of the level of Innovativeness on the measure of the frequency of use of the Analyst ISTE•E Standard was significant, $F_{(3, 286)} = 8.37$, $p < .001$, $\eta^2 = .081$, with higher Innovativeness levels indicating an increase in the frequency of use of the Analyst ISTE•E Standard. The effect size was moderate with the level of Innovativeness accounting for about 8% of the variance in the frequency of use of the Analyst ISTE•E Standard means. Means, standard deviations, and post hoc comparisons, using the Bonferroni correction, can be found in Table 14. Pairwise comparison analyses indicated that the mean score of the Analyst ISTE•E Standard frequency of use was statistically significantly lower for Early Adopters (p = .031), the Early Majority (p < .001) and Late Adopters (p < .001) compared to Innovators. There was not a statistically significant difference between Early Adopters compared to the Early Majority (p = .236) and Late Adopters (p = .071). Also, the means of the Early Majority was not statistically significant different compared to the Late Adopters (p = 1.000).

Innovativeness Summary(RQ4)

Table 14Table 14 provides a summary of the statistical analyses of the frequency of use of the ISTE•E Standards and Innovativeness.

Table 14.

One-Way ANOVA (except where noted) of Innovativeness (IV) and Frequency of Use of the ISTE•E Standards (DV)

ISTE•E Standards	Innov. Group	Mean (SD)	*F*	*df*	*p*	ES[a]	Significant Groups
All ISTE•E Standards	Overall	3.92 (.63)	11.05	3, 299	< .001	.100	
	1	4.20 (.58)					1 vs. 3***, 4***
	2	4.00 (.59)					2 vs. 3*, 4**
	3	3.76 (.62)					
	4	3.47 (.56)					
Learner	Overall	3.86 (1.09)	27.42[b]	3, 295	< .001	.083	
	1	4.45 (2.01)					1 vs. 2*, 3**, 4***
	2	3.81 (.73)					2 vs. 4**
	3	3.74 (.80)					3 vs. 4*
	4	3.29 (.50)					
Leader	Overall	3.71 (.82)	3.01	3, 297	< .001	.066	
	1	4.05 (.74)					1 vs. 3**, 4**
	2	3.78 (.77)					
	3	3.50 (.88)					
	4	3.36 (.67)					
Citizen	Overall	4.14 (.83)	7.40	3, 293	< .001	.070	
	1	4.35 (.75)					1 vs. 4**
	2	4.27 (.90)					2 vs. 4**
	3	3.99 (.70)					
	4	3.53 (.68)					
Collaborator	Overall	3.73 (.72)	4.71	3, 288	.003	.047	
	1	3.96 (.67)					1 vs. 3*, 4*
	2	3.79 (.68)					
	3	3.60 (.74)					
	4	3.39 (.77)					
Designer	Overall	3.95 (.78)	11.98	3, 289	< .001	.111	
	1	4.32 (.67)					1 vs. 3***, 4***
	2	4.04 (.71)					2 vs. 3*, 4***
	3	3.77 (.80)					3 vs. 4*
	4	3.30 (.82)					

Table 14 (continued).

ISTE•E Standards	Innov. Group	Mean (SD)	*F*	*df*	*p*	ES[a]	Significant Groups
Facilitator	Overall	4.01 (.73)	7.61	3, 288	< .001	.073	
	1	4.27 (.84)					1 vs. 3**, 4**
	2	4.10 (.66)					2 vs. 4**
	3	3.86 (.71)					
	4	3.54 (.60)					
Analyst	Overall	3.92 (.71)	8.37	3, 286	< .001	.081	
	1	4.28 (.63)					1 vs. 2*, 3***, 4***
	2	3.95 (.72)					
	3	3.76 (.68)					
	4	3.54 (.59)					

Note. Group #: 1—Innovator, 2—Early Adopter, 3—Early Majority, 4—Late Adopter. Adopter. Likert-type scale: 5—Always to 1—Never.
[a] η^2. [b] Kruskal-Wallis *H*.
* p < .05, ** p < .01, *** p < .001.

CTE Program (RQ4).

A one-way ANOVA was used to determine statistical significance between the frequency of use of the ISTE•E Standards and CTE program. An alpha level of .05 was used for all analyses. In section two of the ITIS, participants rated the frequency of use of the ISTE•E Standards on a five point Likert-type scale ranging from one to five with 1—Never and 5—Always. The seven ISTE•E Standard categories are Learner, Leader, Citizen, Collaborator, Designer, Facilitator and Analyst. In section three of the ITIS, participants were asked to indicate the CTE program in which they taught. Because of low participation, Agriculture educators (n = 13) were combined with JRTOC/Administration, which included counselors and directors. This provided a more balanced count for ANOVA analysis. Abbreviations for CTE programs are as follows:

Business/Marketing—B/M

Family & Consumer Science—FACS

Health Science—HS

Tech/Trade/Industry—T/T/I

Agriculture, JROTC, and Administrators—Ag/JROTC/Adm.

CTE Program - Overall ISTE•E Standards (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 294)} = 1.56$, $p = .186$, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed that CTE program had a statistically significant effect on the measure of the frequency of use of all ISTE•E Standards, $F_{(4, 294)} = 4.58$, $p < .001$ $\eta^2 = .059$. The effect size was moderate with CTE program accounting for about 6% of the variance in the frequency of use of the overall ISTE•E Standard means. Means, standard deviations, and post hoc comparisons, using the Bonferroni correction, can be found in Table 15. Pairwise comparisons indicated that the measure of the frequency of use of all ISTE•E Standards was statistically significantly lower for FACS ($p = .015$), HS ($p = .007$), and Ag/JROTC/Adm. ($p = .007$) educators compared to B/M educators. There was not a statistically significant difference of the frequency of use of all ISTE•E Standards between B/M and T/T/I ($p = .632$ educators. Also, there were no statistically significant differences found between educators in FACS programs compared to educators in HS ($p = 1.000$), T/T/I ($p = 1.000$), and Ag/JROTC /Adm. ($p = 1.000$) programs. In addition, statistical significance was not found between HS educators and educators in T/T/I ($p = 1.000$) and AG/JROTC/Adm. ($p = 1.000$) programs, as well as, T/T/I and AG/JROTC/Adm. programs ($p = .959$).

CTE Program - Learner ISTE•E Standards (RQ4).

Non-parametric analysis, Kruskal-Wallis *H* test, was conducted for the Learner ISTE•E Standard because Cronbach's alpha for these three questions was low ($\alpha = .357$). Results indicated that there was a statistically significant difference in the measure of the frequency of use of the Learner ISTE•E Standard between the different CTE programs, χ^2(4,

n = 294) = 21.91, $p < .001$. The effect size indicated that the proportion of variability of the ranked means of the frequency of use of the Learner ISTE•E Standard was $\eta^2 = .062$, indicating a moderate relationship between frequency of use and CTE program. The mean ranks were as follows: B/M (n = 70) = 185.16 (largest), T/T/I (n = 50) = 153.62, Ag/JROTC/Adm (n = 42) = 137.58, Health Sciences (n = 84) = 129.35, and FACS (n = 48) = 126.66 (smallest). Means, standard deviations, and post hoc comparisons using Dunn's test can be found in Table 15.Table 15. Pairwise comparisons indicated that the B/M educators had a statistically significant higher measure of the frequency of use of the Learner Standard than FACS educators (p = .002), HS educators (p < .001), and Ag/JROTC/Adm (p = .036). No statistically significant differences were found between: B/M educators and T/T/I educators (p = .421); FACS educators and HS educators (p = 1.000), T/T/I educators (p = 1.000) or Ag/JRTOC/Adm educators (p = 1.000); HS educators and T/T/I educators (p = 1.000) or Ag/JRTOC/Adm educators (p = 1.000); and T/T/I educators and Ag/JRTOC/Adm educators (p = 1.000).

CTE Program - Leader ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 292)} = 1.75$, p = .140, indicating that the assumption underlying the ANOVA was met. The effect of CTE program on the measure of the frequency of use of the Leader ISTE•E Standard was significant, $F_{(4, 2920} = 3.72$, $p = .006$, $\eta^2 = .049$. The effect size was moderate with CTE program accounting for about 5% of the variance in the frequency of use of the Leader ISTE•E Standard means. Means, standard deviations, and post hoc comparisons, using the Bonferroni correction, can be found in Table 15Table 15. Pairwise comparisons indicated that the measure of the Leader ISTE•E Standard frequency of use was statistically significantly lower for FACS educators (p = .050) and HS educators (p = .008) compared to

B/M educators, but not T/T/I (*p* = 1.000), or Ag/JROTC/Adm. educators (*p* = .158). There were no statistically significant differences of the measure of the frequency of use of the Leader ISTE•E Standard between educators in FACS programs compared to HS educators (*p* = 1.000), T/T/I educators (*p* = 1.000) and Ag/JROTC/Adm. educators (*p* = 1.000). Also, there were no statistically significant differences of the measure of the frequency of the use of the Leader ISTE•E Standards between educators in HS compared to T/T/I (*p* = .668), and Ag/JROTC/Adm. (*p* = 1.000) programs as well as T/T/I educators and Ag/JROTC/Adm. educators (*p* = 1.000).

CTE Program - Citizen ISTE•E Standard (RQ4).

Levene's test for equality of variance was found to be violated for the present analysis, $F_{(4, 288)} = 3.00$, p = .019. The effect of CTE program on the measure of the frequency of use of the Citizen ISTE•E Standard was significant, *Welch's* $F_{(, 124.24)} = 4.73$, $p = .001$. The estimated omega squared ($\omega^2 = .049$) indicated that approximately 5% of the total variation of the frequency of use of the Citizen ISTE•E Standard measure was attributable to CTE program. Means, standard deviations, and post hoc comparisons, using the Games-Howell post hoc procedure, can be found inTable 15 Table 15. These results indicated that the measure of the frequency of use of the Citizen ISTE•E Standard was statistically significantly higher for B/M educators compared to educators in HS (*p* = .021), T/T/I (*p* = .032), and Ag/JRTOC/Adm. (*p* = .008), however not significantly different compared to educators in FACS programs (*p* = .704). There were no statistically significant differences of the frequency of use of the Citizen ISTE•E Standard between FACS educators and educators in HS (*p* = 1.000), T/T/I (*p* = .982), and Ag/JROTC/Adm. (*p* = .946) programs. In addition, no statistically significant differences were found between HS educators and educators in T/T/I (p = .967) and Ag/JROTC/Adm. (p = .857) programs as well as T/T/I and Ag/JROTC/Adm. (p = .999) programs.

CTE Program - Collaborator ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 284)} = 1.98$, $p = .098$, indicating that the assumption underlying the ANOVA was met. The effect of CTE program on the measure of the frequency of use of the Collaborator ISTE•E Standard was not statistically significant, $F_{(4, 284)} = 1.76$, $p = .137$, $\eta^2 = .024$. However, CTE program did have a moderate effect of about 2.5% on the variance of the means of the frequency of use of the Collaborator ISTE•E Standard. Table 15 Table 15 provides means and standard deviations for CTE program and the frequency of use of the Collaborator ISTE•E Standard.

CTE Program - Designer ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 285)} = 1.23$, $p = .300$, indicating that the assumption underlying the ANOVA was met. The effect of CTE program on the measure of the frequency of use of the Designer ISTE•E Standard was significant, $F_{(4, 285)} = 5.74$, $p < .001$, $\eta^2 = .075$. The effect size was moderate with the CTE program accounting for about 7.5% of the variance of the frequency of use of the Designer ISTE•E Standard means. Means, standard deviations, and post hoc comparisons, using the Bonferroni correction, can be found inTable 15 Table 15. Pairwise comparisons indicated that the Designer ISTE•E Standard frequency of use was statistically significantly lower for FACS (p = .043), HS (p = .002), and Ag/JRTOC/Adm. (p < .001) educators compared to the B/M educators, but not for T/T/I educators (p = .103). There were no statistically significant differences found between FACS educators and educators in HS (p = 1.000), T/T/I (p = 1.000), and Ag/JROTC/Adm. (p = 1.000). Also, no statistical significance was found between HS educators and T/T/I educators (p = 1.000) or Ag/JROTC/Adm. educators (p = 1.000) as well as T/T/I educators and Ag/JROTC/Adm. educators (p = 1.000).

CTE Program - Facilitator ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 284)} = 0.63$, $p = .642$, indicating that the assumption underlying the ANOVA was met. The effect of CTE program on the measure of the frequency of use of the Facilitator ISTE•E Standard was not statistically significant, $F_{(4, 284)} = 1.13$, $p = .345$, $\eta^2 = .016$. Table 15 Table 15 provides means and standard deviations for CTE program and frequency of use of the Facilitator ISTE•E Standards.

CTE Program - Analyst ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 284)} = 1.06$, $p = .377$, indicating that the assumption underlying the ANOVA was met. The effect of CTE program on the measure of the frequency of use of the Analyst ISTE•E Standard was significant, $F_{(4, 249)} = 6.60$, $p < .001$, $\eta^2 = .085$. The effect size was moderate with the CTE program accounting for about 8.5% of the variance of the Analyst ISTE•E Standard means. Means, standard deviations, and post hoc comparisons, using the Bonferroni correction, can be found inTable 15 Table 15. Pairwise comparisons indicated that the Analyst ISTE•E Standard frequency of use was statistically significantly lower for FACS ($p < .001$), HS ($p < .001$), and Ag/JRTOC/Adm. ($p = .008$) educators compared to the B/M educators, but not for T/T/I educators ($p = .482$). There were no statistically significant differences of the frequency of use of the Analyst ISTE•E Standard between educators in FACS and those in HS (p = 1.000), T/T/I ($p = .320$), and Ag/JROTC/Adm. (p = 1.000) programs. Also, no statistically significant differences were found between the means of HS educators and T/T/I educators (p

= .873) and Ag/JROTC/Adm. educators (*p* = 1.000), as well as, between T/T/I educators and Ag/JROTC/Adm. educators (*p* = 1.000).

CTE Program Summary (RQ4)

Table 15Table 15 provides a summary of the statistical analyses of the frequency of use of the ISTE•E Standards and CTE program.

Table 15.

One-Way ANOVA (except where noted) of CTE Program (IV) and Frequency of Use of the ISTE•E Standards (DV)

ISTE•E Standards	CTE Prog Group	Mean (SD)	*F*	*df*	*p*	ES[a]	Significant CTE Program
All ISTE•E Standards	Overall	3.91 (.63)	4.58	4, 294	.001	.059	
	1	4.17 (.50)					1 vs. 2*, 3**, 5**
	2	3.80 (.62)					
	3	3.83 (.65)					
	4	3.95 (.63)					
	5	3.76 (.63)					
Learner	Overall	3.85 (1.10)	21.91[c]	4, 290	< .001	.062	
	1	4.29 (1.74)					1 vs. 2**, 3***, 5*
	2	3.65 (.63)					
	3	3.63 (.79)					
	4	3.92 (.68)					
	5	3.70 (.85)					
Leader	Overall	3.70 (.82)	3.72	4, 292	.006	.049	
	1	3.98 (.69)					1 vs. 2*, 3**
	2	3.56 (.84)					
	3	3.54 (.89)					
	4	3.81 (.79)					
	5	3.61 (.77)					
Citizen	Overall	4.14 (.83)	4.73[b]	4, 288	.001	ω^2 =	
	1	4.40 (.52)				.049	1 vs. 3*, 4*, 5**
	2	4.13 (1.37)					
	3	4.10(.68)					
	4	4.00 (.79)					
	5	3.97 (.70)					
Collaborator	Overall	3.73 (.72)	01.76	4, 284	.137	.024	
	1	3.88 (.64)					
	2	3.62 (.75)					

	3	3.72 (.79)
	4	3.77 (.64)
	5	3.55 (.73)

Table 15 (continued).

ISTE•E Standards	CTE Prog Group	Mean (SD)	*F*	*df*	*p*	ES[a]	Significant CTE Program
Designer	Overall	3.95 (.79)	5.74	4, 285	< .001	.075	
	1	4.30 (.61)					1 vs. 2*, 3**, 5***
	2	3.89 (.70)					
	3	3.83 (.82)					
	4	3.93 (.86)					
	5	3.67 (.82)					
Facilitator	Overall	4.01 (.73)	1.13	4, 284	.345	.016	
	1	4.11 (.72)					
	2	3.88 (.67)					
	3	3.96 (.74)					
	4	4.12 (.82)					
	5	3.96 (.70)					
Analyst	Overall	3.92 (.71)	6.60	4, 284	< .001	.085	
	1	4.25 (.61)					1 vs. 2***, 3***, 5**
	2	3.69 (.64)					
	3	3.78 (.73)					
	4	4.00 (.68)					
	5	3.80 (.77)					

Note. CTE Program Group #: 1—Business/Marketing, 2—Family and Consumer Sciences, 3—Health Sciences, 4—Technical/Trade/Industry, 5—AgriScience, JROTC, Administration. Likert-type scale: 5—Always to 1—Never.
[a] η^2 except where noted. [b] *Welch's F.* [c] Kruskal-Wallis *H.*
* $p < .05$, ** $p < .01$, *** $p < .001$.

Type of Teacher Certification Held or Completing (RQ4).

An ANOVA was performed to determine any statistically significant differences between the frequency of use of the ISTE•E Standards and type of educator certification held or completing. An alpha level of .05 was used for all analyses. In section two of the ITIS, participants rated the frequency of use of the ISTE•E Standards on a five point Likert-type scale ranging from one to five with 1—Never and 5—Always. The seven ISTE•E Standard categories are Learner, Leader, Citizen, Collaborator, Designer, Facilitator and Analyst. In section three of the ITIS, participants were asked to indicate the type of teacher certification that they held or were in the process of completing. When more than one type of certification was listed, the higher certification related to teaching was used. The “Other” category includes Emergency, CTE Temporary, and Other certifications (Doctorates, RN and Associates [Health related], Certification with Teacher Ready program, Praxis in FACS, Service certification and JROTC certification). These were combined due to response rate.

Certification - Overall ISTE•E Standards (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(5, 286} = 0.54$, p = .746, indicating that the assumption underlying the ANOVA was met. Analysis of Variance indicated that the measure of the frequency of use of all ISTE•E Standards and type of educator certification was not significant, $F_{5, 286} = 0.75$, $p = .586$, $\eta^2 = .013$. Effect size was negligible. Table 16 contains means and standard deviations.

Certification - Learner ISTE•E Standard (RQ4).

Non-parametric analysis, Kruskal-Wallis *H* test, was conducted for the Learner ISTE•E Standard because Cronbach's alpha for these three questions was low ($\alpha = .357$). These results indicated that there was not a statistically significant difference in the measure of the frequency of use of the Learner ISTE•E Standard between the different types of educator certifications, $\chi^2(6, n = 287) = 4.91$, $p = .427$, $\eta^2 = .007$. The mean ranks were as follows: Class A (*n* = 103) = 157.50 (largest), Class AA (*n* = 34) = 143.19, Provisional PCCT (*n* = 14) = 141.00, Other (*n* = 22) = 140.20, Class B (*n* = 59) = 134.39, and BA/MA Equivalent Tech. Ed. (*n* = 55) = 131.81 (smallest). Table 16Table 16 contains means and standard deviations.

Certification - Leader ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(5, 284)} = 0.30$, $p = .914$, indicating that the assumption underlying the ANOVA was met. Analysis of Variance indicated that the measure of the frequency of use of the Leader ISTE•E Standard and type of educator certification was not significant, $F_{(5, 284)} = 1.75$, $p = .124$, $\eta^2 = .030$. The effect size was small with the type of certification accounting for about 3% of the variance of the frequency of use of the Leader ISTE•E Standard means. Table 16Table 16 contains means and standard deviations.

Certification - Citizen ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(5, 280)} = 1.57$, $p = .170$, indicating that the assumption underlying the ANOVA was met. Analysis of Variance indicated that the measure of the frequency of use of the Citizen ISTE•E Standard and type of educator certification was not significant, $F_{(5, 280)} = 0.77$, $p = .573$, $\eta^2 = .014$. Effect size was negligible. Table 16 contains means and standard deviations.

Certification - Collaborator ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(5, 276)} = 1.37$, $p = .237$, indicating that the assumption underlying the ANOVA was met. Analysis of Variance indicated that the measure of the frequency of use of the Collaborator ISTE•E Standard and type of educator certification was not significant, $F_{(5, 276)} = 0.77$, $p = .596$, $\eta^2 = .014$. Effect size was negligible. Table 16 contains means and standard deviations.

Certification - Designer ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(5, 277)} = 1.92$, $p = .092$, indicating that the assumption underlying the ANOVA was met. Analysis of Variance indicated that the measure of the frequency of use of the Designer ISTE•E Standard and type of educator certification was not significant, $F_{(5, 277)} = 0.44$, $p = .821$, $\eta^2 = .008$. Effect size was negligible. Table 16 Table 16 contains means and standard deviations.

Certification - Facilitator ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(5, 276)} =0 .18$, $p = .971$, indicating that the assumption underlying the ANOVA was met. Analysis of Variance indicated that the measure of the frequency of use of the Facilitator ISTE•E Standard and type of educator certification was not significant, $F_{(5, 276)} = 0.81$, $p = .544$, $\eta^2 = .014$. Table 16Table 16 contains means and standard deviations.

Certification - Analyst ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(5, 276)} = 0.73$, $p = .598$, indicating that the assumption underlying the ANOVA was met. Analysis of Variance indicated that the measure of the frequency of use of the Analyst ISTE•E Standard and type of educator certification was not significant, $F_{(5, 276)} = 1.10$, $p = .363$, $\eta^2 = .019$. Effect size was negligible. Table 16 Table 16contains means and standard deviations.

Type of Certification Held or Completing Summary (RQ4).

Table 16 Table 16 provides a summary of the statistical analyses of the frequency of use of the ISTE•E Standards and teacher certification held or completing.

Table 16.

One-Way ANOVA (except where noted) of Type of Certification (IV) and Frequency of Use of the ISTE•E Standards (DV)

ISTE•E Standards	Cert. Type Group	Mean (SD)	*F*	*df*	*p*	ES[a]
All ISTE•E Standards	Overall	3.91 (.63)	0.75	5, 286	.586	.013
	1	3.86 (.59)				
	2	3.98 (.65)				
	3	3.79 (.67)				
	4	3.85 (.65)				
	5	3.97 (.67)				
	6	3.96 (.53)				
Learner	Overall	3.84 (1.10)	4.91[b]	5, 282	.427	.007
	1	3.75 (.70)				
	2	4.03 (1.56)				
	3	3.80 (.59)				
	4	3.72 (.64)				
	5	3.81 (.76)				
	6	3.64 (1.06)				
Leader	Overall	3.70 (.82)	1.75	5, 284	.124	.030
	1	3.62 (.84)				
	2	3.86 (.81)				
	3	3.50 (.85)				
	4	3.58 (.82)				
	5	3.60 (.68)				
	6	3.82 (.77)				
Citizen	Overall	4.14 (.84)	0.77	5, 280	.573	.014
	1	4.14 (.67)				
	2	4.21 (1.09)				
	3	4.09 (.61)				
	4	3.98 (.68)				
	5	4.37 (.76)				
	6	4.12 (.49)				
Collaborator	Overall	3.72(.72)	0.77	5, 276	.569	.014
	1	3.60 (.73)				
	2	3.78 (.73)				
	3	3.62 (.79)				
	4	3.82 (.67)				
	5	3.71 (.90)				
	6	3.70 (.53)				

Table 16 (continued).

ISTE•E Standards	Cert. Type Group	Mean (SD)	*F*	*df*	*p*	ES[a]
Designer	Overall	3.94 (.79)	0.44	5, 277	.821	.008
	1	3.92 (.80)				
	2	4.02 (.70)				
	3	3.81 1.02)				
	4	3.90 (.79)				
	5	3.90 (.65)				
	6	3.91 (.93)				
Facilitator	Overall	4.00 (.74)	0.81	5, 276	.544	.014
	1	3.91 (.70)				
	2	4.02 (.76)				
	3	3.91 (.74)				
	4	4.01 (.72)				
	5	3.96 (.80)				
	6	4.26 (.72)				
Analyst	Overall	3.91 (.71)	1.10	5, 276	.363	.019
	1	3.89 (.67)				
	2	3.99 (.69)				
	3	3.73 (.79)				
	4	3.82 (.75)				
	5	4.09 (.71)				
	6	3.94 (.68)				

Note. Certification Type Group #: 1—Class B, 2—Class A, 3—Class AA, 4—BA/MA Equivalent Tech Ed., 5—Prov. PCCT, 6—Other. Likert-type scale: 5—Very Important to 1—Not Important.
[a] η^2. [b] Kruskal-Wallis *H*.

Years of Teaching Experience in CTE (RQ4).

A one-way ANOVA was used to determine any statistically significant differences between the ISTE•E Standards and years of teaching experience in CTE. An alpha level of .05 was used for all analyses. In section two of the ITIS, participants were asked to rate the frequency of use of the ISTE•E Standards on a five-point Likert-type Scale ranging from one to five, with 1—Never and 5—Always. The seven ISTE•E Standards are Learner, Leader, Citizen, Collaborator, Designer, Facilitator, and Analyst. Participants indicated their years of teaching experience in the third section of the ITIS, which was placed into categories by the researcher. These categories were 0–5 years, 6–10 years, 11–20 years, 21–30 years, and 31–42 years. The 21–30 years and 31–42 years categories were combined due to a frequency of six in the 31–42 category. The years of teaching experience ranged from 0 to 42 years, with a mean of 10.02 years (*SD* = 8.77).

Teaching Experience - Overall ISTE•E Standards (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 276)}$ =0 .39, *p* = .758, indicating that the assumption underlying the ANOVA was met. The effect of years of teaching experience in CTE on the measure of the frequency of use of all ISTE•E Standards was not statistically significant, $F_{(3, 276)} = 0.76$, $p = .518$, $\eta^2 = .008$. Effect size was negligible. Table 17 contains means and standard deviations for years of experience and overall ISTE•E Standards.

Teaching Experience - Learner ISTE•E Standard (RQ4).

Non-parametric analysis, Kruskal-Wallis *H* test, was conducted for the Learner ISTE•E Standard because Cronbach's alpha for these three questions was low ($\alpha = .357$). These results indicated that there was not a statistically significant difference in the measure of the frequency of use of the Learner ISTE•E Standard between the different years of teaching experience categories, $\chi^2(3, n = 276) = 4.595$, $p = .204$, $\eta^2 = .006$. The mean ranks were as follows: 11–20 years (*n* = 71) = 154.17 (largest), 6–10 years (*n* = 40) = 140.84, 21–42 years (*n* = 40) = 137.34, and 0–5 years (*n* = 125) = 129.22 (smallest). Means and standard deviations can be found in Table 17Table 17.

Teaching Experience - Leader ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 275)} = 1.31$, $p = .273$, indicating that the assumption underlying the ANOVA was met. The effect of years of teaching experience in CTE on the measure of the frequency of use of the Leader ISTE•E Standard was not statistically significant, $F_{(3, 275)} = 2.44$, $p = .064$, $\eta^2 = .026$. The effect size was small with about 2.5% of the variance of the frequency of use of the Leader ISTE•E Standard attributable to years of experience. Table 17 contains means and standard deviations for years of experience and the Leader ISTE•E Standard.

Teaching Experience - Citizen ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 272)} = 0.67$, $p = .574$, indicating that the assumption underlying the ANOVA was met. The effect of years of teaching experience in CTE on the measure of the frequency of use of the Citizen ISTE•E Standard was not significant, $F_{(3, 272)} = 1.82$, $p = .143$, $\eta^2 = .020$. The effect size was small with about 2% of the variance of the frequency of use of the Citizen ISTE•E Standard attributable to years of experience. Table 17Table 17 contains means and standard deviations for years of experience and the Citizen ISTE•E Standard.

Teaching Experience - Collaborator ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 268)} = 0.08$, $p = .971$) indicating that the assumption underlying the ANOVA was met. The effect of years of teaching experience in CTE on the measure of the frequency of use of the Collaborator ISTE•E Standard was not statistically significant, $F_{(3, 268)} = 0.15$, $p = .931$, $\eta^2 = .00$). Effect size was negligible. Table 17Table 17 contains means and standard deviations for years of experience and the Collaborator ISTE•E Standard.

Teaching Experience - Designer ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 269)} = 1.23$, $p = .298$, indicating that the assumption underlying the ANOVA was met. The effect of years of teaching experience in CTE on the measure of the frequency of use of the Designer ISTE•E Standard was not statistically significant, $F_{(3, 269)} = 1.71$, $p = .165$, $\eta^2 = .019$. Effect size was negligible. Table 17Table 17 contains means and standard deviations for years of experience and the Designer ISTE•E Standard.

Teaching Experience - Facilitator ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 268)} = 1.96$, $p = .120$, indicating that the assumption underlying the ANOVA was met. The effect of years of teaching experience in CTE on the measure of the frequency of use of the Facilitator ISTE•E Standard was not statistically significant, $F_{(3, 268)} = 0.72$, $p = .541$, $\eta^2 = .008$. Effect size was negligible. Table 17Table 17 contains means and standard deviations for years of experience and the Facilitator ISTE•E Standard.

Teaching Experience - Analyst ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(3, 268)} = 1.28$, $p = .280$, indicating that the assumption underlying the ANOVA was met. The effect of years of teaching experience in CTE on the measure of the frequency of use of the Analyst ISTE•E Standard was not statistically significant, $F_{(3, 268)} = 0.30$, $p = .828$, $\eta^2 = .003$. Effect size was negligible. Table 17Table 17 contains means and standard deviations for years of experience and the Analyst ISTE•E Standard.

Years of Teaching Experience Summary (RQ4).

Table 17Table 17 provides a summary of the statistical analyses frequency of use of the ISTE•E Standards and years of experience in CTE.

Table 17.

One-Way ANOVA (except where noted) of Years of Teaching Experience (IV) and Frequency of Use of the ISTE•E Standards (DV)

ISTE•E Standards	Yrs. Exp. Group	Mean (SD)	*F*	*df*	*p*	ES[a]
All ISTE•E Standards	Overall	3.92 (.62)	0.76	3, 276	.518	.008
	1	3.86 (.63)				
	2	3.88 (.57)				
	3	3.98 (.64)				
	4	3.99 (.61)				
Learner	Overall	3.84 (1.12)	4.60[b]	3, 273	.204	.006
	1	3.71 (.79)				
	2	3.84 (.51)				
	3	4.12 (1.78)				
	4	3.74 (.77)				
Leader	Overall	3.70 (.81)	2.44	3, 275	.064	.026
	1	3.56 (.83)				
	2	3.76 (.65)				
	3	3.80 (.89)				
	4	3.90 (.73)				
Citizen	Overall	4.16 (.81)	1.82	3, 272	.143	.020
	1	4.07 (.70)				
	2	4.09 (.60)				
	3	4.22 (.71)				
	4	3.39 (1.32)				
Collaborator	Overall	3.72 (.72)	0.15	3, 268	.931	.002
	1	3.70 (.75)				
	2	3.72 (.71)				
	3	3.74 (.69)				
	4	3.78(.73)				
Designer	Overall	3.93 (.79)	1.71	3, 269	.165	.019
	1	3.84 (.82)				
	2	3.98 (.63)				
	3	4.10 (.79)				
	4	3.89 (.78)				

Table 17 (continued).

ISTE•E Standards	Yrs. Exp. Group	Mean (SD)	*F*	*df*	*p*	ES[a]
Facilitator	Overall	4.00 (.72)	0.72	3, 268	.541	.008
	1	3.99 (.75)				
	2	3.88 (.64)				
	3	4.09 (.77)				
	4	4.01 (.62)				
Analyst	Overall	3.91 (.72)	0.30	3, 268	.828	.003
	1	3.92 (.74)				
	2	3.82 (.64)				
	3	3.96 (.74)				
	4	3.91 (.67)				

Note. Years of Experience Group # — 1: 0–5, 2: 6–10, 3: 11–20, 4: 21-42.
Likert-type scale: 5—Always to 1—Never.
[a] η^2. [b] Kruskal-Wallis *H.*

Age (RQ4).

A one-way ANOVA was used to determine statistical significance between the frequency of use of the ISTE•E Standards and Age. An alpha level of .05 was used for all analyses. In section two of the ITIS, participants were asked to rate the frequency of use of the ISTE•E Standards on a five-point Likert-type Scale ranging from one to five, with 1—Never and 5—Always. The seven ISTE•E Standards are Learner, Leader, Citizen, Collaborator, Designer, Facilitator, and Analyst. Participants indicated the year they were born on the third section of the ITIS. For analysis, age was then calculated and placed into five categories: 21–30 years, 31–40 years, 41–50 years, 51–60 years, 61–70 years. The range of age was from 26 to 70 years with the mean age being 47.80 years (*SD* = 9.66).

Age - Overall ISTE•E Standards (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 281)} = 1.84$, $p = .121$, indicating that the assumption underlying the ANOVA was met. The one-way

ANOVA showed no statistically significant effect due to age on the measure of the frequency to use of all ISTE•E Standards, $F_{4, 281}$ =1.54, p = .192, η^2 = .021. The effect size was small with about 2% of the variance of the frequency of use of all ISTE•E Standards attributable to age. Means and standard deviations can be found in Table 18.

Age - Learner ISTE•E Standard (RQ4).

Non-parametric analysis, Kruskal-Wallis *H* test, was conducted for the Learner ISTE•E Standard because Cronbach's alpha for these three questions was low (α = .357). These results indicated that there was not a statistically significant difference in the measure of the frequency of use of the Learner ISTE•E Standard between age categories, $\chi^2(4, n = 282) = 8.438$, p = .077, η^2 = .016. The mean ranks were as follows: 61–70 years (n = 32) = 163.67 (largest), 51–60 years (n = 79) = 153.32, 31–40 years (n = 57) = 142.82, 21–30 years (n = 12) = 137.21, and 41–50 years (n = 102) = 125.16 (smallest). Means and standard deviations can be found in Table 18.Table 18.

Age - Leader ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 279)}$ = 1.70, p = .151, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed no statistically significant effect due to age on the measure of the frequency to use of the Leader ISTE•E Standard, $F_{(4, 279)}$ =1.35, p = .252, η^2 = .019. Effect size was negligible. Means and standard deviations can be found in Table 18.Table 18.

Age - Citizen ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 276)}$ = 2.08, p = .084, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed no statistically significant effect due to age on the measure of the frequency to use of the Citizen ISTE•E Standard, $F_{4, 276} = 0.61$, $p = .659$, $\eta^2 = .009$. Effect size was negligible. Means and standard deviations can be found in Table 18.Table 18.

Age - Collaborator ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 272)} = .97$, $p =$ 424) indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed no statistically significant effect due to age on the measure of the frequency to use of the Collaborator ISTE•E Standard, $F_{(4, 272)} = 1.94$, $p = .105$, $\eta^2 = .028$. The effect size was small with age accounting for about 3% of the variance of the frequency of use of the Designer ISTE•E Standard means. Means and standard deviations can be found in Table 18.Table 18

Age - Designer ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 273)} = 0.72$, $p =$ .513) indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed no statistically significant effect due to age on the measure of the frequency to use of the Designer ISTE•E Standard, $F_{4, 273} = 1.11$, $p = .351$, $\eta^2 = .016$. Effect size was negligible. Means and standard deviations can be found in Table 18.Table 18

Age - Facilitator ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 272)} = 1.63$, $p =$ .167, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed no statistically significant effect due to age on the measure of the frequency to use of the Facilitator ISTE•E Standard, $F_{(4, 272)} = 1.36$, $p = .249$, $\eta^2 = .020$. The effect size was small with about 2% of the variance of the means of the frequency of use of the Facilitator ISTE•E Standard attributable to age. Means and standard deviations can be found in Table 18Table 18.

Age - Analyst ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(4, 272)} = 1.09$, $p = .363$, indicating that the assumption underlying the ANOVA was met. The one-way ANOVA showed no statistically significant effect due to age on the measure of the frequency to use of the Analyst ISTE•E Standard, $F_{(4, 272)} = 1.01$, $p = .403$, $\eta^2 = .015$. Means and standard deviations can be found in Table 18.Table 18

Age Summary (RQ4).

Table 18Table 18 provides a summary of the statistical analyses of the frequency of use of the ISTE•E Standards and age.

Table 18.

One-Way ANOVA (except where noted) of Age (IV) and Frequency of Use of the ISTE•E Standards (DV)

ISTE•E Standards	Age Group	Mean (SD)	*F*	*df*	*p*	ES[a]
All ISTE•E Standards	Overall	3.92 (.63)	1.54	4, 281	.192	.021
	1	4.17 (.58)				
	2	3.88 (.67)				
	3	3.83 (.55)				
	4	3.95 (.69)				
	5	4.07 (.62)				
Learner	Overall	3.85 (1.11)	8.44[b]	4, 278	.077	.016
	1	3.78 (.89)				
	2	4.04 (1.98)				
	3	3.69 (.60)				
	4	3.89 (.82)				
	5	3.98 (.84)				
Leader	Overall	3.69 (.82)	1.35	4, 279	.252	.019
	1	4.08 (.99)				
	2	3.63 (.82)				
	3	3.61 (.74)				
	4	3.73 (.89)				
	5	3.84 (.84)				
Citizen	Overall	4.16 (.83)	061	4, 276	.659	.009
	1	4.29 (.72)				
	2	4.07 (.78)				
	3	4.10 (.60)				
	4	4.23 (1.17)				
	5	4.27 (.59)				
Collaborator	Overall	3.73 (.73)	1.94	4, 272	.105	.028
	1	4.03 (.60)				
	2	3.66 (.65)				
	3	3.65 (.65)				
	4	3.73 (.74)				
	5	3.99 (.77)				

Table 18 (continued).

ISTE•E Standards	Age Group	Mean (SD)	*F*	*df*	*p*	ES[a]
Designer	Overall	3.94 (.79)	1.11	4, 273	.351	.016
	1	4.32 (.60)				
	2	3.93 (.86)				
	3	3.87 (.73)				
	4	4.02 (.78)				
	5	3.88 (.89)				
Facilitator	Overall	4.01 (.73)	1.36	4, 272	.249	.020
	1	4.17 (.59)				
	2	3.96 (.80)				
	3	3.96 (.68)				
	4	3.99 (.80)				
	5	4.27 (.62)				
Analyst	Overall	3.91 (.71)	1.01	4, 272	.403	.015
	1	4.13 (.73)				
	2	3.93 (.74)				
	3	3.82 (.67)				
	4	3.93 (.75)				
	5	4.04 (.67)				

Note. Age Group #—1: 21–30 years, 2: 31–40 years, 3:41–50 years, 4: 51–60 years, 5: 61–70 years. Likert-type scale: 5—Always to 1—Never.
[a] η^2. [b] Kruskal-Wallis *H*.

Gender (RQ4).

Analysis of Variance was used to determine statistical significance between the frequency of use of the ISTE•E Standards and gender. An alpha level of .05 was used for all analyses. In section two of the ITIS, participants rated the frequency of use of the ISTE•E Standards on a five point Likert-type scale ranging from one to five with 1—never and 5—Always. The seven ISTE•E Standard categories are Learner, Leader, Citizen, Collaborator, Designer, Facilitator and Analyst. Participants indicated their gender in the third part of the ITIS. Females accounted for 76.8% of the sample and males for 23.2%.

Gender - Overall ISTE•E Standards (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(1, 301)} = 0.04$, $p = .837$, indicating that the assumption underlying the ANOVA was met. The effect of gender on the measure of the frequency of use of all ISTE•E Standards was statistically significant, $F_{(1, 301)} = 4.92$, $p = .027$, $\eta^2 = .016$, with female educators using all ISTE•E Standards more frequently than male educators. Effect size was negligible. Means and standard deviations can be found in Table 19.

Gender - Learner ISTE•E Standard (RQ4).

Non-parametric analysis, Mann-Whitney *U* test, was conducted for the Learner ISTE•E Standard due to Cronbach's alpha = .357 for these three questions. These results indicated that there was a statistically significant difference in the measure of the frequency of use of the Learner ISTE•E Standard between gender, $U = 6554.50$, $p = .022$, $\eta^2 = .017$. The mean ranks were as follows: Female ($n = 228$) = 155.75 (largest), and Male ($n = 70$) = 129.14 (smallest). Means and standard deviations can be found in Table 19.Table 19

Gender - Leader ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(1, 299)} = 0.18$, $p = .675$, indicating that the assumption underlying the ANOVA was met. The effect of gender on the measure of the frequency of use of the Leader ISTE•E Standard was not statistically significant, $F_{(1, 299} = 1.67$, $p = .197$, $\eta^2 = .006$. Effect size was negligible. However, while not significant female educators used the Leader ISTE•E Standard at a higher frequency than male educators. Means and standard deviations can be found in Table 19.

Gender - Citizen ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(1, 295)} = 0.02$, $p = .903$, indicating that the assumption underlying the ANOVA was met. The effect of gender on the measure of the frequency of use of the Citizen ISTE•E Standard was statistically significant, $F_{(1, 295)} = 8.44$, $p = .004$, $\eta^2 = .028$, with female teachers using the Citizen ISTE•E Standard more frequently than male teachers. The effect size was small with gender accounting for about 2.8% of the variance of the frequency of use of the Citizen ISTE•E Standard means. Means and standard deviations can be found inTable 19 Table 19.

Gender - Collaborator ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(1, 290)} = 0.04$, $p = .851$, indicating that the assumption underlying the ANOVA was met. The effect of gender on the measure of the frequency of use of the Collaborator ISTE•E Standard was statistically significant, $F_{(1, 290)} = 4.77$, $p = .030$, $\eta^2 = .016$, with female teachers using the Collaborator ISTE•E Standard more frequently than male teachers. Effect size was negligible. Means and standard deviations can be found in Table 19.Table 19

Gender -

The test for homogeneity of variance was not significant, *Levene's* $F_{(1, 291)} = 1.36$, $p = .245$, indicating that the assumption underlying the ANOVA was met. The effect of gender on the measure of the frequency of use of the Designer ISTE•E Standard was significant, $F_{(1, 291)} = 11.22$, $p = .001$, $\eta^2 = .037$, with female teachers using the Designer ISTE•E Standard more frequently than male teachers. The effect size was small with gender accounting for about 4% of the variance of the frequency of use of the Designer ISTE•E Standard. Means and standard deviations can be found in Table 19.Table 19

Gender - Facilitator ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(1, 290)} = 0.01$, $p = .922$, indicating that the assumption underlying the ANOVA was met. The effect of gender on the measure of the frequency of use of the Facilitator ISTE•E Standard was not significant, $F_{(1, 290)}$ = 0.01, *p* = .927, $\eta^2 < .001$. Effect size was negligible. However, female educators implemented the Facilitator ISTE•E Standard slightly more frequently than male educators. Means and standard deviations can be found inTable 19 Table 19.

Gender - Analyst ISTE•E Standard (RQ4).

The test for homogeneity of variance was not significant, *Levene's* $F_{(1, 288)}$ = 0.01, *p* = .915, indicating that the assumption underlying the ANOVA was met. The effect of gender on the measure of the frequency of use of the Analyst ISTE•E Standard was not significant, $F_{(1, 288)}$ = 2.93, *p* = .088, $\eta^2 = .010$. Effect size was negligible. However, while not significant the Analyst ISTE•E Standard was implemented more frequently by female educators than male educators. Means and standard deviations can be found in Table 19.Table 19

Gender Summary (RQ4).

Table 19Table 19 provides a summary of the statistical analyses of the frequency of use of the ISTE•E Standards and gender.

Table 19.

One-Way ANOVA (except where noted) of Gender (IV) and Frequency of Use of the ISTE•E Standards (DV)

ISTE•E Standards	Gender	Mean (SD)	*F*	*df*	*p*	ES[a]
All ISTE•E Standards	Overall	3.92 (.63)	4.92	1, 301	.027	.016
	Female	3.96 (.62)				
	Male	3.78 (.63)				
Learner	Overall	3.86 (1.09)	6554.50[b]	1, 297	.022	.017
	Female	3.91 (1.17)				
	Male	3.66 (.75)				
Leader	Overall	3.71 (.82)	1.67	1, 299	.197	.006
	Female	3.74 (.83)				
	Male	3.60 (.79)				
Citizen	Overall	4.14 (.83)	8.44	1, 295	.004	.028
	Female	4.22 (.85)				
	Male	3.89 (.71)				
Collaborator	Overall	3.73 (.72)	4.77	1, 290	.030	.016
	Female	3.78 (.72)				
	Male	3.56 (.69)				
Designer	Overall	3.95 (.78)	11.22	1, 291	.001	.037
	Female	4.03 (.75)				
	Male	3.67 (.82)				
Facilitator	Overall	4.01 (.73)	0.01	1, 290	.927	<.001
	Female	4.01 (.74)				
	Male	4.00 (.70)				
Analyst	Overall	3.92 (.71)	2.93	1, 288	.088	.010
	Female	3.96 (.71)				
	Male	3.79 (.70)				

Note. Likert-type scale: 5—Always to 1—Never.
[a] η^2. [b] Mann-Whitney *U*.

Previous ISTE•E Standard Knowledge.

The last question in the third section of the ITIS asked participants if they had heard of the ISTE•E Standards before taking the survey. Fifty-seven percent had not heard of the Standards before taking the survey. Table 20 provides frequencies and percentages of characteristics and previous ISTE•EStandard knowledge.

Table 20.

Previous Knowledge of the ISTE•E Standards by Characteristics

Characteristics	Yes		No	
	n	%	*n*	%
Innovativeness (*n* = 304)				
Innovator	21	44	27	56
Early Adopter	64	46	76	54
Early Majority	42	49	53	51
Late Adopter	4	19	17	81
CTE Program (*n* = 284)				
Business/Marketing	40	57	30	43
Family & Consumer Science	23	44	29	56
Health Science	22	26	63	74
Technical/Trade/Industry	23	44	29	56
Ag/JROTC/Administration	23	51	22	49
Teaching Certification (*n* = 297)				
Class B	24	39	38	61
Class A	53	47	56	53
Class AA	17	49	18	51
BA/MA Equiv. Tech Ed.	17	29	41	71
Provisional (PCCT)	5	42	7	58
Other[a]	12	57	9	43

Table 20 (continued).

Characteristics	Yes		No	
	n	%	*n*	%
Years Teaching Exp. (*n* = 306)				
0–5	49	39	78	61
6–10	12	30	28	70
11–20	39	51	37	49
21–42	42	67	21	33
Age (years) (*n* = 291)				
21–30	2	17	10	83
31–40	19	33	39	67
41–50	47	44	59	56
51–60	39	49	41	51
61–72	18	51	17	49
Gender (*n* = 304)				
Female	104	44	133	56
Male	27	40	40	60

[a] Other included Doctorate degree, RN and Associates degree (Health related), Certification with Teacher Ready program, Praxis in FACS, Service certification, JROTC certification, Emergency certification, CTE Temporary, and Substitute certification

Summary

In this chapter, a review was presented of the Innovativeness, importance and use of the ISTE•E Standards, and educator characteristics of 313 secondary CTE educators in Alabama. In an effort to understand the Innovativeness of CTE educators and how technology is integrated into classrooms, participants completed an email version or paper version of the ITIS. Most educator's level of Innovativeness fell in the Early Adopter category (44.9%). Wilcoxon signed ranks analysis found that there was an association between Survey Calculated Innovativeness and Self-ID Innovativeness ($p < .001$) with a weak association (ϕ_c = .27). Most notable was that even though the Survey Calculated and Self-ID Innovativeness were similar (SC = 141, Self-ID = 142), participants did not always place themselves into the correct category. Table two provides a cross tabulation between Survey Calculated Innovativeness and Self-ID Innovativeness.

A Pearson Chi-Square test determined that there was not a significant relationship between Innovativeness and CTE program. The overall Innovativeness Scale mean was 70.83, placing it in the Early Adopter category (scores between 69–79) across CTE programs. Trade/Technical/Industry educators and Business/Marketing educators had the highest Innovativeness means of 73.17 and 72.30, respectively, with AG/JROTC/Adm. Educators following with a mean of 71.52. Health Science and Family and Consumer Science educators had the lowest means of Innovativeness at 68.90 and 69.00, respectively.

For Research Question 3, importance of the ISTE•E Standards was evaluated across Innovativeness, CTE program, type of certification, years of teaching experience, age, and gender. Analysis of variance was performed on all ISTE•E Standards except the Leader Standard due to Cronbach's alpha score of .315; a non-parametric test, Kruskal-Wallis test was performed on the Leader ISTE•E Standard category.

Table 21 summarizes the overall ISTE•E Standards by characteristics. Innovativeness, CTE program, certification type, and gender had statistically significant differences of the measure of importance of all ISTE•E Standards. Effect sizes were small to moderate. All mean scores were in the 4—Important to 5—Very Important range, except for the Innovativeness characteristic which had a range of 3—Somewhat to 5—Very Important.

Table 21.

One-Way ANOVA of Importance (DV) of Overall ISTE•E Standards by Characteristic (IV)

IV	*F*	*df*	*p*	ES[a]
Innovativeness	16.71[b]	3, 310	< .001	ω^2 = .131
CTE Program	6.83[b]	4, 309	< .001	ω^2 = .070
Cert. Type	2.50	5, 297	.031	.040
Yrs Exp	1.34	3, 287	.261	.014
Age	0.72	4, 292	.582	.010
Gender	10.31	1, 312	.001	.032

Note. Likert-type scale: 5—Very Important to 1—Not Important.
[a] η^2 except where noted. [b] *Welch's F.*

Table 22 summarizes the importance of the Learner ISTE•E Standard by characteristics. Innovativeness and CTE program had statistically significant differences of the measure of importance of the Learner Standard. Effect sizes were small to moderate. Mean scores were in the 4—Important to 5—Very Important range, except for the lowest means scores of CTE program and age, where they ranged between 3—Undecided and 4—somewhat important.

Table 22.

One-Way ANOVA of Importance (DV) of the Learner Standard by Characteristic (IV)

IV	*F*	*df*	*p*	ES[a]
Innovativeness	12.29	3, 309	< .001	.107
CTE Program	4.93	4, 304	.001	.061
Cert. Type	0.81[b]	5, 296	.546	ω^2 = .003
Yrs Exp	0.88	3, 286	.451	.009
Age	0.70	4, 291	.593	.010
Gender	2.29	1, 311	.131	.007

Note. Likert-type scale: 5—Very Important to 1—Not Important.
[a] η^2 except where noted. [b] *Welch's F.*

Table 23 summarizes the importance of the Leader ISTE•E Standard by characteristics. Innovativeness, CTE program, and years of experience had statistically significant differences of the measure of importance of the Leader Standard. Effect sizes were small to moderate. Mean scores were in the 4—Important to 5—Very Important range, except for the lowest scores of Innovativeness, CTE program and certification type, where the mean scores ranged between 3—Undecided and 4—Somewhat important.

Table 23.

Kruskal-Wallis Test of Importance (DV) of the Leader Standardby Characteristic (IV)

IV	χ^2	*df*	*p*	ES[a]
Innovativeness	26.76	3, 310	< .001	.077
CTE Program	12.58	4, 305	.014	.028
Cert. Type	8.00	5, 297	.156	.003
Yrs Exp	10.20	3, 287	.017	.025
Age	4.77	4, 292	.312	.003
Gender	7670.50[b]	1, 313	.102	.008

Note. Likert-type scale: 5—Very Important to 1—Not Important.
[a] η^2 . [b] Mann-Whitney *U*.

Table 24 summarizes the importance of the Citizen ISTE•E Standard. Innovativeness, certification type, and gender had statistically significant differences of the measure of importance of the Citizen Standard. Effect sizes were small to moderate. Mean scores were in the 4—Important to 5—Very Important range, except for the lowest score of Innovativeness between 3—Undecided and 4—Somewhat important.

Table 24.

One-Way ANOVA of Importance (DV) of the Citizen Standard by Characteristic (IV)

IV	*F*	*df*	*p*	ES[a]
Innovativeness	10.30	3, 309	< .001	.091
CTE Program	6.03[b]	4, 304	< .001	ω^2 = .061
Cert. Type	3.55	5, 296	.004	.057
Yrs Exp	2.06[b]	3, 286	.110	ω^2 = .011
Age	0.44	4, 296	.780	.006
Gender	14.34	1, 311	< .001	.044

Note. Likert-type scale: 5—Very Important to 1—Not Important.
[a] η^2 except where noted. [b] *Welch's F.*

Table 25 summarizes the importance of the Collaborator ISTE•E Standard by characteristics. Innovativeness and gender had statistically significant differences of the measure of importance of the Collaborator Standard. Effect sizes were small to moderate. Mean scores were in the 4—Important to 5—Very Important range, except for the lowest means score of Innovativeness, certification type and gender where the mean scores ranged between 3—Undecided and 4—Somewhat important.

Table 25.

One-Way ANOVA of Importance (DV) of the Collaborator Standard by Characteristic (IV)

IV	*F*	*df*	*p*	ES [a]
Innovativeness	6.99	3, 308	< .001	.064
CTE Program	.934	4, 304	.444	.012
Cert. Type	1.62	5, 296	.154	.027
Yrs Exp	0.34	3, 286	.800	.004
Age	0.30	4, 291	.877	.004
Gender	6.75	1, 310	.010	.021

Note. Likert-type scale: 5—Very Important to 1—Not Important.
[a] η^2.

Table 26 summarizes the importance of the Designer ISTE•E Standard. Innovativeness, CTE program, and gender had statistically significant differences. Effect sizes were small to moderate, except for Innovativeness which was large. Mean scores were in the 4—Important to 5—Very Important range, except for the lowest score of Innovativeness which had a range between 3—Undecided and4—Somewhat important.

Table 26.

One-Way ANOVA of Importance (DV) of the Designer Standard by Characteristic (IV)

IV	*F*	*df*	*p*	ES[a]
Innovativeness	18.95[b]	3, 306	< .001	$\omega^2 = .148$
CTE Program	8.31[b]	4, 302	< .001	$\omega^2 = .087$
Cert. Type	1.91	5, 294	.093	.031
Yrs Exp	0.77	3, 285	.511	.008
Age	2.03	4, 289	.090	.027
Gender	11.27	1, 308	.001	.035

Note. Likert-type scale: 5—Very Important to 1—Not Important.
[a] η^2 except where noted. [b] *Welch's F*.

Table 27 summarizes the importance of the Facilitator ISTE•E Standard by characteristics. Innovativeness, CTE program, and gender had statistically significant differences of the measure of importance of the Facilitator Standard. Effect sizes were small to moderate. All mean scores were in the 4—Important to 5—Very Important range.

Table 27.

One-Way ANOVA of Importance (DV) of Facilitator Standard by Characteristic (IV)

IV	*F*	*df*	*p*	ES[a]
Innovativeness	11.98[b]	3, 307	< .001	ω^2 = .096
CTE Program	4.22	4, 303	.002	.053
Cert. Type	1.97	5, 295	.141	.028
Yrs Exp	2.50	3, 285	.060	.026
Age	0.36	4, 290	.837	.005
Gender	4.96	1, 309	.027	.016

Note. Likert-type scale: 5—Very Important to 1—Not Important.
[a] η^2 except where noted. [b] *Welch's F.*

Table 28 summarizes the importance of the Analyst ISTE•E Standard by characteristics. Innovativeness, CTE program, and gender had statistically significant differences of the measure of importance of the Analyst Standard. Effect sizes were small to moderate. All mean scores were in 4—Important to 5—Very Important range.

Table 28.

One-Way ANOVA of Importance (DV) of Analyst Standard by Characteristic (IV)

IV	*F*	*df*	*p*	ES[a]
Innovativeness	14.28	3, 307	< .001	.122
CTE Program	9.33[b]	4, 304	< .001	ω^2 = .097
Cert. Type	2.15	5, 296	.060	.035
Yrs Exp	0.95	3, 286	.416	.010
Age	1.25	4, 291	.292	.017
Gender	6.25	1, 309	.013	.020

Note. Likert-type scale: 5—Very Important to 1—Not Important.
[a] η^2 except where noted. [b] *Welch's F.*

For Research Question 4, frequency of use of the ISTE•E Standards was evaluated across Innovativeness, CTE program, type of certification, years of teaching experience, age, and gender. The seven categories of the ISTE•E Standards include Learner, Leader, Citizen, Collaborator, Designer, Facilitator, and Analyst. Analysis of variance was performed on all categories except the Learner Standard due to Cronbach's alpha score of .357; a non-parametric test, Kruskal-Wallis test was performed on the Learner category.

Table 29 summarizes the frequency of use of all ISTE•E Standards by characteristics. Innovativeness, CTE program, and gender had statistically significant differences of the measure of the frequency of use of all ISTE•E Standards. Effect sizes were small to moderate. Mean scores were between the ranges of 3—Sometimes to 5—Always.

Table 29.

One-Way ANOVA of the Frequency of Use of All ISTE•E Standards (DV) and Characteristic (IV)

IV	*F*	*df*	*p*	ES[a]
Innovativeness	11.05	3	< .001	.100
CTE Program	6.83[b]	4	< .001	ω^2 = .070
Cert. Type	0.75	5	.586	.013
Yrs Exp	0.76	3	.518	.008
Age	1.54	4	.192	.021
Gender	4.92	1	.027	.016

Note Likert-type scale: 5—Always to 1—Never.
[a] η^2 except where noted. [b] *Welch's F.*

Table 30 summarizes the frequency of use of the Learner ISTE•E Standard by characteristics. Innovativeness, CTE program, and gender had statistically significant differences of the measure of the frequency of use of the Learner Standard. Effect sizes were small to moderate. Mean scores were between the ranges of 3—Sometimes to 5—Always.

Table 30.

Kruskal-Wallis Test of the Frequency of Use of the Learner Standard (DV) by Characteristic (IV)

IV	*F*	*df*	*p*	ES[a]
Innovativeness	27.42	3	< .001	.083
CTE Program	21.91	4	< .001	.062
Cert. Type	4.91	5	.427	.007
Yrs Exp	4.60	3	.204	.006
Age	8.44	4	.077	.016
Gender	6554.50[b]	1	.022	.017

Note. Likert-type scale: 5—Always to 1—Never.
[a] η^2. [b] Mann-Whitney *U.*

Table 31 summarizes the frequency of use of the Leader ISTE•E Standard by characteristics. Innovativeness and CTE program had statistically significant differences of the measure of the frequency of use of the Leader Standard. Effect sizes were small to moderate. Mean scores were between the ranges of 3—Sometimes to 5—Always.

Table 31.

One-Way ANOVA of the Frequency of Use of Leader Standard (DV) by Characteristic (IV)

IV	χ^2	*df*	*p*	ES[a]
Innovativeness	7.01	3	< .001	.066
CTE Program	3.72	4	.006	.049
Cert. Type	1.75	5	.124	.030
Yrs Exp	2.44	3	.064	.026
Age	1.35	4	.252	.019
Gender	1.67	1	.197	.006

Note. Likert-type scale: 5—Always to 1—Never.
[a] η^2.

Table 32 summarizes the frequency of use of the Citizen ISTE•E Standard by characteristics. Innovativeness, CTE program, and gender had statistically significant differences of the measure of the frequency of use of the Citizen Standard. Effect sizes were small to moderate. Mean scores were between the ranges of 3—Sometimes to 5—Always.

Table 32.

One-Way ANOVA of the Frequency of Use of Citizen Standard (DV) by Characteristic (IV)

IV	*F*	*df*	*p*	ES[a]
Innovativeness	7.40	3	< .001	.070
CTE Program	4.73[b]	4	.001	ω^2 = .049
Cert. Type	0.77	5	.573	.014
Yrs Exp	1.82	3	.143	.020
Age	0.61	4	.659	.009
Gender	8.44	1	.004	.028

Note. Likert-type scale: 5—Always to 1—Never.
[a] η^2 except where noted. [b] *Welch's F*.

Table 33 summarizes the frequency of use of the Collaborator ISTE•E Standard by characteristics. Innovativeness and gender had statistically significant differences for the measure of the frequency of use of the Collaborator Standard. Effect sizes were small to moderate. Mean scores were between the ranges of 3—Sometimes to 5—Always.

Table 33.

One-Way ANOVA of the Frequency of Use of Collaborator Standard (DV) by Characteristic (IV)

IV	*F*	*df*	*p*	ES [a]
Innovativeness	4.71	3	.003	.047
CTE Program	1.76	4	.137	.024
Cert. Type	0.77	5	.569	.014
Yrs Exp	0.15	3	.931	.002
Age	1.94	4	.105	.028
Gender	4.77	1	.030	.016

Note. Likert-type scale: 5—Always to 1—Never.
[a] η^2 .

Table 34 summarizes the frequency of use of the Designer ISTE•E Standard by characteristics. Innovativeness, CTE program, and gender had statistically significant differences for the measure of the frequency of use of the Designer Standard. Effect sizes were small to moderate. Mean scores were between the ranges of 3—Sometimes to 5—Always.

Table 34.

One-Way ANOVA of the Frequency of Use of Designer Standard (DV) by Characteristic (IV)

IV	*F*	*df*	*p*	ES[a]
Innovativeness	11.98	3	< .001	.111
CTE Program	5.74	4	< .001	.075
Cert. Type	0.44	5	.821	.008
Yrs Exp	1.71	3	.165	.019
Age	1.11	4	.351	.016
Gender	11.22	1	.001	.037

Note. Likert-type scale: 5—Always to 1—Never.
[a] η^2.

Table 35 summarizes the frequency of use of the Facilitator ISTE•E Standard by characteristics. Innovativeness was the only characteristic to have a statistically significant difference for the measure of the frequency of use of the Facilitator Standard. Effect sizes were small to moderate. Mean scores were between the ranges of 3—Sometimes to 5—Always.

Table 35.

One-Way ANOVA of the Frequency of Use of Facilitator Standard (DV) by Characteristic (IV)

IV	*F*	*df*	*p*	ES[a]
Innovativeness	7.61	3	< .001	.073
CTE Program	1.13	4	.345	.016
Cert. Type	0.81	5	.544	.014
Yrs Exp	0.72	3	.541	.008
Age	1.36	4	.249	.020
Gender	0.01	1	.927	< .001

Note. Likert-type scale: 5—Always to 1—Never.
[a] η^2.

Table 36 summarizes the frequency of use of the Analyst ISTE•E Standard by characteristics. Innovativeness, CTE program, and gender had statistically significant differences for the measure of the frequency of use of the Analyst Standard. Effect sizes were small to moderate. Mean scores were between the ranges of 3—Sometimes to 5—Always.

Table 36.

One-Way ANOVA of Frequency of Use of Analyst Standard (DV) by Characteristic (IV)

IV	*F*	*df*	*p*	ES[a]
Innovativeness	8.37	3	< .001	.081
CTE Program	6.60	4	< .001	.085
Cert. Type	1.10	5	.363	.019
Yrs Exp	0.30	3	.828	.003
Age	1.01	4	.403	.015
Gender	2.93	1	.088	.010

Note. Likert-type scale: 5—Always to 1—Never.
[a] η^2.

Chapter 5: Discussion, Conclusions, and Recommendations

As we head into the Fourth Industrial Revolution (Schwab, 2016), the World Economic Forum shares that it is thought that at least 65% of children entering school today will work in jobs that do not currently exist, and that these jobs will require technical, social and analytical skills that are not taught inclusively in many educational systems (World Economic Forum, 2016). Another estimate by the Institute for the Future (IFTF) provides a more aggressive number—85% of jobs that will exist just ten years from now have yet to be invented (Institute for the Future, 2017). With the number probably somewhere in between, it is important that educators, in addition to being content knowledge experts, be competent in using and integrating technology in classrooms. While passing on lifelong learning skills, educators must also help students become literate and fluent in all forms of digital technology resources. This cannot take place in one class or course period. It must be engaged throughout the curriculum, including all Career and Technical Education (CTE) programs.

States and organizations realize the urgency of classroom technology integration. Guidelines, including standards, frameworks, indicators, and legislation, have been developed to support educators' efforts in using technology and teaching technology. On a global level, the International Society for Technology in Education (ISTE) has developed standards for students, educators, and others, to support a level playing field for all students across all nations regarding technology use and knowledge. On a national level, the Perkins Program of Study Framework, as well as, the ACTE Quality CTE Program of Study Framework support high quality, comprehensive programs of study in which students acquire employability skills including technology, communications, social, and critical thinking. These frameworks also provide guidelines that involve educators having the required professional development and training in technology and innovative instructional approaches to support students that are prepared for current and emerging occupations (Carl D. Perkins CTE Act of 2006, 2018; Hyslop & Imperatore, 2018). The 2017 National Education Technology Plan (NETP) recommended that in addition to students and educators having adequate access to technology and the internet, both in and out of school, professional development be provided at the state, district, and local levels. It suggests that training be powered by technology to enhance instructional practices and increase educators' ability to create engaging learning activities for improved student outcomes (Office of Educational Technology - US Department of Education, 2017). In addition, the Every Student Success Act (ESSA) in 2015 not only recognized that not all students learn at the same rate or in the same way, but also included provisions for educators to develop more personalized learning approaches for all students using technology. It supports ensuring that educators, through professional development, keep technology skills up-to-date to provide better technology integrated learning experiences for students (Office of Educational Technology, 2018). At the state level, Alabama has put into place several sets of guidelines and standards that establish goals for increased student career and college readiness, including technology and media literacy, problem-solving and trouble-shooting, and collaboration and teamwork. These include the Alabama Technology Plan: Transform 2020, the Alabama State Board of Education Plan 2020, the Alabama Course of Study: Career and Technical Education, the Alabama Course of Study: Computer Science and Digital Literacy, and Administrative Code, to name a few (Alabama State Department of Education, 2006, 2015; Education, 2012; Morton, 2008; Richardson, 2018). A component of all of these guidelines, include professional development and training related to technology resources and instructional methods that are research-based, relevant and current, and sustained and on-going thus encouraging collaboration and enhanced student engagement, maximizing student learning and ownership.

In an effort to assess CTE educators' technology integration and level of Innovativeness, or willingness to change or try new technology resources, a researcher-designed survey instrument, the Innovativeness and Technology Integration Survey (ITIS), was developed using the Hurt et al. (1977, 2013) Innovativeness Scale Instrument and the International Society for Technology in Education Standards for Educators (ISTE•E). Analyses were conducted to determine the degree of Innovativeness of educators and their level of technology integration by asking participants to rate their perceived technology importance and frequency of use.

In the previous chapter, data collected from Alabama secondary CTE educators utilizing the ITIS instrument was reported and analyzed. This chapter includes discussion of those findings, conclusions and recommendations.

Summary and Discussion of Findings

For the current survey, participants included educators teaching in the following programs: Ag, Food, and Natural Resources (4.2%), Business/Marketing (22.9%), Family and Consumer Sciences (16.8%), Health Sciences (28.1%), Technical/Trade/Industry (17.4%), and JROTC/Administration, including CTE counselors and directors (10.6%). For the purpose of analysis, Ag, Food, and Natural Resources and JROTC/Administration were combined into the Ag/JROTC/Administration group. Tech/Trade/Industry programs included electronics, robotics, automotive technology, welding, cosmetology, building construction, carpentry, collision repair, drafting, plumbing, solar technology, electrical technology, industrial maintenance, architecture, engineering principles, public safety, HVAC &R, television production, technical theater, transportation, and STEM.

Of this population, 76.8% were female and about a third had a Class A certification (36.3%). The other two most common certification types were Class B (20.8%) and BA/MA equivalent Tech. Ed. (19.5%). Almost half of all educators had only 0–5 years of teaching experience (45%), with an average of about 10 years of experience. The average age was 47.8 years, with 36% of the population of this survey in the age range of 41–50 years. Before completing the ITIS, only 43% had previous knowledge of the ISTE•E Standards.

The findings of this study indicated that the average Innovativeness score was 70.83, which is on the low end of the Early Adopter category (69–79), with a minimum score of 44 and a maximum score of 92. Of the CTE educators participating in the study, the adopter categories included the following percentages: Innovator (16.2%), Early Adopter (44.9%), Early Majority (31.5%), and Late Adopter (7.3%). The Late Adopter category included both Late Majority and Traditionalists. These values were different than expected. Rogers' diffusion of innovation theory predicts: Innovative (2.5%), Early Adopter (13.5%), Early Majority (34.0%) and Late Majority and Traditionalists together (50%). There were seven times as many Innovative educators than was expected and three times as many Early Adopter educators as was expected. Most likely this was due to the technology related nature of many CTE programs.

When asked to Self-ID themselves into an adopter category, about half as many educators placed themselves into the Innovative category (8.6%) as was expected compared to the Survey Calculated score (16.2%). Although a Wilcoxon Signed Rank test with Cramer's V test found that there was a significant relationship $\chi^2(9, n = 314) = 68.65$, $p < .001$, the association was weak ($\phi_c = .27$) between Survey Calculated and Self-ID

Innovativeness. Only 21.6% of Innovators put themselves into the correct category, as well as, 51.8% of Early Adopters, 56.6% of the Early Majority, and 21.7% of Late Adopters. The Survey Calculated score was used for the remaining analyses due to reliability of the score.

Analysis was conducted to determine if there was a significant relationship between Innovativeness and CTE program. A Pearson Chi-Square test between Innovativeness and CTE program was not significant and indicated a weak association, $\chi^2(12, n = 310) = 16.33$, $p = .177$, ($\phi_c = .13$).

Technology integration was analyzed through two measures—importance of the ISTE•E Standards and frequency of use of those standards. There are seven ISTE•E Standards with the eighth analysis including all of the standards. The standards are: Learner, Leader, Citizen, Collaborator, Designer, Facilitator, and Analyst. The educator characteristics that were analyzed included Innovativeness, CTE program, teaching certification held or completing, years of experience in CTE, age, and gender. One notable characteristic of the data was that for importance, almost all means were between 4 and 5 on the Likert-type scale, meaning between 4—Important and 5—Very Important for the technology importance. However, for frequency of use, most scores were between 3—Sometimes and 4—Very Often.

Characteristics Summary and Discussion.

Innovativeness Summary and Discussion.

For all ISTE•E Standards, Innovativeness was statistically significant. Educators with higher levels of Innovativeness indicated a higher level of importance ($F_{3, 310} = 16.71$, $p < .001$) and frequency of use ($F_{3, 299} = 11.05$, $p < .001$) of the ISTE•E Standards than those with lower levels of Innovativeness. Integration was thus more important and occurred at a higher rate in classrooms with educators with higher levels of Innovativeness than those at lower levels.

CTE Program Summary.

For all ISTE•E Standards, CTE program was statistically significant for both importance ($F_{4, 305}$ = 6.38, p < .001) and frequency of use ($F_{4, 294}$ = 4.58, p < .001). When reviewing individual standards, all were statistically significantly different between CTE programs except for the importance and frequency of use of the Collaborator Standard and the frequency of use of the Facilitator Standard (Table 8 and Table 15Table 15). Business/Marketing educators generally had the highest means across importance and frequency of use. For importance, educators in Health Science and Family and Consumer Science programs generally had the lowest mean of all programs, and was significantly lower than Business/Marketing educators, across the importance of all ISTE•E Standards. For the frequency of use, educators in the Ag, JRTOC, and Administrator group had the lowest means and was statistically significantly lower than Business/Marketing educators, most likely because the Administrators in the group do not have the need or access to use technology in a classroom. Family and Consumer Science and Health Science educators had the statistically significantly lower means for the frequency of use when compared to Business/Marketing educators. As a whole, Business/Marketing educators integrated technology at a higher rate than other educators.

Type of Teacher Certification Summary.

For all ISTE•E Standards, importance was statistically significant ($F_{5, 297}$ = 2.50, p = .031), with educators with a Class A certification rating importance of technology higher than educators with a BA/MA Equivalent Tech. Ed. certification. This was also true for the Citizen Standard ($F_{5, 296}$ = 3.55, p = .004). While not significant, the trend for importance of technology across all other standards was that educators with a Class A certification had the highest means and that educators with a BA/MA Equivalent Tech Ed certification had one of the lowest means. There were no statistically significant differences for frequency of use of technology between types of certification. Generally, technology integration was higher for educators with a Class A certification compared to other certifications, and significantly higher compared to those with a BA/MA Equivalent Tech. Ed. certification.

Years of Teaching Experience in CTE Summary.

The only statistically significant difference found between years of teaching experience in CTE was for the importance of the Leader Standard ($F_{3, 286} = 10.20$, $p = .017$). Educators with 11–20 years of experience had a statistically significantly higher measure of the importance of the Leader Standard compared to educators with 0–5 years. Generally, technology integration was more important and occurred at a higher rate for educators with 11–20 years of experience than other educators.

Age Summary.

Age was not statistically significant for both important and frequency of use of the ISTE•E Standards. When reviewing the means, though not significant, it was apparent that educators who were 21–30 years of age had a higher rate of technology integration, both importance and frequency of use. Educators in the 61–70 age range had the next highest technology integration. Also, those educators in the age range of 41–50 years, generally had the lowest means across all ISTE•E Standards for importance and frequency of use.

Gender Summary.

Gender had a significant impact on technology integration. Females had statistically significantly higher ratings for importance ($F_{1, 312} = 10.31$, $p = .001$) than males for all standards except for the Learner and Leader Standard. In these two instances, while not significant, the means for females were higher than males. Females also rated their frequency of use ($F_{1, 301} = 4.92$, $p = .027$) of technology statistically significantly higher than males for all but three standards, Leader, Facilitator and Analyst Standards. Even when not statistically significant, again, females rated frequency of use higher than males.

ISTE•E Standards Summary.

Overall ISTE•E Standards Summary.

The ISTE•E Standards are a guide that educators can use to ensure that they have the skills to use technology in the classroom, are creating a classroom culture that champions technology use, and are presenting opportunities and experiences for students to be technology literate and fluent, as well as, academically successful using technology (ISTE standards, 2015). They call for educators to provide opportunities for students to learn technology and learn using technology. Innovativeness, CTE program, and gender were statistically significant, for both importance and frequency of use. Certification type was significant for importance. Higher levels of Innovativeness accounted for increased importance and frequency of use. Business/Marketing educators rated importance and frequency of use statistically significantly higher than Family and Consumer Science educators and Health Science educators. Educators with a Class A certification had a statistically significantly higher rating for the measure of importance of the overall ISTE•E Standards than educators with a BA/MA Equivalent Tech. Ed. certification. Female educators had a statistically significant higher rating for both importance and frequency of use than male educators.

Learner ISTE•E Standard Summary.

The first standard of Learner is concerned with the educator improving the teaching practice that leverages technology to enhance student achievement through setting professional learning goals and staying current on relevant research (International Society for Technology in Education, 2017a). Innovativeness and CTE program were statistically significant for both importance and frequency of use of the Learner Standard. Gender was also statistically significant for the frequency of use. Higher levels of Innovativeness accounted for increased importance and frequency of use. Business/Marketing educators rated importance and frequency of use of technology statistically significantly higher than Family and Consumer Science educators and Health Science educators, as well as, Ag/JRTOC/Administrator for frequency of use. Females rated the measure of the frequency of use higher than males.

Leader ISTE•E Standard Summary.

The second standard, Leader, involves the educator seeking opportunities for leadership that empowers student achievement through improving teaching and learning using technology. Innovativeness and CTE program were statistically significant for both the measure of importance and frequency of use. Years of teaching experience was also statistically significant for importance. Higher levels of Innovativeness accounted for increased technology importance and frequency of use. Business/Marketing educators a had statistically significantly higher measure of importance compared to Health Science educators, and a statistically significantly higher measure of the frequency of use compared to Family and Consumer Science and Health Science educators. Educators with 0–5 years of experience rated importance significantly lower than educators with 11–20 years of experience. Females had a statistically higher level of frequency of use related to the Leader Standard.

Citizen ISTE•E Standard Summary.

The third standard of Citizen deals with inspiring students to be a responsible and active part of the digital society through teaching, practicing, and modeling appropriate online behaviors and fostering digital literacy and fluency. Innovativeness was statistically significant for both importance and frequency with higher levels of innovativeness accounting for a higher occurrence of technology integration. CTE program was statistically significantly with Business/Marketing educators having a statistically significantly higher rating for the measure of importance and frequency of use compared to Health Science and Technical/Trade/Industry educators, and Ag/JRTOC/Administration educators for frequency of use. Also, certification type was statistically significantly higher for importance of the Citizen Standard for educators with a Class A certification compared to educators with a BA/MA Equivalent Tech. Ed. certification. In addition, gender accounted for a statistically significant difference with females having higher measures of importance and frequency of use of technology compared to males.

Collaborator ISTE•E Standard Summary.

The fourth standard of Collaborator involves educators actively collaborating with students and other stakeholders involved in the positive educational experience of students and fostering learning opportunities that leverage technology. Innovativeness and gender were statistically significant for both importance and frequency of use of the Collaborator Standard. Higher levels of Innovativeness accounted for increased importance and frequency of use of technology. Females had a statistically significantly higher measure of the importance and frequency of use of the Collaborator Standard than males.

Designer ISTE•E Standard Summary.

The fifth Designer Standard establishes educators as creators of and fostering personalized learning experiences through technology resources. Innovativeness and CTE program were statistically significant for both importance and frequency of use for the Designer Standard, and gender for importance. Higher levels of Innovativeness accounted for increased ratings of the measures of importance and frequency of use of technology. Business/Marketing educators had statistically significantly higher measures of the importance and frequency of use of the Designer Standard compared to educators in Family and Consumer Sciences, Health Sciences, and Ag/JRTOC/Administration. Gender also affected the Designer Standard, with females having statistically significant higher measures for the importance and frequency of use of the Designer Standard compared to males.

Facilitator ISTE•E Standard Summary.

The sixth standard of Facilitator revolves around educators fostering a culture of student learning, ownership, and responsible expression and communication, supporting the 2016 ISTE Standards for Students. Innovativeness accounted for statistically significant differences, with educators with higher Innovativeness levels having an increased rating of the importance and frequency of use of the Facilitator Standard. Also, for importance of the Facilitator Standard, CTE program and gender were also statistically significant. Business/Marketing and female educators rated importance of technology use statistically significantly higher than Health Science educators and male educators.

Analyst ISTE•E Standard Summary.

The final standard, the Analyst Standard, is related to the notion that educators should understand and use data to drive decisions about effective instructional strategies and student support. Innovativeness and CTE program had an effect on the Analyst Standard for importance and frequency of use, as well as, gender on the effect of importance of the Analyst Standard. Higher levels of Innovativeness accounted for increased levels of importance and frequency of use of technology. Business/Marketing educators had a statistically significantly higher rating for the measures of importance and frequency of use of technology compared to Family and Consumer Science and Health Science educators, and Ag/JRTOC/Administration educators for the frequency of use of Analyst Standard. For the importance of the Analyst Standard, female educators had a statistically significantly higher rating than male educators.

Previous ISTE•E Standard Knowledge.

The last question in the third section of the ITISasked participants if they had heard of the ISTE•E Standards before taking the survey. Fifty-seven percent of participants (n = 304) indicated that they did not know about the ISTE•E Standards before taking the ITIS. Of the educators in the Business/Marketing programs, 57% were aware of the ISTE•E Standards and 43% were not; of the educators in Ag/JROTC/Administration, 51% were aware and 49% were not. For the remaining programs, more educators were not aware of the ISTE•E Standards than were aware: Family and Consumer Science educators, 56% were not aware; Health Science educators, 74% were not aware; and Technical/Trade/Industry educators, 56% were not aware. There is an opportunity for all educators to become more aware of the ISTE•E Standards and understand how they can be used to increase technology integration in the classroom.

Conclusions

1. About 60% of CTE educators are highly innovative. The remaining 40% are not. According to Green, Gottlieb, and Parcel (as cited in Dearing, 2009) explained that

through communication and training, diffusion of technology innovation can be enhanced so that the rate of adoption is accelerated.

2. Self-Identification into a correct adopter category was not reliable. While analysis indicated an association between Self-ID and Survey Calculated Innovativeness, it was weak. Over two-thirds of Late Adopters (78%) and one-third of the Early Majority (36%) placed themselves into a higher adopter level. About three-fourths of Innovators (79%) and over one-third of Early Adopters (39%) placed themselves in a lower level of Innovativeness. This conclusion supports Medlin (2001) who found that people do not usually self-identify themselves into the adopter category that they fall in when taking the Hurt, Joseph and Cook's Innovativeness scale. Using the Hurt et al. (2013) Innovativeness Scale to determine adopter category was a more appropriate measure.
3. There was not a significant relationship found between CTE program and Innovativeness.
4. More educators did not know about the ISTE•E Standards before taking the ITIS than those that did have prior knowledge. There is an opportunity to provide training for all educators in the use of ISTE•E Standards to increase technology integration in classrooms.
5. Level of Innovativeness was a key factor when determining level of technology integration in classrooms. Technology was statistically significantly more important and occurred at a higher rate in classrooms with educators with higher levels of Innovativeness (Innovators and Early Adopters) than those at lower levels. While the level of Innovation was higher than the general population (Rogers', 2003), educators

need to be able to easily integrate various technology resources into their pedagogy and feel comfortable teaching technology to students.

6. CTE program had an effect on integration, with Business/Marketing educators integrating technology at higher levels than other programs. Health Sciences and Family and Consumer Sciences integrated technology at lower levels than other programs. An opportunity exists for collaboration between programs to increase technology integration.
7. Type of certification held or completing had a slight impact on technology integration. Certification type was more significant for importance than for frequency of use of ISTE•E Standards. Those with a Class A certification felt that technology was significantly more important than those with a BA/MA Equivalent Tech Ed. certification for ISTE•E Standards overall and the Citizen Standard. While not significant, the same was true for all other categories. Educators in the BA/MA Equivalent Tech Ed. certification path should be provided more information concerning technology integration resources and the ISTE•E Standards.
8. Years of teaching experience did not have a significant impact on technology integration, except that it was obvious that educators with more years of experience did integrate technology more. This was most likely due to the accumulation of technology into the classroom and having it available to teach with.
9. Age did not have a significant impact on technology integration.
10. Gender did have a significant impact on technology integration, with female educators integrating technology at higher rates that male educators.
11. The frequency of use of technology as defined by the ISTE•E Standards had means that were usually between the ratings of 3—Somewhat and 4—Very Often. There is

an opportunity to increase the frequency of use and technology integration by CTE educators in Alabama.

Recommendations

This study begins to close the gap in research concerning secondary CTE educators and technology Innovativeness and integration in classrooms. Understanding educators' Innovativeness, or *willingness-to-change*, and their level of technology integration can help education leaders make better decisions regarding professional development and technology training needs. The following recommendations are made based on the conclusions:

1. Professional development and technology training should be available for all educators to increase competency and raise awareness of the value of technology integration in the classroom. Educators should be competent enough in using technology that they feel they can teach technology to students.
2. Educational leaders and trainers providing technology training should understand the various Innovativeness categories and the characteristics of each. As Rogers' (2003) suggested, knowing the Innovativeness level of participants of a professional development activity or training can be useful to help focus the content. If there is an extreme variation in the Innovativeness levels of participation, it may be worth the effort to separate the group to have more focused discussions.
3. When determining the level of Innovativeness, educators should not Self-ID into adopter category because of personal subjectivity towards adopter categories.
4. Professional development and training needs to be focused across all CTE programs. Specific training for each program should be developed to help educators integrate technology into their pedagogy and everyday classroom environments. This may mean developing lesson plans and programs specific to standards or objectives in

each CTE program to help those who are in the Early Majority and Late Adopter categories be more successful at technology integration.

5. Educators in the Early Majority and Late Adopter categories are looking to those in the Innovator and especially Early Adopter categories for guidance on the use of technology. These educators generally make a very deliberate choice to use technology, choosing the wait-and-see attitude (Rogers, 2003). Late Adopters usually need peer pressure to motivate them to adopt and use technology. Both categories feel safer using technology if activities are ready-made to use with lesson plans. This study also supports Xie et al. (2017) who found that professional development in specific technology uses can be beneficial for educators with less prior technology use and experience in the classroom.
6. Opportunities should be identified and provided for educators in the Innovator and Early Adopter categories in each CTE program area to develop curriculum or specific topics that integrates technology in the classroom. These same educators need to be involved in professional development and technology training of other educators.
7. Institutional and alternative education programs should consider incorporating information about the ISTE•E Standards in their courses throughout the program for all types of educator certification. This is especially true for programs providing BA/MA Equivalent Tech Ed. certifications.
8. To assist technology integration, educators and education leaders should consider instituting one or more of the following: a) campus wide technology integration, b) pairing less technology confident educators with avid technology users c) credentialing educators, d) requiring lesson plans which include various technology integration, and e) utilizing performance tasks for educator evaluations.

9. A follow-up study should be conducted in two to three years to determine if technology integration has increased for educators in all CTE programs.
10. Additional research should target such as questions: What technology do educators use? What technology are students using? What are the preferred professional development and training methods of educators?
11. This study should be repeated in other states.

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Appendix A

ISTE STANDARDS
FOR EDUCATORS

Empowered Professional

1. Learner

Educators continually improve their practice by learning from and with others and exploring proven and promising practices that leverage technology to improve student learning. Educators:

a. Set professional learning goals to explore and apply pedagogical approaches made possible by technology and reflect on their effectiveness.
b. Pursue professional interests by creating and actively participating in local and global learning networks.
c. Stay current with research that supports improved student learning outcomes, including findings from the learning sciences.

2. Leader

Educators seek out opportunities for leadership to support student empowerment and success and to improve teaching and learning. Educators:

a. Shape, advance and accelerate a shared vision for empowered learning with technology by engaging with education stakeholders.
b. Advocate for equitable access to educational technology, digital content and learning opportunities to meet the diverse needs of all students.
c. Model for colleagues the identification, exploration, evaluation, curation and adoption of new digital resources and tools for learning.

3. Citizen

Educators inspire students to positively contribute to and responsibly participate in the digital world. Educators:

a. Create experiences for learners to make positive, socially responsible contributions and exhibit empathetic behavior online that build relationships and community.
b. Establish a learning culture that promotes curiosity and critical examination of online resources and fosters digital literacy and media fluency.
c. Mentor students in the safe, legal and ethical practices with digital tools and the protection of intellectual rights and property.
d. Model and promote management of personal data and digital identity and protect student data privacy.

Learning Catalyst

4. Collaborator

Educators dedicate time to collaborate with both colleagues and students to improve practice, discover and share resources and ideas, and solve problems. Educators:

a. Dedicate planning time to collaborate with colleagues to create authentic learning experiences that leverage technology.
b. Collaborate and co-learn with students to discover and use new digital resources and diagnose and troubleshoot technology issues.
c. Use collaborative tools to expand students' authentic, real-world learning experiences by engaging virtually with experts, teams and students, locally and globally.
d. Demonstrate cultural competency when communicating with students, parents and colleagues and interact with them as co-collaborators in student learning.

5. Designer

Educators design authentic, learner-driven activities and environments that recognize and accommodate learner variability. Educators:

a. Use technology to create, adapt and personalize learning experiences that foster independent learning and accommodate learner differences and needs.
b. Design authentic learning activities that align with content area standards and use digital tools and resources to maximize active, deep learning.
c. Explore and apply instructional design principles to create innovative digital learning environments that engage and support learning.

6. Facilitator

Educators facilitate learning with technology to support student achievement of the 2016 ISTE Standards for Students. Educators:

a. Foster a culture where students take ownership of their learning goals and outcomes in both independent and group settings.
b. Manage the use of technology and student learning strategies in digital platforms, virtual environments, hands-on makerspaces or in the field.
c. Create learning opportunities that challenge students to use a design process and computational thinking to innovate and solve problems.
d. Model and nurture creativity and creative expression to communicate ideas, knowledge or connections.

7. Analyst

Educators understand and use data to drive their instruction and support students in achieving their learning goals. Educators:

a. Provide alternative ways for students to demonstrate competency and reflect on their learning using technology.
b. Use technology to design and implement a variety of formative and summative assessments that accommodate learner needs, provide timely feedback to students and inform instruction.
c. Use assessment data to guide progress and communicate with students, parents and education stakeholders to build student self-direction.

ISTE

iste.org/standards

ISTE Standards Essential Conditions

ISTE

Learn Membership Standards Events About

ESSENTIAL CONDITIONS

The ISTE Essential Conditions are the 14 critical elements necessary to effectively leverage technology for learning. They offer educators and school leaders a research-backed framework to guide implementation of the ISTE Standards, tech planning and systemwide change.

Learn more about each condition below and find out how they apply to your school or district. Share the information with your colleagues!

For a deeper look into your school or district's strengths and weaknesses, use the Lead & Transform Diagnostic Tool to generate a free custom report that will help guide your tech integration planning based on the Essential Conditions.

Shared Vision

Proactive leadership develops a shared vision for educational technology among all education stakeholders, including teachers and support staff, school and district administrators, teacher educators, students, parents and the community.

Empowered Leaders

Stakeholders at every level are empowered to be leaders in effecting change.

Implementation Planning

All stakeholders follow a systematic plan aligned with a shared vision for school effectiveness and student learning through the infusion of information and communication technology (ICT) and digital learning resources.

Consistent and Adequate Funding

Ongoing funding supports technology infrastructure, personnel, digital resources and staff development.

Equitable Access

All students, teachers, staff and school leaders have robust and reliable connectivity and access to current and emerging technologies and digital resources.

Skilled Personnel

Educators, support staff and other leaders are skilled in the selection and effective use of appropriate ICT resources.

Ongoing Professional Learning

Educators have ongoing access to technology-related professional learning plans and opportunities as well as dedicated time to practice and share ideas.

Technical Support

Educators and students have access to reliable assistance for maintaining, renewing and using ICT and digital learning resources.

Curriculum Framework

Content standards and related digital curriculum resources align with and support digital age learning and work.

Student-Centered Learning

Planning, teaching and assessment all center on the needs and abilities of the students.

Assessment and Evaluation

Teaching, learning, leadership and the use of ICT and digital resources are continually assessed and evaluated.

Engaged Communities

Leaders and educators develop and maintain partnerships and collaboration within the community to support and fund the use of ICT and digital learning resources.

Support Policies

Policies, financial plans, accountability measures and incentive structures support the use of ICT and other digital resources for both learning and district/school operations.

Supportive External Context

Policies and initiatives at the national, regional and local levels support schools and teacher preparation programs in the effective implementation of technology for achieving curriculum and learning technology (ICT) standards.

Website: https://www.iste.org/standards/essential-conditions

Appendix B

Table B1.

Career & Technical Education Career Clusters as identified by ALSDE

Career and Technical Career Clusters	
1. Agriculture, Food, and Natural Resources	8. Health Science
2. Architecture and Construction	9. Hospitality and Tourism
3. Arts, Audio-Video Technology and Communications	10. Human Services
4. Business, Management, and Administration	11. Information Technology
5. Education and Training	12. Law, Public Safety, Corrections, and Security
6. Finance	13. Manufacturing
7. Government and Public Administration	14. Marketing, Sales, and Service
	15. Science Technology Engineering, and Mathematics
	16. Transportation, Distribution, and Logistics

Note: From Alabama Learning Exchange, 2017.

Table B2.

Career & Technical Teaching Fields as identified by ALDSE

Career and Technical Teaching Fields		
Agriscience Education	Cosmetology Culinary Arts	Innovations in Science &
Business/Marketing Ed.	Database Design	Technologies
Career Technologies	Diesel Technology	Integrated Production Tech.
Family & Consumer	Drafting Design Technology	Law Enforcement
Sciences Ed.	Electrical Technology	Legal Services Manufacturing
Health Science	Electronics Technology	Marine Technology
Technical Education:	Emergency & Fire Mngt Serv.	Masonry
Advertising Design	Engineering	Network Systems &
Animation	Global Logistics & Supply	Computer Services
Automotive Service	Chain Mngt	Plumbing
Aviation Technology	Graphic Arts	Power Equipment
Building Construction	Health Informatics	Precision Machining
Cabinetmaking	HVACR	Programming & Software
Carpentry	Ind. Maintenance – Electrical	Development
Clean Energy	& Instrumentation	Television Production
Collision Repair	Ind. Maintenance—	Welding
Commercial Photography	Mechanical	Working in Multicultural
Computer Electronics	Informatics	Environments: Korean

Note: From ALSDE, 2018

Appendix C

Initial Email for ITI Survey

Hello CTE Educator,
You are invited and encouraged to participate in a research study to collect information on the CTE educators' innovativeness and technology integration in the classroom. Besides being a survey developed to fulfill the requirements of a PhD dissertation, the survey will provide valuable information about your innovativeness, use of technology, and how important technology is to you in your classroom. The information you provide is entirely anonymous and extremely valuable.

This first link will take you to the survey, which should take 15-20 minutes to complete. If the link does not work, please copy and paste the URL.

www.aub.ie/itisurvey or

This second link will take you to a detailed information letter about the survey. If the link does not work, please copy and paste the URL.

www.aub.ie/itisurvey_info_consent_letter

Submitting the survey represents your consent to participate in the study. Having read the information provided, you must decide if you want to participate in this survey. If you decide to participate, the data you provide will serve as your agreement to do so. If you change your mind about participating, you can withdraw at any time by closing your browser window. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Once you have submitted anonymous data, it cannot be withdrawn since it will be unidentifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, the Department of Curriculum and Teaching, or the Business/Marketing Education program.

If you have questions or would like a copy of the results, please contact me, Elizabeth Diamond atelizabethdiamond@auburn.edu.

The Auburn University Institutional Review Board has approved this document for use on May 11, 2018. Protocol #18-194 EX 1805.

Thank you very much, in advance, for your time.

Sincerely,
S.Elizabeth Alley Diamond
Graduate Teaching Assistant
PhD Candidate, Career and Technical Education
Auburn University, AL 36849
0301 Haley Center (Office)
5040 Haley Center (Mailing)
sea0033@auburn.edu
elizabethdiamond@auburn.edu
334-844-3810 (Office, no voice mail)

Follow-up Email for ITI Survey

Dear CTE Educator:

Earlier this week you were invited to participate in a survey about your technology innovativeness and use of technology in your classroom. It should take about 15 minutes and is anonymous. It is being conducted as part of dissertation research and will provide valuable information about your use of technology and integration in the classroom.

I would like to urge you to take the time to complete this survey. The information it will provide is extremely valuable. If you have already completed it, thank you!

This first link will take you to the survey, which should take about 15 minutes to complete. If the link does not work, please copy and paste the URL.

www.aub.ie/itisurvey or

This second link will take you to a detailed information letter about the survey. If the link does not work, please copy and paste the URL.

www.aub.ie/itisurvey_info_consent_letter

Submitting the survey represents your consent to participate in the study. Having read the information provided, you must decide if you want to participate in this survey. If you decide to participate, the data you provide will serve as your agreement to do so. If you change your mind about participating, you can withdraw at any time by closing your browser window. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Once you have submitted anonymous data, it cannot be withdrawn since it will be unidentifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, the Department of Curriculum and Teaching, or the Business/Marketing Education program.

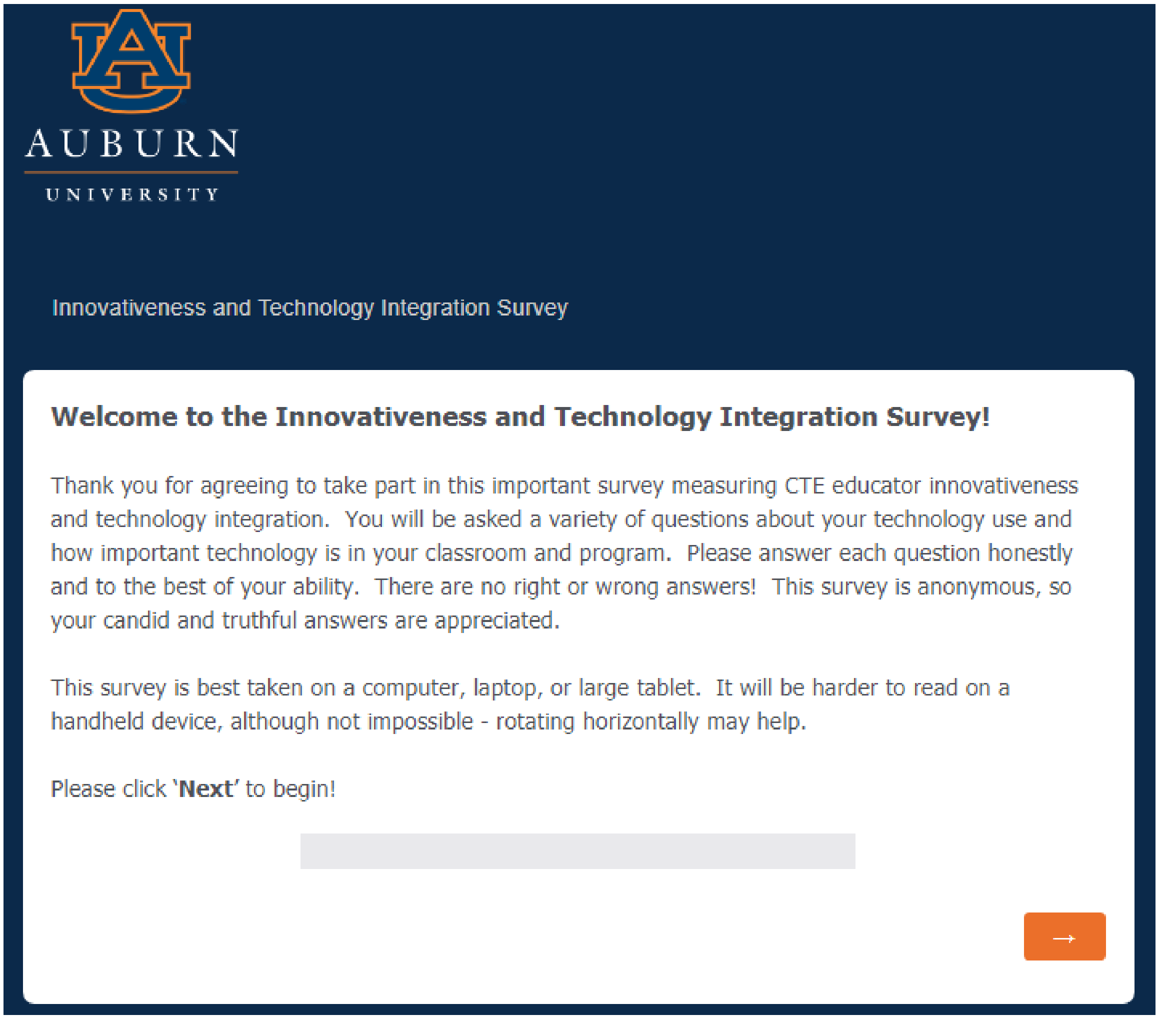
If you have questions or would like a copy of the results, please contact me, Elizabeth Diamond at elizabethdiamond@auburn.edu.

The Auburn University Institutional Review Board has approved this document for use on May 11, 2018. Protocol #18-194 EX 1805.

Thank you very much, in advance, for your time.

Sincerely,
S.Elizabeth Alley Diamond
Graduate Teaching Assistant
PhD Candidate, Career and Technical Education
Auburn University, AL 36849
5040 Haley Center (Mailing)
elizabethdiamond@auburn.edu
334-844-3810 (Office, no voice mail)

Innovativeness and Technology Integration Survey: Email Version



Innovativeness and Technology Integration Survey

Welcome to the Innovativeness and Technology Integration Survey!

Thank you for agreeing to take part in this important survey measuring CTE educator innovativeness and technology integration. You will be asked a variety of questions about your technology use and how important technology is in your classroom and program. Please answer each question honestly and to the best of your ability. There are no right or wrong answers! This survey is anonymous, so your candid and truthful answers are appreciated.

This survey is best taken on a computer, laptop, or large tablet. It will be harder to read on a handheld device, although not impossible - rotating horizontally may help.

Please click '**Next**' to begin!

→

Read the following statements.
Select the statement that best describes you.
(FYI - this is the longest question. The rest are much shorter.)

- I would say I am obsessed with technology. I love trying out new technologies and will usually be the first of my friends or colleagues to buy it or use it. I can't wait to get my hands on it.
- I seem to use new technologies earlier than most people around me, though I will wait a bit to make an informed decision about using it. I like to explore new options. I often will share my knowledge of new technologies with my friends and colleagues to help them begin to use the technology.
- I will use new technologies once I know it will benefit me or my classroom and after I know all the "bugs" are worked out. I consider myself thoughtful and careful about trying something new. I usually need someone to show me how to specifically use it.
- I am skeptical to try to new technologies. I need to know that the new technology will benefit me or my students before I spend time to learn how to use it and integrate it into my classroom.
- I do not like to use new technologies and will only do so if I must. I prefer to do things the old fashion way, and will use technology if I must.

For this set of questions, please answer as truthfully as possible.

Using the scale, rate how each statement describes you.

5 = Strongly Agree, 4 = Agree, 3 = Undecided, 2 = Disagree, 1 = Strongly Disagree.

	5	4	3	2	1
My peers often ask me for advice or information using technology.	O	O	O	O	O
I enjoy trying out new ideas or technology.	O	O	O	O	O
I seek out new ways to do things using technology.	O	O	O	O	O
I am generally cautious about accepting new ideas or technology.	O	O	O	O	O
I frequently improvise methods for solving problems when an answer is not apparent.	O	O	O	O	O
I am suspicious of new inventions, new technologies or new ways of thinking.	O	O	O	O	O
I rarely trust new ideas or new technology until I can see whether the vast majority of people around me accept them.	O	O	O	O	O
I feel that I am an influential member of my peer group.	O	O	O	O	O
I consider myself to be creative and original in my thinking and behavior.	O	O	O	O	O
I am aware that I am usually one of the last people in my group to accept something new.	O	O	O	O	O
I am an inventive kind of person.	O	O	O	O	O
I enjoy taking part in the leadership responsibilities of the group I belong to.	O	O	O	O	O

I am reluctant about adopting new way of doing things or new technologies until I see them working for people around me.	O	O	O	O	O
I find it stimulating to be original in my thinking and behavior.	O	O	O	O	O
I tend to feel that the old way of living and doing things is the best way.	O	O	O	O	O
I am challenged by ambiguities and unsolved problems.	O	O	O	O	O
I must see other people using new innovations or technology before I will consider them.	O	O	O	O	O
I am receptive to new ideas and new technology.	O	O	O	O	O
I am challenged by unanswered questions.	O	O	O	O	O
I often find myself skeptical of new ideas and new technology.	O	O	O	O	O

This section covers technology related practices, skills, and activities that are important for a 21st century classroom. These Standards are part of the new *2017 ISTE Standards for Educators* (International Society for Technology in Education) and are divided into 7 short sections.

The 1st column lists the **Standard.**

In the 2nd column, indicate how ***important*** you feel the standard is by clicking the appropriate box.
The response categories are:
5 = Very Important; 4 = Important; 3 = Undecided; 2 = Somewhat Important; 1 = Not Important

In the 3rd column, indicate how ***frequently*** you implement each standard by clicking the appropriate box.
The response categories are:
5 = Always; 4 = Very Often; 3 = Sometimes; 2 = Rarely; 1 = Never

Please click '**Next**' to continue!

With regard to being a Learner, as a teacher, I...
Rate each question.

	How important is the standard to you? 5 = Very Important to 1 = Not important					How frequently do you implement the standard? 5 = Always to 1 = Never				
	5 Very Important	4 Important	3 Undecided	2 Somewhat Important	1 Not Important	5 Always	4 Very Often	3 Sometimes	2 Rarely	1 Never
Participate in learning networks to pursue professional learning interests.										
Set PD goals related to using technology in my classroom.										
Stay current with educational research.										

With regard to being a Leader, as a teacher, I...
Rate each question.

	How important is the standard to you? 5 = Very Important to 1 = Not important					How frequently do you implement the standard? 5 = Always to 1 = Never				
	5 Very Important	4 Important	3 Undecided	2 Somewhat Important	1 Not Important	5 Always	4 Very Often	3 Sometimes	2 Rarely	1 Never
Work with other school leaders to ensure a shared vision for technology use in the classroom.										
Advocate for equitable technology use to meet the diverse needs of students.										
Model for colleagues adoption and use of various digital resources and tools for learning.										

With regard to being a Citizen, as a teacher, I...

Rate each question.

	How important is the standard to you? 5 = Very Important to 1 = Not important					How frequently do you implement the standard? 5 = Always to 1 = Never				
	5 Very Important	4 Important	3 Undecided	2 Somewhat Important	1 Not Important	5 Always	4 Very Often	3 Sometimes	2 Rarely	1 Never
Create experiences for students to make positive, socially responsible decisions while using the internet.	○	○	○	○	○	○	○	○	○	○
Establish a classroom culture that promotes critical examination of online resources.	○	○	○	○	○	○	○	○	○	○
Establish a learning culture that fosters digital literacy.	○	○	○	○	○	○	○	○	○	○
Establish a learning culture that fosters media fluency.	○	○	○	○	○	○	○	○	○	○
Mentor students in safe, legal and ethical practices of digital tools.	○	○	○	○	○	○	○	○	○	○
Promote student understanding of the importance of the protection of intellectual rights and property.	○	○	○	○	○	○	○	○	○	○
Promote responsible management of personal data and digital identity.	○	○	○	○	○	○	○	○	○	○

With regard to being a Collaborator, as a teacher, I...

Rate each question.

	How important is the standard to you? 5 = Very Important to 1 = Not important					How frequently do you implement the standard? 5 = Always to 1 = Never				
	5 Very Important	4 Important	3 Undecided	2 Somewhat Important	1 Not Important	5 Always	4 Very Often	3 Sometimes	2 Rarely	1 Never
Dedicate planning time to collaborate with colleagues to create authentic student learning experiences leveraging technology.	○	○	○	○	○	○	○	○	○	○
Collaborate with students to discover and use digital resources.	○	○	○	○	○	○	○	○	○	○
Collaborate and co-learn with students to diagnose and troubleshoot technology issues.	○	○	○	○	○	○	○	○	○	○
Expand students' authentic, real-world learning experiences by engaging virtually with experts and others.	○	○	○	○	○	○	○	○	○	○
Demonstrate cultural competency when communicating with parents, students, and colleagues.	○	○	○	○	○	○	○	○	○	○
Interact with parents as co-collaborators in student learning.	○	○	○	○	○	○	○	○	○	○
Interact with colleagues as co-collaborators in student learning.	○	○	○	○	○	○	○	○	○	○
Interact with students as co-collaborators in their learning.	○	○	○	○	○	○	○	○	○	○

With regard to being a Designer, as a teacher, I...
Rate each question.

	How important is the standard to you? 5 = Very Important to 1 = Not important					How frequently do you implement the standard? 5 = Always to 1 = Never				
	5 Very Important	4 Important	3 Undecided	2 Somewhat Important	1 Not Important	5 Always	4 Very Often	3 Sometimes	2 Rarely	1 Never
Use technology to personalize learning experiences that fosters independent learning.										
Accommodate learner differences and needs using technology.										
Design technology related learning activities that align with content area standards.										
Use digital tools and resources to maximize learning.										
Apply instructional design principles to create innovative digital learning environments.										

With regard to being a Facilitator, as a teacher, I...
Rate each question.

	How important is the standard to you? 5 = Very Important to 1 = Not important					How frequently do you implement the standard? 5 = Always to 1 = Never				
	5 Very Important	4 Important	3 Undecided	2 Somewhat Important	1 Not Important	5 Always	4 Very Often	3 Sometimes	2 Rarely	1 Never
Foster a culture where students take ownership of their learning goals.										
Manage the use of technology and learning strategies in a variety of situations (i.e. digital platforms, virtual environments, hands-on makerspaces, in the field).										
Create opportunities for students to innovate and solve problems using technology.										
Model and encourage creative expression to communicate ideas and knowledge.										

With regard to being a Analyst, as a teacher, I...
Rate each question.

	How important is the standard to you? 5 = Very Important to 1 = Not important					How frequently do you implement the standard? 5 = Always to 1 = Never				
	5 Very Important	4 Important	3 Undecided	2 Somewhat Important	1 Not Important	5 Always	4 Very Often	3 Sometimes	2 Rarely	1 Never
Provide alternative ways for students to demonstrate competency using technology.	○	○	○	○	○	○	○	○	○	○
Provide alternative ways for students to reflect on their learning using technology.	○	○	○	○	○	○	○	○	○	○
Use technology to design and implement formative and summative assessments.	○	○	○	○	○	○	○	○	○	○
Use technology to provide timely feedback to students.	○	○	○	○	○	○	○	○	○	○
Use technology to guide my instruction.	○	○	○	○	○	○	○	○	○	○
Use assessment to guide student progress and self-direction.	○	○	○	○	○	○	○	○	○	○
Use assessment to communicate with parents about student progress and self-direction.	○	○	○	○	○	○	○	○	○	○

In this final section, please tell us about yourself.

Indicate the best answer for the following:

What is your gender?
Select one:

○ Male
○ Female

What year were you born?
Type in the 4 digital number.

[ ]

In what Career and Technical Teaching Field(s) do you currently teach?
Check all that apply.

☐ Agriculture, Food and Natural Resources
☐ Business/Marketing Education
☐ Family and Consumer Sciences Education
☐ Health Science education
☐ Technical/Trade/Industry education
☐ Other [ ]

List the program(s) you teach:
(i.e. Carpentry, Public Safety, Finance, Horticulture, etc.)

How many years total have you been teaching in the secondary Career and Technical Education program area?
Type in a number:

Select the county where you teach.

- Autauga
- Baldwin
- Barbour
- Bibb
- Blount
- Bullock
- Butler
- Calhoun
- Chambers
- Cherokee

What is the highest certification you have or are completing? *Choose one*
If you have more than one, **ALSO** select *Other* and Explain.

- ☐ Class B (Bachelor's degree)
- ☐ Class A (Master's degree)
- ☐ Class AA (Ed. Specialist or Sixth-year Equivalent Technical Education Certificate)
- ☐ CTE Temporary Certification (CTE T)
- ☐ Bachelor/Master's Degree Equivalent Technical Education Certificate
- ☐ Provisional Certificate in a CTE Teaching Field (PCCT: previously CT ABC approach)
- ☐ Emergency Certification
- ☐ Substitute Teacher License
- ☐ Other: Please describe

Please indicate your estimated years to retirement. *Indicate in number of years.*

Before completing this survey, were you aware of the ISTE Standards for Educators?

- ○ Yes
- ○ No

Is there any additional information about technology use, integration, and innovativeness you would like to share? Please list below.

Innovativeness and Technology Integration Survey: Paper Version

Innovativeness and Technology Integration Survey

Technology use and beliefs of CTE Educators

To help improve teacher technology training

COMPLETE this survey on paper and RETURN to the boxes at door or the registration desk

(IF YOU COMPLETED THIS SURVEY in May via email, please do not submit another one)

AUBURN UNIVERSITY

Primary Researcher: Elizabeth Diamond
PhD Candidate, Career and Technical Education
5040 Haley Center, Auburn University, AL 36849
elizabethdiamond@auburn.edu

Please remove this sheet before returning the survey, to keep for your information.

AUBURN
UNIVERSITY

College of Education

Curriculum & Teaching

The Auburn University Institutional Review Board has approved this Document for use from 07/16/2018 to --- Protocol # 18-194 EX 1805

(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS AN IRB APPROVAL STAMP WITH CURRENT DATES HAS BEEN APPLIED TO THIS DOCUMENT.)

INFORMATION LETTER
for a Research Study entitled
"Innovation & Integration of Technology in the Classroom by CTE Educators"

You are invited to participate in a research study to collect information on the use and integration of technology in your classroom as a Career and Technical Education educator. The study is being conducted by Elizabeth Diamond, PhD candidate, under the direction of Dr. Leane Skinner, Professor and Program Coordinator of Business/Marketing Education in the Auburn University Department of Curriculum and Teaching. You are invited to participate because you are a Career and Technical Education secondary teacher, teaching at least one class in a career cluster, and are age 19 or older.

What will be involved if you participate? If you decide to participate in this research study, you will be asked to complete and submit this paper survey. Your total time commitment will be approximately 15 minutes.

Are there any risks or discomforts? The are no risks associated with participating in this study.

Are there any benefits to yourself or others? If you participate in this study, you will be assisting in providing valuable information concerning the use and integration of technology in CTE classrooms. This information will be helpful in improving teacher technology training.

If you change your mind about participating, you can withdraw at any time during the study. Your participation is completely voluntary. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, the Department of Curriculum and Teaching or the Business/Marketing Education program.

Any data obtained in connection with this study will remain anonymous. We will protect your privacy and the data you provide by not having any identifiable information on the survey itself. Information collected through your participation may be published as part of a dissertation to fulfill an education requirement, published in a professional journal or magazine, and/or presented at a professional meeting.

If you have questions about this study, contact Elizabeth Diamond at sea0033@auburn.edu.

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Research Compliance or the Institutional Review Board by phone (334)-844-5966 or e-mail at IRBadmin@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE IF YOU WANT TO PARTICIPATE IN THIS RESEARCH PROJECT. IF YOU DECIDE TO PARTICIPATE, THE DATA YOU PROVIDE WILL SERVE AS YOUR AGREEMENT TO DO SO. THIS LETTER IS YOURS TO KEEP.

Sincerely,
Elizabeth Diamond
PhD Candidate, Career and Technical Education

The Auburn University Institutional Review Board has approved this document for use on May 11, 2018. Protocol #18-194 EX 1805.

5040 Haley Center
Auburn, AL 36849-5212

Telephone:
334-844-4434

Fax:
334-844-6789

www.auburn.edu

ITI SURVEY - **This survey has 3 short sections. Please read each section and answer.**

Section 1: Read each short statement. Using the scale, rate how each statement describes you, by placing an X in the box. ANSWER AS TRUTHFULLY AS POSSIBLE. There are no wrong answers!

5 = Strongly Agree (SA), 4 = Agree (A), 3 = Undecided (U), 2 = Disagree (D), 1 = Strongly Disagree (SD)

	5-SA	4-A	3-U	2-D	1-SD
My peers often ask me for advice or information using technology.	☐	☐	☐	☐	☐
I enjoy trying out new ideas or technology.	☐	☐	☐	☐	☐
I seek out new ways to do things using technology.	☐	☐	☐	☐	☐
I am generally cautious about accepting new ideas or technology.	☐	☐	☐	☐	☐
I frequently improvise methods for solving problems when an answer is not apparent.	☐	☐	☐	☐	☐
I am suspicious of new inventions, new technologies or new ways of thinking.	☐	☐	☐	☐	☐
I rarely trust new ideas or new technology until I can see whether the vast majority of people around me accept them.	☐	☐	☐	☐	☐
I feel that I am an influential member of my peer group.	☐	☐	☐	☐	☐
I consider myself to be creative and original in my thinking and behavior.	☐	☐	☐	☐	☐
I am aware that I am usually one of the last people in my group to accept something new.	☐	☐	☐	☐	☐
I am an inventive kind of person.	☐	☐	☐	☐	☐
I enjoy taking part in the leadership responsibilities of the group I belong to.	☐	☐	☐	☐	☐
I am reluctant about adopting new way of doing things or new technologies until I see them working for people around me.	☐	☐	☐	☐	☐
I find it stimulating to be original in my thinking and behavior.	☐	☐	☐	☐	☐
I tend to feel that the old way of living and doing things is the best way.	☐	☐	☐	☐	☐
I am challenged by ambiguities and unsolved problems.	☐	☐	☐	☐	☐
I must see other people using new innovations or technology before I will consider them.	☐	☐	☐	☐	☐
I am receptive to new ideas and new technology.	☐	☐	☐	☐	☐
I am challenged by unanswered questions.	☐	☐	☐	☐	☐
I often find myself skeptical of new ideas and new technology.	☐	☐	☐	☐	☐

Read the following statements. Place an X in the box of the statement that BEST DESCRIBES YOU.

- ☐ I would say I am obsessed with technology. I love trying out new technologies and will usually be the first of my friends or colleagues to buy it or use it. I can't wait to get my hands on it.
- ☐ I seem to use new technologies earlier than most people around me, though I will wait a bit to make an informed decision about using it. I like to explore new options. I often will share my knowledge of new technologies with my friends and colleagues to help them begin to use the technology.
- ☐ I will use new technologies once I know it will benefit me or my classroom and after I know all the "bugs" are worked out. I consider myself thoughtful and careful about trying something new. I usually need someone to show me how to specifically use it.
- ☐ I am skeptical to try to new technologies. I need to know that the new technology will benefit me or my students before I spend time to learn how to use it and integrate it into my classroom.
- ☐ I do not like to use new technologies and will only do so if I must. I prefer to do things the old fashion way and will use technology if I must.

Section 2: This section covers technology related practices, skills, and activities that are important for a 21st century classroom. These Standards are part of the new 2017 ISTE Standards for Educators (International Society for Technology in Education) and are divided into 7 small groups.

The **1st column** lists the Standard.

In the **2nd column**, indicate how important you feel the standard is by placing an X in the appropriate box. The response categories are:
5 = Very Important; 4 = Important; 3 = Undecided; 2 = Somewhat Important; 1 = Not Important

In the **3rd column**, indicate how frequently you implement each standard by clicking the appropriate box. The response categories are:
5 = Always; 4 = Very Often; 3 = Sometimes; 2 = Rarely; 1 = Never

Answer as truthfully as possible – there are no wrong answers!

Group 1:

With regard to being a Learner, as a teacher, I...

Rate each question:	How important is the standard to you? *5 = Very Important to 1 = Not important*					How frequently do you implement the standard? *5 = Always to 1 = Never*				
	5	4	3	2	1	5	4	3	2	1
Participate in learning networks to pursue professional learning interests.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Set PD goals related to using technology in my classroom.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Stay current with educational research.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Group 2:

With regard to being a Leader, as a teacher, I...

Rate each question:	How important is the standard to you? *5 = Very Important to 1 = Not important*					How frequently do you implement the standard? *5 = Always to 1 = Never*				
	5	4	3	2	1	5	4	3	2	1
Work with other school leaders to ensure a shared vision for technology use in the classroom.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Advocate for equitable technology use to meet the diverse needs of students.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Model for colleagues adoption and use of various digital resources and tools for learning.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Group 3:

With regard to being a Citizen, as a teacher, I...

Rate each question:	How important is the standard to you? *5 = Very Important to 1 = Not important*					How frequently do you implement the standard? *5 = Always to 1 = Never*				
	5	4	3	2	1	5	4	3	2	1
Create experiences for students to make positive, socially responsible decisions while using the internet.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Establish a classroom culture that promotes critical examination of online resources.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Establish a learning culture that fosters digital literacy.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Establish a learning culture that fosters media fluency.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Mentor students in safe, legal and ethical practices of digital tools.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Promote student understanding of the importance of the protection of intellectual rights and property.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Promote responsible management of personal data and digital identity.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Group 4:

With regard to being a Collaborator, as a teacher, I...

Rate each question:	How important is the standard to you? *5 = Very Important to 1 = Not important*					How frequently do you implement the standard? *5 = Always to 1 = Never*				
	5	4	3	2	1	5	4	3	2	1
Dedicate planning time to collaborate with colleagues to create authentic student learning experiences leveraging technology.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Collaborate with students to discover and use digital resources.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Collaborate and co-learn with students to diagnose and troubleshoot technology issues.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Expand students' authentic, real-world learning experiences by engaging virtually with experts and others.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Demonstrate cultural competency when communicating with parents, students, and colleagues.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Interact with parents as co-collaborators in student learning.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Interact with colleagues as co-collaborators in student learning.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Interact with students as co-collaborators in their learning.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Group 5:

With regard to being a Designer, as a teacher, I...

Rate each question:	How important is the standard to you? *5 = Very Important to 1 = Not important*					How frequently do you implement the standard? *5 = Always to 1 = Never*				
	5	4	3	2	1	5	4	3	2	1
Use technology to personalize learning experiences that fosters independent learning.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Accommodate learner differences and needs using technology.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Design technology related learning activities that align with content area standards.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Use digital tools and resources to maximize learning.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Apply instructional design principles to create innovative digital learning environments.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Group 6:

With regard to being a Facilitator, as a teacher, I...

Rate each question:	How important is the standard to you? *5 = Very Important to 1 = Not important*					How frequently do you implement the standard? *5 = Always to 1 = Never*				
	5	4	3	2	1	5	4	3	2	1
Foster a culture where students take ownership of their learning goals.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Manage the use of technology and learning strategies in a variety of situations (i.e. digital platforms, virtual environments, hands-on makerspaces, in the field).	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Create opportunities for students to innovate and solve problems using technology.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Model and encourage creative expression to communicate ideas and knowledge.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Group 7:

With regard to being a Analyst, as a teacher, I...

Rate each question:

	How important is the standard to you? *5 = Very Important to 1 = Not important*					How frequently do you implement the standard? *5 = Always to 1 = Never*				
	5	4	3	2	1	5	4	3	2	1
Provide alternative ways for students to demonstrate competency using technology.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Provide alternative ways for students to reflect on their learning using technology.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Use technology to design and implement formative and summative assessments.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Use technology to provide timely feedback to students	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Use technology to guide my instruction.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Use assessment to guide student progress and self-direction.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Use assessment to communicate with parents about student progress and self-direction.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Section 3: In this final section, please tell us about yourself. Indicate the best answers for the following:

What is your gender? Select one: ☐ Male ☐ Female

What year were you born? 19_______

In what Career and Technical Teaching Field(s) do you currently teach? Check all that apply:

- ☐ Agriculture, Food and Natural Resources
- ☐ Business/Marketing Education
- ☐ Family and Consumer Sciences Education
- ☐ Health Science education
- ☐ Technical/Trade/Industry education
- ☐ Other (please indicate): ________________

List the program(s) you teach: (i.e. Carpentry, Public Safety, Finance, Horticulture, etc.)

____

____

How many years total have you been teaching in the secondary CTE? (Write a number): __________

In what county do you teach: ____

What is the highest certification you have or are completing? Choose one:
*(If you have more than one, ALSO select **Other** and explain)*

- ☐ Class B (Bachelor's degree)
- ☐ Class A (Master's degree)
- ☐ Class AA (Ed. Specialist or Sixth-year Equivalent Technical Education Certificate)
- ☐ CTE Temporary Certification (CTE T)
- ☐ Other (please describe): ____________________
- ☐ Bachelor/Master's Degree Equivalent Technical Education Certificate
- ☐ Provisional Certificate in a CTE Teaching Field (PCCT: previously CT ABC approach)
- ☐ Emergency Certification
- ☐ Substitute Teacher License

Please indicate your estimated years to retirement. Indicate in number of years: ______________

Before completing this survey, were you aware of the ISTE Standards for Educators? ☐ Yes ☐ No

Is there any additional information about technology use, integration, and innovativeness you would like to share?

____

____

Thank You for Your Participation!

Appendix D

IRB Research Protocol Review Form

AUBURN UNIVERSITY INSTITUTIONAL REVIEW BOARD for RESEARCH INVOLVING HUMAN SUBJECTS

RESEARCH PROTOCOL REVIEW FORM

FULL BOARD or EXPEDITED

For Information or help contact THE OFFICE OF RESEARCH COMPLIANCE (ORC), 115 Ramsay Hall, Auburn University
Phone: 334-844-5966 **e-mail:** IRBAdmin@auburn.edu **Web Address:** http://www.auburn.edu/research/vpr/ohs/index.htm

Revised 2.1.2014 **Submit completed form to IRBsubmit@auburn.edu or 115 Ramsay Hall, Auburn University 36849.**

Form must be populated using Adobe Acrobat / Pro 9 or greater standalone program (do not fill out in browser). Hand written forms will not be accepted.

1. **PROPOSED START DATE of STUDY:** 4/10/2018

PROPOSED REVIEW CATEGORY (Check one): ☐ FULL BOARD ☑ EXPEDITED

SUBMISSION STATUS (Check one): ☑ NEW ☐ REVISIONS (to address IRB Review Comments)

2. **PROJECT TITLE:** Evaluation of hte Use of Technology, Innovative Instructional Strategies, and the ISTE Standards in CTE using the Technology Acceptance Model

3.

Sarah Elizabeth Diamond	GTA	Curriculum and Teachi	sea0033@auburn.edu
PRINCIPAL INVESTIGATOR	**TITLE**	**DEPT**	**AU E-MAIL**
5040 Haley Center, Auburn Univ., AL 36849		334-844-3810	diamond9429@gmail.com
MAILING ADDRESS		**PHONE**	**ALTERNATE E-MAIL**

4. **FUNDING SUPPORT:** ☑ N/A ☐ Internal ☐ External Agency: ____________ ☐ Pending ☐ Received

For federal funding, list agency and grant number (if available). ____________

5a. List any contractors, sub-contractors, other entities associated with this project:

Alabama Department of Education

b. List any other IRBs associated with this project (including Reviewed, Deferred, Determination, etc.):

____

PROTOCOL PACKET CHECKLIST

All protocols must include the following items:

- ☐ Research Protocol Review Form (All signatures included and all sections completed)
  (Examples of appended documents are found on the OHSR website: http://www.auburn.edu/research/vpr/ohs/sample.htm)
- ☐ CITI Training Certificates for all Key Personnel.
- ☐ Consent Form or Information Letter and any Releases (audio, video or photo) that the participant will sign.
- ☐ Appendix A, "Reference List"
- ☐ Appendix B if e-mails, flyers, advertisements, generalized announcements or scripts, etc., are used to recruit participants.
- ☐ Appendix C if data collection sheets, surveys, tests, other recording instruments, interview scripts, etc. will be used for data collection. Be sure to attach them in the order in which they are listed in # 13c.
- ☐ Appendix D if you will be using a debriefing form or include emergency plans/procedures and medical referral lists (A referral list may be attached to the consent document).
- ☐ Appendix E if research is being conducted at sites other than Auburn University or in cooperation with other entities. A permission letter from the site / program director must be included indicating their cooperation or involvement in the project. NOTE: If the proposed research is a multi-site project, involving investigators or participants at other academic institutions, hospitals or private research organizations, a letter of IRB approval from each entity is required prior to initiating the project.
- ☐ Appendix F - Written evidence of acceptance by the host country if research is conducted outside the United States.

FOR ORC OFFICE USE ONLY

DATE RECEIVED IN ORC: ______ by ______		PROTOCOL # ______	
DATE OF IRB REVIEW: ______ by ______		APPROVAL CATEGORY: ______	
DATE OF IRB APPROVAL: ______ by ______		INTERVAL FOR CONTINUING REVIEW: ______	
COMMENTS:			

6. **GENERAL RESEARCH PROJECT CHARACTERISTICS**

6A. Research Methodology

Please check all descriptors that best apply to the research methodology.

Data Source(s): ☑ New Data ☐ Existing Data

Will recorded data directly or indirectly identify participants?
☐ Yes ☑ No

Data collection will involve the use of:

- Educational Tests (cognitive diagnostic, aptitude, etc.)
- Interview
- Observation
- Location or Tracking Measures
- Physical / Physiological Measures or Specimens (see Section 6E.)
- ✓ Surveys / Questionnaires
- ✓ Internet / Electronic
- Audio
- Video
- Photos
- Digital images
- Private records or files

Other: ______________________________

6B. Participant Information

Please check all descriptors that apply to the target population.
☑ Males ☑ Females ☐ AU students

Vulnerable Populations
☐ Pregnant Women/Fetuses ☐ Prisoners ☐ Institutionalized
☐ Children and/or Adolescents (under age 19 in AL)

Persons with:
☐ Economic Disadvantages ☐ Physical Disabilities
☐ Educational Disadvantages ☐ Intellectual Disabilities

Do you plan to compensate your participants? ☐ Yes ☑ No

6C. Risks to Participants

Please identify all risks that participants might encounter in this research.

☐ Breach of Confidentiality* ☐ Coercion
☐ Deception ☐ Physical
☐ Psychological ☐ Social
☑ None
☐ Other:

*Note that if the investigator is using or accessing confidential or identifiable data, breach of confidentiality is always a risk.

6D. Corresponding Approval/Oversight

- Do you need IBC Approval for this study?
  ☐ Yes ☑ No

  If yes, BUA #______________ Expiration date ______________

- Do you need IACUC Approval for this study?
  ☐ Yes ☑ No

  If yes, PRN #______________ Expiration date ______________

- Does this study involve the Auburn University MRI Center?
  ☐ Yes ☑ No

  Which MRI(s) will be used for this project? (Check all that apply)
  ☐ 3T ☐ 7T

  Does any portion of this project require review by the MRI Safety Advisory Council?
  ☐ Yes ☑ No

  Signature of MRI Center Representative: ______________________
  Required for all projects involving the AU MRI Center

  Appropriate MRI Center Representatives:
  Dr. Thomas S. Denney, Director AU MRI Center
  Dr. Ron Beyers, MR Safety Officer

7. PROJECT ASSURANCES Evaluation of hte Use of Technology, Innovative Instructional Strategies, and the ISTE Standards in CTE using the Technology Acceptance Model

A. PRINCIPAL INVESTIGATOR'S ASSSURANCES

1. I certify that all information provided in this application is complete and correct.
2. I understand that, as Principal Investigator, I have ultimate responsibility for the conduct of this study, the ethical performance this project, the protection of the rights and welfare of human subjects, and strict adherence to any stipulations imposed by the Auburn University IRB.
3. I certify that all individuals involved with the conduct of this project are qualified to carry out their specified roles and responsibilities and are in compliance with Auburn University policies regarding the collection and analysis of the research data.
4. I agree to comply with all Auburn policies and procedures, as well as with all applicable federal, state, and local laws regarding the protection of human subjects, including, but not limited to the following:
   a. Conducting the project by qualified personnel according to the approved protocol
   b. Implementing no changes in the approved protocol or consent form without prior approval from the Office of Research Compliance
   c. Obtaining the legally effective informed consent from each participant or their legally responsible representative prior to their participation in this project using only the currently approved, stamped consent form
   d. Promptly reporting significant adverse events and/or effects to the Office of Research Compliance in writing within 5 working days of the occurrence.
5. If I will be unavailable to direct this research personally, I will arrange for a co-investigator to assume direct responsibility in my absence. This person has been named as co-investigator in this application, or I will advise ORC, by letter, in advance of such arrangements.
6. I agree to conduct this study only during the period approved by the Auburn University IRB.
7. I will prepare and submit a renewal request and supply all supporting documents to the Office of Research Compliance before the approval period has expired if it is necessary to continue the research project beyond the time period approved by the Auburn University IRB.
8. I will prepare and submit a final report upon completion of this research project.

My signature indicates that I have read, understand and agree to conduct this research project in accordance with the assurances listed above.

Sarah Elizabeth Diamond	Sarah Elizabeth Alley Diamond	4/10/2018
Printed name of Principal Investigator	**Principal Investigator's Signature**	**Date**

B. FACULTY ADVISOR/SPONSOR'S ASSURANCES

1. I have read the protocol submitted for this project for content, clarity, and methodology.
2. By my signature as faculty advisor/sponsor on this research application, I certify that the student or guest investigator is knowledgeable about the regulations and policies governing research with human subjects and has sufficient training and experience to conduct this particular study in accord with the approved protocol.
3. I agree to meet with the investigator on a regular basis to monitor study progress. Should problems arise during the course of the study, I agree to be available, personally, to supervise the investigator in solving them.
4. I assure that the investigator will promptly report significant incidents and/or adverse events and/or effects to the ORC in writing within 5 working days of the occurrence.
5. If I will be unavailable, I will arrange for an alternate faculty sponsor to assume responsibility during my absence, and I will advise the ORC by letter of such arrangements. If the investigator is unable to fulfill requirements for submission of renewals, modifications or the final report, I will assume that responsibility.

Printed name of Faculty Advisor / Sponsor	**Faculty Advisor's Signature**	**Date**

C. DEPARTMENT HEAD'S ASSSURANCE

By my signature as department head, I certify that I will cooperate with the administration in the application and enforcement of all Auburn University policies and procedures, as well as all applicable federal, state, and local laws regarding the protection and ethical treatment of human participants by researchers in my department.

Printed name of Department Head	**Department Head's Signature**	**Date**

8. **PROJECT OVERVIEW: Prepare an abstract that includes:**
(350 word maximum, in language understandable to someone who is not familiar with your area of study):

a) **A summary of relevant research findings leading to this research proposal:**
(Cite sources; include a "Reference List" as Appendix A.)
b) **A brief description of the methodology, including design, population, and variables of interest**

This qualitative research study is designed to determine technology innovativeness of secondary CTE teachers in Alabama and their technology use and integration, as determined by perceived technology importance, likeliness to use and integrate technology, and preparedness to use and integrate technology. A survey instrument will be emailed to all secondary public school CTE teachers identified in as teachers in a CTE Career Cluster course. In Section 1 of the questionnaire contains 20 short statements and a five-point Likert-type scale, which was adapted from the original Individual Innovativeness Scale designed by Hurt, Joseph and Cook (1977; 2013). Respondents are instructed to select the best answer for each statement on a scale of (5) = Strongly Agree to (1) = Strongly Disagree. In Section 2, there are three columns of ratings, Column A, B and C, in which three separate questions are being asked. Respondents are asked to determine the best rating for each of three questions for each technology related statement. The technology related statements are derived from the ISTE Standards for Educators (2017) and are divided by the established ISTE categories. These categories include Learner, Leader, Citizen, Collaborator, Designer, Facilitator, and Analyst. Column A contains the question "How important is this to you?" with ratings between (5) = Very Important to (1) = Not Important. Column B contains the question "How prepared do you feel to implement this?" with ratings between (5) = A Great Deal to (1) = Not at all. Column C asks the question "How likely are you to implement this? (If you already implement the activity, etc., please indicate if you plan to continue)" with ratings between (5) = Definitely Will to (1) = Definitely Will Not. Section 3 includes demographic information such as age, gender, school type, years of teaching experience, type of teacher certification held or working on, and career teaching field or program area of certification. The Survey has a total of 68 questions.

9. **PURPOSE.**
a. **Clearly state the purpose of this project and all research questions, or aims.**

The purpose of this research is to determine technology innovativeness and perceived technology importance, use, and preparedness of secondary CTE teachers in Alabama. The research questions are,
1) What Innovativeness adopter categories do CTE teachers belong to?
2) Is there a significant relationship between secondary CTE programs and Innovativeness?
3) Is there a significant relationship between secondary CTE teachers perceived technology importance and identified characteristics?
4) Is there a significant relationship between secondary CTE teachers perceived preparedness to use and integrate technology and identified characteristics?
5) Is there a significant relationship between secondary CTE teachers perceived likeliness to use and integrate technology in their classroom and identified characteristics?

b. **How will the results of this project be used? (e.g., Presentation? Publication? Thesis? Dissertation?)**

Dissertation research, publication and presentation

10. **KEY PERSONNEL.** Describe responsibilities. Include information on research training or certifications related to this project. **CITI is required. Be as specific as possible.** (Include additional personnel in an attachment.) *All key personnel must attach CITI certificates of completion.*

Principle Investigator Sarah Elizabeth Diamond Title: GTA E-mail address sea0033@auburn.edu

Dept / Affiliation: Curriculum and Teaching

Roles / Responsibilities:

Individual: __________ Title: __________ E-mail address __________

Dept / Affiliation: __________

Roles / Responsibilities:

Individual: __________ Title: __________ E-mail address __________

Dept / Affiliation: __________

Roles / Responsibilities:

Individual: __________ Title: __________ E-mail address __________

Dept / Affiliation: __________

Roles / Responsibilities:

Individual: __________ Title: __________ E-mail address __________

Dept / Affiliation: __________

Roles / Responsibilities:

Individual: __________ Title: __________ E-mail address __________

Dept / Affiliation: __________

Roles / Responsibilities:

11. **LOCATION OF RESEARCH. List all locations where data collection will take place.** (School systems, organizations, businesses, buildings and room numbers, servers for web surveys, etc.) **Be as specific as possible. Attach permission letters in Appendix E.** *(See sample letters at http://www.auburn.edu/research/vpr/ohs/sample.htm)*

Public secondary schools in the state of Alabama with a Career and Technical Education (CTE) program.

12. PARTICIPANTS.

a. Describe the participant population you have chosen for this project including inclusion or exclusion criteria for participant selection.

☐ Check here if using existing data, describe the population from whom data was collected, & include the # of data files.

The participants and population for the study will be the current year (2017-2018) public secondary CTE educators in the state of Alabama.

b. Describe, step-by-step, in layman's terms, all procedures you will use to recruit participants. *Include in Appendix B a copy of all e-mails, flyers, advertisements, recruiting scripts, invitations, etc., that will be used to invite people to participate.* *(See sample documents at http://www.auburn.edu/research/vpr/ohs/sample.htm.)*

The Alabama State Department of Education (ALSDE) has agreed to send the survey via email, along with a follow-up reminder email approximately seven days after the initial email, to all secondary teachers in Alabama that are identified as teaching a class in a CTE program. The first email will contain a brief letter explaining the reserach, a request to complete the survey, and a link to the Qualtrics designed survey. The first page of the survey contains a more detailed information letter that describes the study and outlines the procedures to follow. It also includes a statement that indicates that the participant is giving permission to use the data if they proceed with the survey. They survey is anonymous. After the responses are received, the obtained data will be analyzed, and the results reported.

c. What is the minimum number of participants you need to validate the study? 75

How many participants do you expect to recruit? 1000

Is there a limit on the number of participants you will include in the study? ☑ No ☐ Yes – the # is ________

d. Describe the type, amount and method of compensation and/or incentives for participants.

(If no compensation will be given, check here: ☑)

Select the type of compensation: ☐ Monetary ☐ Incentives

☐ Raffle or Drawing incentive (Include the chances of winning.)

☐ Extra Credit (State the value)

☐ Other

Description:

13. PROJECT DESIGN & METHODS.

a. Describe, step-by-step, all procedures and methods that will be used to consent participants. If a waiver is being requested, check each waiver you are requesting, describe how the project meets the criteria for the waiver.

- ☑ Waiver of Consent (including using existing data)
- ☐ Waiver of Documentation of Consent (use of Information Letter)
- ☐ Waiver of Parental Permission (for college students)

A consent statement is included in the detailed information letter that is the first page of the survey. Participants are advised that if they continue with the survey, they are giving consent to use the data collected from the survey. The detailed information letter also includes a statement of anonymity.

b. Describe the research design and methods you will use to address your purpose. Include a clear description of when, where and how you will collect all data for this project. Include specific information about the participants' time and effort commitment. (*NOTE: Use language that would be understandable to someone who is not familiar with your area of study. Without a complete description of all procedures, the Auburn University IRB will not be able to review this protocol. If additional space is needed for this section, save the information as a .PDF file and insert after page 7 of this form.*)

This qualitative research study is designed to determine the innovativeness and technology use and integration by secondary CTE teachers in Alabama. The survey has 68 questions in three sections. In Section 1 of the questionnaire contains 20 short statements and a five-point Likert-type scale, which was adapted from the original Individual Innovativeness Scale designed by Hurt, Joseph and Cook (1977; 2013). Respondents are instructed to select the best answer for each statement on a scale of (5) = Strongly Agree to (1) = Strongly Disagree. In Section 2, there are three columns of ratings, Column A, B and C, in which three separate questions are being asked. Respondents are asked to determine the best rating for each of three questions for each technology related statement. The technology related statements are derived from the ISTE Standards for Educators (2017) and are divided by the established ISTE categories. These categories include Learner, Leader, Citizen, Collaborator, Designer, Facilitator, and Analyst. Column A contains the question "How important is this to you?" with ratings between (5) = Very Important to (1) = Not Important. Column B contains the question "How prepared do you feel to implement this?" with ratings between (5) = A Great Deal to (1) = Not at all. Column C asks the question "How likely are you to implement this? (If you already implement the activity, etc., please indicate if you plan to continue)" with ratings between (5) = Definitely Will to (1) = Definitely Will Not. Section 3 includes demographic information such as age, gender, school type, years of teaching experience, type of teacher certification held or working on, and career teaching field or program area of certification. The procedure for distributing the self reporting survey will be via email to all public CTE teachers in the state of Alabama. The Department of Education has agreed to distribute the questionnaire. In order to obtain maximum participation, two (2) separate request emails will be distributed. An initial email with a request to complete the survey and a second reminder email approximately seven days later. They survey is through Qualtrics, so the information will come directly to the researchers account. The researcher will save the data in a secure location. The estimated date for completion of the project is May 2018.

13. PROJECT DESIGN & METHODS. *Continued*

c. List all data collection instruments used in this project, in the order they appear in Appendix C.
(e.g., surveys and questionnaires in the format that will be presented to participants, educational tests, data collection sheets, interview questions, audio/video taping methods etc.)

Innovativeness and Technology Use/ Likelines to use, Importance, and Preparedness Survey

d. Data analysis: Explain how the data will be analyzed.

For this research, descriptive statistics will be used to summarize and describe the collected data. The statistical procedures used to analyze the data will be analysis of variance (ANOVA), and descriptive statistics Other analysis may be appropriate or necessary to obtain the information needed.

14. RISKS & DISCOMFORTS: List and describe all of the risks that participants might encounter in this research. ***If you are using deception in this study, please justify the use of deception and be sure to attach a copy of the debriefing form you plan to use in Appendix D.*** *(Examples of possible risks are in section #6D on page 2)*

None anticipated

15. **PRECAUTIONS.** Identify and describe all precautions you have taken to eliminate or reduce risks as listed in #14. If the participants can be classified as a "vulnerable" population, please describe additional safeguards that you will use to assure the ethical treatment of these individuals. *Provide a copy of any emergency plans/procedures and medical referral lists in Appendix D. (Samples can be found online at http://www.auburn.edu/research/vpr/ohs/sample.htm#precautions)*

If using the Internet or other electronic means to collect data, what confidentiality or security precautions are in place to protect (or not collect) identifiable data? Include protections used during both the collection and transfer of data.

The researcher will have access to data, as well as any faculty advisor that may need access to help complete data analysis. Data will be stored on a secure computer or storage device upon completion of the study.

16. **BENEFITS.**

a. **List all realistic direct benefits participants can expect by participating in this specific study.**
(Do not include "compensation" listed in #12d.) Check here if there are no direct benefits to participants. ☐

No direct benefits.

b. **List all realistic benefits for the general population that may be generated from this study.**

This research will help fill a gap in knowledge concerning Innovativeness and technology use and integration by AL CTE teachers. Specific information regarding teachers perceptions of the ISTE Standards for Educators will also be gained. With this knowledge, appropriate and targeted training can be developed to help all CTE teachers better utilize technology to enhance academic achievement and student outcomes.

17. PROTECTION OF DATA.

a. Data are collected:

- ☑ Anonymously with no direct or indirect coding, link, or awareness of who participated in the study (Skip to e)
- ☐ Confidentially, but without a link of participant's data to any identifying information (collected as "confidential" but recorded and analyzed as "anonymous") (Skip to e)
- ☐ Confidentially with collection and protection of linkages to identifiable information

b. If data are collected with identifiers or as coded or linked to identifying information, describe the identifiers collected and how they are linked to the participant's data.

c. Justify your need to code participants' data or link the data with identifying information.

d. Describe how and where identifying data and/or code lists will be stored. (Building, room number?) Describe how the location where data is stored will be secured in your absence. For electronic data, describe security. If applicable, state specifically where any IRB-approved and participant-signed consent documents will be kept on campus for 3 years after the study ends.

e. Describe how and where the data will be stored (e.g., hard copy, audio cassette, electronic data, etc.), and how the location where data is stored is separated from identifying data and will be secured in your absence. For electronic data, describe security

The data will be stored electronically on a secure computer with access only available to researcher and faculty advisor

f. Who will have access to participants' data?
(*The faculty advisor should have full access and be able to produce the data in the case of a federal or institutional audit.*)

The researcher and faculty advisor.

g. When is the latest date that identifying information or links will be retained and how will that information or links be destroyed?
(Check here if only anonymous data will be retained ☑)

IRB Request for Modification

AUBURN UNIVERSITY INSTITUTIONAL REVIEW BOARD for RESEARCH INVOLVING HUMAN SUBJECTS

REQUEST for MODIFICATION

For help, contact: THE OFFICE OF RESEARCH COMPLIANCE (ORC), 115 Ramsay Hall, Auburn University
Phone: 334-844-5966 e-mail: IRBAdmin@auburn.edu Web Address: http://www.auburn.edu/research/vpr/ohs

Revised 2.1.2014 **Submit completed form to IRBsubmit@auburn.edu or 115 Ramsay Hall, Auburn University 36849.**

Form must be populated using Adobe Acrobat / Pro 9 or greater standalone program (do not fill out in browser). Hand written forms will not be accepted.

1. Protocol Number: #18-194 EX 1805
2. Current IRB Approval Dates: From: 5/11/2018 To: --
3. Project Title: Innovation and Integration fo Technology in the Classroom by CTE Educators
4. Sarah E. Diamond | GTA | C & T | 606-483-9429 | sea0033@auburn.edu
   Principal Investigator | Title | Department | Phone | AU E-Mail (primary)
   Sarah E. Diamond | 5040 Haley Center | | Alternate E-Mail
   PI Signature | Mailing Address
   Leane Skinner | Dr. Leane B. Skinner | C & T | | skinnal@auburn.edu
   Faculty Advisor | FA Signature | Department | Phone | AU E-Mail
   Name of Current Department Head: David Virtue AU E-Mail: dcv0004@auburn.edu
5. Current External Funding Agency and Grant number: N/A
6. a. List any contractors, sub-contractors, other entities associated with this project:

   b. List any other IRBs associated with this project:
7. Nature of change in protocol: (Mark all that apply)

- ☐ Change in Key Personnel (attach CITI forms for new personnel)
- ☐ Change in Sites (attach permission forms for new sites)
- ☐ Change in methods for data storage/protection or location of data/consent documents
- ☐ Change in project purpose or questions
- ☐ Change in population or recruitment (attach new or revised recruitment materials as needed)
- ☐ Change in consent procedures (attach new or revised consent documents as needed)
- ☑ Change in data collection methods or procedures (attach new data collection forms as needed)
- ☐ Other (explain):

FOR ORC OFFICE USE ONLY

DATE RECEIVED IN ORC: ______ by ______ MODIFICA
DATE OF IRB REVIEW: ______ by ______ PROTOCO
DATE OF IRB APPROVAL: ______ by ______ MODIFICA
INTERVAL
COMMENTS:

The Auburn University Institutional Review Board has approved this Document for use from 07/16/2018 to ---
Protocol # 18-194 EX 1805

1 of 2

8. **Briefly list** *(numbered or bulleted)* **the activities that have occurred up to this point, particularly those that involved participants.**

1. Email was sent to participants (CTE educators) via the Alabama State Dept. of Education.
2. Reminder email was sent to participants approximately 5 days after the initial email.

9. **For each item marked in Question #7, describe the requested changes to your research protocol, with an explanation and/or rationale for each.** (*Additional pages may be attached if needed to provide a complete response.*)

Change in data collection methods - since only a limited number of completed surveys were received back, a paper version needs to be administered at the annual state conference for all CTE educators, July 30 - Aug. 2, 2018. I have obtained permission from the Alabama Association for Career and Technical Education to put the survey with the information letter into all registration packets at the annual conference.

10. **Identify any changes in the anticipated risks and / or benefits to the participants.**

N/A

11. **Identify any changes in the safeguards or precautions that will be used to address anticipated risks.**

N/A

12. **Attach a copy of all "stamped" IRB-approved documents you are currently using.** *(information letters, consents, flyers, etc.)*

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