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Utilizing Technology to Leverage the Improvement of 21st Century Skills

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UTILIZING TECHNOLOGY TO LEVERAGE THE IMPROVEMENT OF 21ST CENTURY SKILLS

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To those that dare to dream and push the limits who aren't afraid to fall and make mistakes. For those that push others to be better, but can do it without making them feel worse. To my parents and grandparents who have given me a privileged life, but instilled hard work and respect for all. To my wife who has never held back my ambition and provided unlimited compassion especially to our animals. To Bethel University Faculty and Staff who have made a Masters degree still matter and mean that a student has had to push themselves, outside of comfort zones, to make them a better leader in the world. For Grace and Clara, may they provide my motivation to be the best teacher to all the kids in the world that I have a power of influence over since I never had the chance to teach them to do extraordinary things.

Abstract

As technology integration becomes the norm in society, the field of education must adapt to the usage of technology, to prepare future citizens in the workforce. Educators can use a framework of 21st-century skills, to assess if they are preparing students how to leverage technology capabilities. There are questions related to the effectiveness of technology in developing higher level thinking skills or if the information and communication technologies need to be taught explicitly to digital natives that have grown up immersed in technology. Many researchers are seeking to find ways to integrate 21st-century skills into curriculum and content areas, along with innovating a means to engage learners, while respectively increasing higher level thinking skills, such as communication, collaboration, creativity and critical thinking.

Table of Contents

CHAPTER I: INTRODUCTION

Introduction

The essential mission of a formal education has many purposes depending on the lens those that have vested interests deem the most prudent given the time and vision they have for students. This can range from general statements that an education should provide students with knowledge to have success in life, or become more specific, and cater to pushing students to attend college, or perhaps be post-secondary and career ready. Underneath all of the formalities of mission and vision statements, education provides students a base of knowledge that is applied and practiced through a set of generational skills. These skills may vary based on the time of which the education is obtained, but most remain in some enduring capacity. The ability to communicate, collaborate, critically think and be creative are not new to the long history of education, but rather take on their own personality depending on the society surrounding these skills. According to Higgins (2014), in the late 20th century and the beginnings of the 21st century, there have been significant changes in the skills needed in today's world for both work and leisure. There is still value in the content and information that educational institutions disperse but along with the technology resources, simply gaining information is not enough. It has become more essential that educators adapt to the current and future needs of students. There is a balance as noted by Higgins (2014), between the traditional view that the essence of true education is timelessness and the desire of a younger generation's perspective of teaching skills for the practical world. The field of education must balance timelessness while preparing students to be future ready in the content and skills that no one can exactly predict are needed.

Rationale

It is not the goal of this research to change the importance of what has been established as best practices in education but rather emphasize how, given the changing landscape of the 21st century, there are other areas and skills that need to be integrated into teaching to prepare students for life beyond school. Of these skills, the ability to use information and communication technologies, within the context of a set of 21st century skills to promote higher levels of critical thinking is becoming ever more vital. Given the global competitiveness and rapid rate of change from the influence of technology, workers need to use 21st-century digital skills to adapt and thrive in this changing society (van Laar et. al, 2017). Educators and educational institutions play an important role in developing these skills. It is paramount that educators incorporate technology whenever possible to prepare students for the changing landscape of the globalized world.

The role of an educator has to merge technology along with the traditional concept of providing a broad spectrum of contents that may help students become college and career ready. Much of the research considers that by utilizing 21st century skills students will be also working on the developing communication, collaboration, creativity and critical thinking at higher levels (P21, 2016). Among the research presented, Serim (2011) suggests that information and communication technology (ICT) provides a way of teaching both content and 21st century skills by utilizing tasks that are designed to cause students to think in 21st century ways. An example of this is the technology providing visible reflection and evidence for the student and teacher to collaborate on. Not only is it important to be competent in ICT use in the modern world, but

these digital platforms and tools used in digital classrooms can track and store extensive information that learners in turn can create into learner-centered digital portfolios (Kong, 2013).

Of the 21st century skills the most notable gap recognized by the International Society for Technology in Education (ISTE) standards is regarding critical thinking, problem solving and decision making, which is also cited as the greatest deficit by employers regarding the abilities of students seeking jobs (Serim, 2011). Perhaps by having students engaging in projects, the learners develop problem solving by applying core content skills to real world challenges.

Definition of terms

Information and communication technologies (ICT) With the spread of digital technologies, terms such as IT, ICT and computer literacy have become prevalent. Information and communication technologies are at the core of this fast-changing economy and can include any technology that can help to collect and process information along with communicating and sharing information digitally with the aid of wired or wireless connections (Pucer, Trobec and Zvanut, 2014).

21st-century skills and Framework The Partnership for 21st Century Learning a national not for profit organization has established the following key areas. Students mastery of key subjects and 21st century themes essential to student success. Preparing students in learning and innovation skills focused on creative innovation, critical thinking, communication, and collaboration. Student competence in information, media and technology skills such as, information literacy, media Literacy and ICT literacy. Lastly the students translation to life and career skills needed to gain knowledge, and manage social and emotional competencies to

navigate complex life and work environments (P21, 2016).

Critical thinking (CT) is the process of analysis, evaluation, inference, and interpretation of solving problems (Pellegrino, 1995).

Digital literacy recognizes that a cognitive process is involved in the utilization of computer-based and multiple types of technology (Green et al. , 2014).

Digital natives are those that have a competent understanding of digital literacy (Green et al. , 2014)

Self-regulated learning strategies (SRL) involves the ability of the student to plan and, set goals, monitor progress, reflect on the outcomes and use the results to guide the next steps (Green et al. , 2014)

Epistemic cognition (EC) refers to the process of thinking about one's forms of knowledge and ways of knowing. Epistemic cognition becomes especially critical when learners need to assess the validity, certainty, reliability, source, and limits of their knowledge (Green et al. , 2014)

Statement of the question

The literature to be reviewed is in service of the question, how can utilizing technology lead to the improvement of 21st century skills? To establish a baseline knowledge there must first be an introduction to the terminology regarding what are 21st century skills defined as. This will include a variety of aspects regarding the importance of these skills and their impact on a student being future ready in school and life. There are examples of how educators can start to utilize 21st century skills in content areas and curriculum. The aim is to practice and improve students competency in utilizing 21st century skills in all aspects of education and life. One

must also recognize the beginning level of a students digital literacy to develop a plan to improve upon those digital natives. Knowing what a student has for a digital skill set allows an educator to develop the plan to improve or develop gaps. There are multiple types of information and communication technologies that need to be best fit to the task. Not every technology matches each 21st century skill and it is vital to learn how to choose the best tool for the job along with being adaptable to new technologies that are developed and evolve. The critical thinking being developed and utilized when applying 21st century skills can lead to an dynamic improvement in a students preparedness for being college and career ready. The future of technology is moving forward and unavoidably leading to learning needed by education stakeholders to help students find ways to utilize technology to effectively change the way they think in the 21st century.

CHAPTER II: LITERATURE REVIEW

Introduction to 21st Century Skills

The Partnership for 21st-Century Learning, also known as P21, has stated that 21st century skills aim to prepare students to be successful in an ever complex life and demanding workplace. The P21 focuses on increasing students creativity, communication, collaboration, and critical thinking skills. The use of such skills has been known to improve an individual's ability to have success in a rapidly evolving world. The marked change that places an emphasis on 21st-century skills, according to the framework for 21st-Century Learning (2016) is as follows:

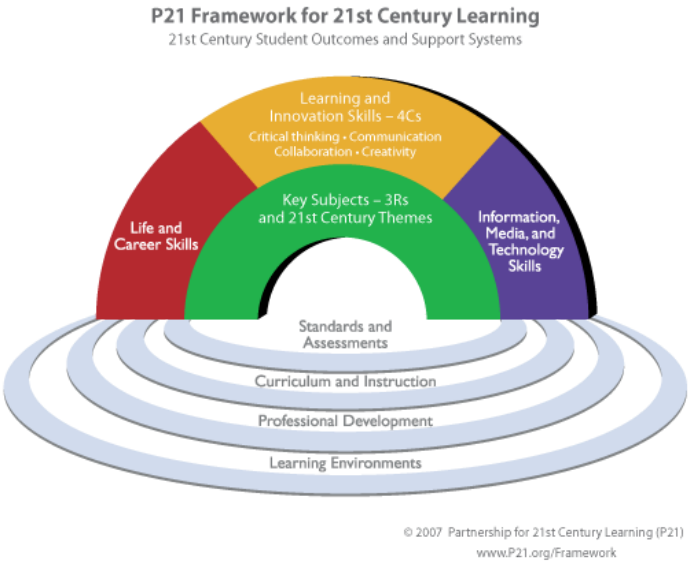
> "Today, we live in a technology and media-driven environment, marked by access to an abundance of information, rapid changes in technology tools and the ability to collaborate and make individual contributions on an unprecedented scale. Effective citizens and workers must be able to exhibit a range of functional and critical thinking skills, such as Information Literacy, Media Literacy, and ICT (Information, Communications, and Technology) Literacy. 21st-century learning as emphasized by P21, "requires educators to develop and utilize a system to engage learners through applicable skills and knowledge, appropriate technologies, and real-world connections to make learning relevant, personalized, and engaging" (p. 2).

Considering the need to make read world connections, Trilling (2010a), focused on how middle schools can relate students world outside school to the world inside the school. Life outside of school has dilemmas posed within a large socially interconnected information and media-rich environment that leads to real-world problems and challenges locally and globally.

Since middle school is regarded as a crucial time when students think more about their future and begin to wonder how their school experience is helping them get there Trilling (2010a) investigated instructionals strategies to develop a middle school students' ability to achieve 21st-century learning goals.

The P21 framework for 21st-century learning rainbow in Figure 1 represents the essential skills and knowledge all students now need. The pools below represent the key components our education system needs to deliver and support the 21st-century learning goals (Trilling, 2010a).

Figure 1



According to Trilling (2010b), this model differs from 20th century Industrial Age learning in that the emphasis is on three sets of skills that are necessary in our interconnected world; life and career skills, learning and innovation skills and information, media and technology skills. One example of a challenge utilizing this framework was to, create an

innovative educational website for use by other students (and teachers) on a topic the team really cares about. Six students from five countries collaborated online to create an award-winning website on a topic of the deadly outbreak of the Severe Acute Respiratory Syndrome (SARS) virus.

The global team had to do all the work involved in producing an engaging educational website: researching the topic; interviewing experts; writing the text; designing and creating the look and feel of the site; and programming the navigation, interactive games, and quizzes included on the site. Collaborating over five different time zones, the team used online tools to plan, schedule, communicate and coordinate all their work. "If you take the evergreen 3Rs and multiply them by the 21st century 7Cs, the result is a learning equation that can guide teaching and learning in our times: 3Rs x 7Cs = 21st-century learning" (Trilling, 2010b, p.10).

The increasing attention given to 21st-century skills has van Laar et. al (2017) questioning how to assess these skills to determine what extent students will become employees that possess 21st-century skills and digital skills relevant to sustainable lifelong career and life success. The study led by van Laar et. al (2017) evaluating articles that aim to define or measure 21st century skills resulted in a framework of seven core skills: technical, information management, communication, collaboration, creativity, critical thinking and problem solving, and five contextual skills: ethical awareness, cultural awareness, flexibility, self-direction and lifelong learning. A survey done by van Laar et. al, (2017) revealed that students rated social skills and collaboration as the most important 21st-century skills needed in future employment.

Although 21st-century digital skills were viewed as essential, they were not yet ultimately covered in the published research. This study has extended the understanding and categorization of 21st-century digital skills, but it also contains points for discussion leading to students becoming productive members of an information-rich and technology-based society (van Laar et. al, 2017).

There is an argument that technology is more of a hindrance than a helpful tool in developing students to be productive citizens in the 21st century. Although technology does have tremendous potential to make students smarter, Thompson and Crompton (2010) observed that most schools are limiting technology in ways that hold students back. In many schools, educators avoid teachable moments by installing filters and limiting access to pretend to keep students safe, but the end result is only protecting them from thinking and learning how to evaluate sources.

Technology is also not effectively being used if educators quash the opportunities for collaboration, losing pathways in technology that can aid in moving beyond the classroom and allowing students to think for themselves globally (Thompson and Crompton, 2010). The main use of technology is often not to improve 21st-century skills, but to simplify tasks with less thinking. Instead educators, according to Thompson and Crompton (2010), should think about the future employability in considering that schools could teach computer science that is ripe with critical thinking, but fewer than one in eight schools have an AP computer science course, because it is not on a SAT.

While many see the benefits in technology, there is still some split as noted by a poll completed by the International Society for Technology in Education (ISTE) (2010). The results were that 27% believe that technology is eliminating critical thinking skills. These results show that some educators are hesitant to embrace how technology can assist student thinking. While it has eliminated the need for thinking in some aspects, such as using a card catalog to find books, students still need to identify the information that is pertinent and engage in discussions around the more readily available information. In the poll, comments against technology focus on the things that are made easier, which may drive an expectation that life should be easy and require less thinking.

Promoters of technology make note that the elimination of simple tasks made easier should allow for more elaboration of essential questions developing deeper critical thinking of the curriculum. Even more important to note is the massive amount of change occurring with technology and the student's practice in adapting to dynamic growth requires a much higher extent of thinking to utilize emerging technologies. The 73% that believe technology is not killing critical thinking make the argument that perhaps it is the non digitally native teachers who need to critically think on how to use technology in order to see progress towards higher level skills development in our digitally native students (ISTE, 2010).

The challenge is for the teachers and schools to utilize the technology at a higher level, emphasizing the opportunity to increase 21st-century skills. Thompson and Crompton (2010), suggest starting with having students apply critical thinking to carefully evaluate and think about information, and how they can relate what they have learned in the classroom to the real world. The end goal might involve more than just analyzing the teachers' information but perhaps

challenging it using evidence they have collected. Students are also empowered to produce and edit their own information, based on what they have analyzed as pertinent. Teachers then empower students to be critically thinking with editing, revising, critiquing, and commenting on their own and others work with the ease of technology-based simultaneous sharing of work products.

Technology, Thompson and Crompton (2010) asserts "provides tools to think critically, but teachers need to integrate technologies and teach students how to be critical thinkers through the use" (p. 7). Allowing a more fully immersed student experience helps to learn lifelong 21st-century skills of being evaluators of information and active consumers of knowledge.

Technology now makes it possible for a diverse population to engage and have more supports in problem-solving, than was previously possible. Many stakeholders emphasize a main goal of education is to give students the ability to critically think clearly about complex issues and solve a wide range of problems and acknowledge these as the critical skills. Technology is playing an increasingly vital role in the development of these skills.

Pellegrino (1995) proposes that technology tools enhance the ability to gather information, generating solutions and communication in order to solve complex problems. Students need to be explicitly taught how best to use technology to relieve complex processing demands, so that they can focus on finding solution paths, instead of using their limited time and working memory to hold basic information relevant to the problem-solving process. Along with processing information, complex problems which often demand collaborative activity, where individuals can communicate and share information and perspectives is supported by

communication technologies (Pellegrino, 1995). Students need to be explicitly taught efficient technology-enhanced strategies for selecting relevant information, that is most likely to assist in the process of finding a solution faster than previously possible, leading to expressing one's solution thoughts and ideas in their problem-solving process (Pellegrino, 1995).

The emphasis on a set of 21st-century skills does not mean those skills are entirely new. Higgins (2014), offers a blended perspective of past skills that are perennial: retained from the previous century, such as communication, creativity and critical thinking. A second set of past contextual skills: unique to this century, such as the capability to manage large quantities of digital information that appears relevant for decision making.

It is also true that the range and forms of available information are changing with the advent of new digital literacies, which combined with past forms of information, increases the complexity of what can and must be learned. This, according to Higgins (2014), is making critical thinking and developing thinking skills become more prominent in education as people recognize the changes that technology is enabling and requiring in terms of information and knowledge acquisition and usage. Research from Abrami et al. (2008) has found that the most effective approach is to explicitly teach critical thinking lessons, infusing these skills with teaching curriculum for an effect size of 0.94, with any effect size over 0.5 being deemed statistically impactful. This effect size over 0.5 shows that there is a significant difference in the effectiveness of the given variable, in this case integrating the teaching of critical thinking skills with curriculum versus critical thinking lessons taught independently in the classroom.

Higgins (2014), believes in three key aspects of education: knowledge will change, new technology will provide access to valuable information and students must become economically competitive. It is reasonable to argue that, as the availability of information increases and the status of that information may be more questionable (Wikipedia, for example), critical thinking must take a more significant place in the curriculum. Digital skills are certainly important in allowing children and young people access to information and the ability to participate in the digital world. This may help to engage the learner in a contemporary curriculum.

The solution is an increased emphasis on the broader concept of productive thinking, which helps the individual find solutions to problems, which certainly includes critical thinking and reasoning, but also involves creative and inventive thinking and the capability to synthesize information. (Higgins, 2014)

Utilizing 21st Century Skills

Many stakeholders in education have placed an emphasis on modernizing learning for the 21st century with the focus on a set of skills needed to succeed. Summarizing these efforts, Brusic and Shearer (2014), aim to provide insight on how to a utilize life and career skills, learning and innovation skills, and information, media, and technology skills to link core subjects with content or themes that are often underrepresented in schools. These content or themes include global awareness, entrepreneurial literacy, civic literacy, wellness awareness, and environmental literacy.

The idea of focusing on children to handle the technological demands of life in the 21st century was introduced by The National Aeronautics and Space Administration (NASA) by

funding the Mission 21 program in the 1980s and early 1990s. This program according to Brusic and Shearer (2014), was geared toward elementary students and used a thematic approach and open-ended problem solving to engage students. The program touted an interdisciplinary learning environment that stressed collaboration, teamwork, relevant content, and an emphasis on building basic skills such as creativity, problem-solving, and critical thinking.

The ABCs for the 21st century developed by Brusic and Shearer (2014), suggest emphasis on the basic vocabulary regarding 21st-century skills needed for learners. These are simply a collection of words or phrases that can be associated with the types of concepts, skills, understandings, and habits of mind that are invaluable for all students. Teachers can use these as starting points in engaging with students the expectations of what is required to a successful learner in the 21st century. If teachers ensure clearer expectations, the reality of achieving learning goals, within the context of utilizing technology will be a more viable outcome. Teachers can print this new alphabet and use these mini-posters to help engage learners to better understand some of the concepts, skills, and habits needed to be a successful learner with respect to established skills and new emerging 21st century skills. For example new alphabet associates terms, phrases, and traits that are considered essential in the 21st century. The letter "C" could stand for critical thinking, creativity, and collaboration. The letter "I" reinforces the importance of students being able to imagine, invent, and innovate. Every letter of the alphabet connects to one or more words that teachers can integrate into the curriculum to help students better comprehend what they should be thinking about and learning throughout their K-12 educational experiences (Brusic and Shearer 2014.

School libraries are essential learning resources and librarians are the essential guides with deep expertise in Digital Literacy Skills in our schools. Effective 21st century librarians also have well developed instructional strategies based on thinking critically, communicating creatively, and solving problems creatively that best prepare our students for the challenges of the 21st century (Trilling 2010a). Effective learning incorporates these 21st-century knowledge-and-skills outcomes with students using appropriate technologies to produce artifacts (reports, presentations, videos, podcasts, models, simulations, inventions, etc.), as part of their project work. This learning project approach, powered by 21st-century technology and using powerful inquiry and design learning methods, can be lead by librarians who are frequently leaders in promoting this kind of learning in their schools.

According to Trilling (2010), libraries are evolving into learning laboratories or environments where a wide variety of learning activities and projects can take place. Providing equitable opportunity to a 21st-century education by providing continuous access to the information tools and content for 21st-century learning will always be an essential school service provided by librarians,. Libraries of the future will have a new alphabet of services known as the new ABC's of the 21st-century.

Steele, (2015) found it troubling that although his library had many great books available there was not a place to practice information being obtained from reading. The solution to this problem is to reorganize the existing space to make room for hands on spaces, referred to as maker-spaces, that allow library users to complete projects , such as robotics, lego engineering, 3-d printing, circuitry and multimedia audio visual designs (Steele, 2015). Steele, (2015) and his team of librarians want students to become creators instead of consumers by utilizing 21st

century skills. By transforming the learning areas and creating makerspaces it has created a set of valuable tools to use in education for authentic, student-owned learning (Steele, 2015).

Students can leverage these 21st-century communication technologies to take projects to a global level with students in other countries, sharing common interests, participate on global teams to find local solutions to common issues and problems, such as alternative energy use, community health, and income through entrepreneurship. With innovation and creativity becoming the fuel that powers new economic growth in the global economy, the demand for students to have more opportunities to create and design will only grow over time. A combination of the words library and laboratory into libratory can provide a 21st century redefinition of the role the library can take on. A libratory is a digital adaptation to a current standard educational place staffed by libratorians. With project based laboratory tools, utilizing new and emerging technologies along with books and other sources of information user can learn, create, and innovate. 21st-century ready libratorians will be vital in providing guidance on information literacy, media design principles, and digital technology (Trilling 2010a).

The potential for future for this restructuring of current libraries and librarians as Stated by Trilling (2010) is that, " the unique impact libratorians will continue to have in helping students, teachers, and parents acquire these 21st-century digital literacies will be one of the most valued contributions they can make to 21st-century learnings" (p. 46). There is much good work to be done in transforming our schools into 21st-century learning environments, and our present and future libratorians must seize the opportunity to create libratories and learning services that clearly help students and teachers acquire the 21st-century knowledge and skills.

In order to prepare and support teachers for 21st-century expectations King, William, and Warren (2011), research suggests a Universal Design for Learning (UDL), that can effectively provide tiered instruction, accommodations and supports within the context of technology integration. By using UDL, teachers can utilize traditional methods and technology to provide multiple means of representation, engagement, and expression of the curriculum, resulting in an improvement in 21st-century skills.

Multiple forms of technology may be deployed by teachers to meet the needs of individual students, such as podcasts for auditory learners, multimedia graphics for visual learners, among other digital text editing tools that allow critical information to be delivered (King et al., 2011). Engaging students can also be made easier by utilizing online interactive simulations and ways to collaborate with others motivating them by connecting to current real-world topics helping relate to the "why" of the learning process. King et al. (2011) recommend teachers increase the "how" of learning by providing students with choices for communicating their understanding of a topic or mastering an academic task in various ways, some may opt for multimedia projects to illustrate the content or traditional text-based projects. “Future generations of teachers can use the UDL model to integrate technology into instruction and to encompass the new technology abilities of students in the 21st century” states (King et al., 2011).

Action research done by Chin (2013), questioned if the utilization of technology would result in clearer and more focused communication through team building lesson design. As educators were using digital technology to effectively facilitate communication, a group of

students showed enhanced production, understanding, collaboration and at times enhanced creativity.

Chin (2013), promoted the participants to use an online learning management system and social media to help give individual students a voice that may otherwise feel unheard, providing a sounding board for discussion, building better camaraderie and collaboration in projects and goals. Data collected in the presurvey done by Chin (2013), showed participants felt that working in groups was beneficial and most liked working in groups, although they preferred to work alone under self-guided direction. The data gathered during the research cycle indicated that, while directly teaching lessons about digital communication and collaboration can help foster team building and effective communication, more time and teacher-student interaction needs to take place in order to facilitate a team environment.

The integration of technology by both administration and teachers becomes vital, as the future employers of students require a set of 21st-century skills valued by the employer's global workforce (Hummel, 2016) . The social and cultural awareness within these skills help to seek to find ways to encourage and foster effective ways to help our students understand, appreciate, and respect diversity, teamwork, collaboration, and communication in a global future.

Hummel (2016), suggests general approaches to increase students social and cultural 21st-century skills by giving elementary students challenging, open-ended, hands-on, projects, and problems that require teamwork and positive collaborative skills. Teachers can emphasize to students how important teamwork and mutual respect are to achieving our larger world-altering goals. It is the responsibility of Science, Technology, Engineering, and Math (STEM) educators to guide students in their own search for mutual understanding and respect, and increasing social

and cultural awareness skills will help students to embrace their similarities and differences, while working to make their classrooms and the world better places.

The importance of early developing critical thinking skills according to Hummel (2016), is crucial in elementary schools where students should be allowed to explore, empathize, question, hypothesize, conceptualize, experiment, and reflect on their own learning to become productive 21st-century citizens in the future. Hummel (2016), states "Critical thinking allows people to live rational, productive, reasonable, and empathetic lives, without the crucial skills of conceptualization, application, analysis, synthesis, and evaluation, human beings would fail to thrive and would focus on survival only" (p. 5).

Hummel (2016) further provides the implications of critical thinking being valuable in a variety of subject matters and is incorporated in a family of integrated modes of thinking connecting scientific, mathematical, historical, economic, moral, and philosophical thinking together to provide a more wholly developed citizen. Critical thinking development and usage are therefore not just present in one mode of learning, but rather the critical thinking skills of conceptualization, application, analysis, synthesis, and evaluation can be incorporated into almost every lesson a student does with the right type of lesson planning, development, implementation, and questioning.

Various studies have provided empirical support for developing 21st-century skills through technology integration. With the advancements in technology Mohammed (2016) asserts that today no organization can achieve results without incorporating technology developments, especially information and communication technology (ICT) and openness in its utilization will have major implications for changing 21st-century learning paradigms. The

technologies have also provided an infrastructure for teachers and students to improve collaboration, interaction, and participation in their learning activities, and support them to create constructive learning environments.

Leaders in Social Studies technology integration believe it provides unlimited sources and a large breadth of ideas for learners and teachers, thus it becomes an essential element to engage learners in the curriculum, which cannot be provided in a traditional curriculum. Leaders also think that technology integration into Social Studies has a strong influence on the students' daily lives (Mohammed, 2016).

Mohammed (2016), suggests that productive citizen lives in society are supported by a "technology-driven" and "technologically-oriented civic society" which have a major influence on learners' beliefs, knowledge, daily life; social and cultural changes; and on the ways people interact with the world. The technologies can provide the tools and opportunities for students to practice freedom of speech, protect their rights, and to participate as citizens in the global democratic community leading to becoming active in social change. Mohammed (2016) recognizes the social importance of integrating technology and the connection to democracy development. The informed citizen is a digital citizen who can leverage digital literacy and citizenship to become impactfully engaged in the democratic process.

To achieve the intended objective of increasing achievement in Social Studies, Mohammed (2016) suggests using an approach that integrates Technological Pedagogical Content Knowledge (TPCK). Theoretically, it integrates the current era parts of the learning environment: the content, pedagogy, and technology. The curriculum also needs to be current with 21st-century skills and topics including, cooperation, critical thinking, a global perspective;

technology in learning, mass communications, cross-cultural understanding, and respect for human rights. Various studies also provide empirical support for developing 21st-century skills through technology integration.

Often overlooked in the discussion of technology are the non core classes. Non Core classes are defined as not being Math, English Language Arts, Science, and Social Studies. There are examples of how technology can be of value in improving students 21st-century skills, including critical thinking in classes such as Orchestra. Cruz (2015) notes that orchestra students have always needed to collaborate by playing and listening together, but questions if they reflect on their own playing and how it fits together with the group. By leveraging technology tools, such as SmartMusic to record and analyze performances both individually and as a whole, students are then asked to make comments about verbal feedback received and how they perceived that group was doing. This is followed-up by a whole class discussion, which engages even those who did not wish to speak out loud had their feedback evaluated by the group. The result is students were not only working on collaboration and critical listening skills, but reflecting on all feedback building critical thinking skills, which are covered in 21st-century learning according to (Cruz, 2015).

Digital Natives and Digital Literacy

The researchers Green et al. (2014) used Think Aloud Protocols (TAPs) that measure participants thinking process, without explaining, while they were reading and navigating the Internet. At the conclusion, Green et al. (2014) stated that "the study provides evidence that self regulated strategies (SRL) and epistemic cognition (EC) are relevant aspects of digital literacy, and predict learning of complex science topics on the Internet" (p. 65). The importance of SRL

and EC in the digital learning age is exemplified by the fact that the Internet provides a wealth of information, but a simple Google search can retrieve information with varying degrees of relevance, accuracy, and comprehensibility within which the users become quickly overwhelmed if they cannot effectively self-regulate their learning (Green et al. 2014).

Ng (2012), argues that educators need to raise awareness of the range of educational technologies that digital natives could use for learning and taught about these technologies. The basis of the study was to ensure that educators and digital natives do not assume they are adept at using and best utilizing the technologies according to Ng (2012). While most current students are labeled digital natives, people who live their lives immersed in digital technologies, few may be digitally literate. These digital natives are connected and online creating and processing information quickly and often focused on the visual forms of media versus text, but lack digital literacy skills. One broad definition of digital literacy stated by Ng (2012) is as follows

> "Digital Literacy is the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyse and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process" (p.1067).

Students' use of common Information, Communication and Technology (ICT), in particular the use of mobile phones and social media technology, means they possess a certain level of digital literacy. Ng (2012), suggested educators attempt to improve digital literacy by integrating a variety of ICT learning, presentation, collaborative and assessment tools into the

students' learning. Once educators had integrated technology the growth noted by Ng (2012) was in their ability to solve their own technical problems, increase perceived confidence of their technical ICT skills used for learning, and creating artifacts to demonstrate their understanding of what they have learned. The main implication of the study suggested by Ng (2012), is that educators know how to use the tools and teach their students about the technologies and their uses that are beneficial for their own teaching and for their students' learning.

The presence of ICT in the current generation of students is undeniable and there is debate over whether the pros outweigh the cons. The paradigm shift according to Kolikant (2010), is students are free from low-order mental activities, enabling concentrated effort on critical thinking. Some view this tendency to use ICT, to mine for simple data, as proof that students are no longer thinking. In the study Kolikant (2012), established that all students used the internet for research. Some dispute whether the Internet has a positive influence on their ability to learn, as evidenced by 63% of the students disagreed with the statement ,''I believe that my generation knows how to learn better than the generation that did not have computers".

The majority of the students thought that their generation was worse at learning than the pre-ICT generation. Some attributed the problem to their schools' book-orientation, while schools have not recognized the change of digitalism on life (Kolikant, 2012). The effects of this lagging support by schools Kolikant (2012) comments is students feel disempowered, with regard to schoolwork being irrelevant and lagging behind technology. This perceived partnership leads to missing the learning opportunities to establish the productive relationship with ICT.

While not in school, Kolikant (2012), noted students feel positive about the internet and it helps increase one's curiosity while they are interacting with information through collaboration, and creating by gaining the knowledge from the ICT. The shift as concluded by Kolikant (2012), is that the educational system needs to accommodate dynamic student ICT abilities by helping students to consciously and selectively use different values and practices for their learning purposes, especially incorporating meaningful ICT skills and tools.

In summary, Margaryan, Littlejohn, and Vojt (2011), found that students studying both a technical discipline and digital natives used more technology tools in formal and informal learning and for recreational purposes when compared to others that were not in a technical discipline or a digital native. Margaryan et al. (2011), researched to gain a more accurate picture of the patterns and uses of technology adoption by university students and to begin to explore the motivations for technology adoption. The focus of Margaryan et. al (2011), was on student's use of technology for content knowledge and course management and technology used for socializing and recreation.

The main tool used by students in alignment with the several dimensions of 21st-century skills was the use of mobile phones to organize project meetings, to collaborate on group assignments, to prepare for exams or to record lectures. All interviewees indicated a preference for text messaging rather than voice calling because texting was considered quicker and easier to manage (Margaryan et al., 2011). Important to note was students preferred instant messaging types of technologies compared to asynchronous communication tools, such as the virtual learning environment (VLE) based discussion forums (Margaryan et al., 2011). According to

Margaryan et al. (2011), when needing to use technologies to collect information YouTube was primarily used by students, but used minimally for creating and sharing content.

Although digital natives are adept at using technologies,Margaryan et al. (2011), found that most students had difficulties in suggesting ideas how they could use technologies to support teaching and learning with a few suggesting lecture podcasts. Most students were unsure how technologies can support their learning. Margaryan et al. (2011), noted a pattern that suggests students may not fully understand the learning potential of technologies, either because they use them in very limited ways or do not use them at all. Margaryan et al. (2011) also gathered information from professors and noted that most have a clear understanding of the ways in which technologies could support effective learning while others view these as fads.

The overall findings from Margaryan et al. (2011), run contrary to what some may believe in young people having advanced technology skills. Rather students are in need of a deep understanding of what the educational value of these technologies are and how technology can better facilitate the learning process and deeper understanding. The emphasis needs to be on faculty researching and utilizing technologies in their teaching to evaluate the effectiveness and expose students to the expanding potential.

The focus on 21st century skills means ensuring students are critically digitally literate which Hinrichsen and Coombs (2013) have reinterpreted to be framed as, decoding, meaning, making, using and analyzing digital content that is digested. This closer look at the skills framework of ICT literacy has a significant impact on the performance in academics requiring curriculum, to respond to the learners in relation to their technical skills and also in their attitudes

to technology respectively and an analysis of learner characteristics in relation to the digital content.

The argument Hinrichsen and Coombs (2013) make is that the current focus on students leaving school as 21st century citizens will only be possible, if the curriculum is identified as a key site for digital literacy development. It is possible, if not an imperative, to find ways to integrate not only technology into the discipline but, perhaps more importantly, the discipline into the technology. The critical digital literacy framework outlined has been pilot tested in workshop form by teachers, students, learning technologists, managers to gauge its acceptability and its use in activity design with positive evaluations thus far.

As the screen is now the dominant site of texts, Hinrichsen and Coombs (2013) argue that the reading of a multi-modal text has become more complex and places greater demand on the reader, which means that learning with and about the digital may be correspondingly more complex. The text using resources are concerned with the appropriate use of specific text forms for given purposes and involves understanding both the particular characteristics of different texts and the particular requirements of different contexts of use. The rapid change in the development of digital technologies means that new and unexplored purposes, potentials and problems seem likely to become more frequent and require critical evaluation decoding skills to identify the usefulness in a digital usage.

The development of digital literacy should involve using devices and software. This development should also be recognized and made explicit in analytical and multiple subject practices; in syllabus content; in assessment design and grading criteria; and formal course

specification documents. This validate the implications for the purpose of improving students potential to properly become critically digitally literate (Hinrichsen and Coombs, 2013).

Information, Communication and Technology Skills

The modern era of teaching requires educators to be increasingly aware of instructional strategies and tools that research has shown to impact students learning. The broad category of tools referred to as information, communication technologies are unlimited in their potential uses. The use is not alone enough to call technology beneficial but students also need to learn the skills of how to maximize the exponential possible combinations ICT can achieve. The recent emphasis on learning skills within the ICT era has placed a greater need for teachers to be cognizant of how to educate students on the knowledge, beliefs, attitudes, and values impacted while integrating ICT (Siddiq, Scherer, & Tondeur, 2016). Multiple factors may impact the effectiveness of integrating technology. Siddiq et al. (2016), argue that Teachers' Emphasis on Developing students' Digital Information and Communication Skills (TEDDICS) is a goal-oriented construct that combines the use of ICT, teaching practice, curricular demands, and beliefs about which ICT skills are important. The TEDDICS mentality may be impacted by a variety of factors, including content taught, gender, age, and ICT familiarity. The multidimensional digital skills consist of three factors: accessing digital information, evaluating digital information, and sharing and communicating the information (Siddiq et al., 2016).

Evaluating the TEDDICS in reference to the three main factors proves difficult considering they are distinct factors, all three overlap and may represent a sequential process in

the method in which a teacher may employ them in the classroom (Siddiq et al., 2016). Focusing on the primary TEDDICS, Siddiq et al., (2016) found that the impact varied greatly depending on the content of the teacher, in particular, more emphasis was noted in the liberal arts subjects versus science and math areas. The explanation provided may be the result of a focus on more research-driven skills of ICT in those subject areas of the Humanities, English and the Arts.

Siddiq et al. (2016) provided evidence of teachers perceiving that the more emphasis placed on developing a student's digital information skills the greater the impact on the use of ICT. However, the impact may be driven by the belief of how the digital skills relate to a content area and are only being measured by teachers self-reporting their feeling of the integration. Evaluating students abilities to utilize Information and Communication Technology skills (ICT) is a vital starting point in guiding future use of technology in a classroom. Claro et al. (2012) specifically states "ICT skills were defined as the capacity to solve problems of information, communication, and knowledge in a digital environment" (p. 1).

The Chilean government's Ministry of Education has developed a four-part strategy named ENLACES (the information and communication technology in education initiative) deemed appropriate to address the concerns in the area of ICT skills development, ICT use plan, reduction of the digital gap, development of digital competencies and skills in students and teachers and lastly digital educational curriculum resources (Claro et al., 2012). Claro et al. (2012) evaluated the effectiveness of the ENLACES plan and consider the effects the plan has had on students, teachers, and staff. Claro et al. (2012) maintain the focus is on ICT literacy that goes beyond simplistic tasks but rather pushes the higher-order cognitive skills that can be improved with using the leverage ICT can offer. This point is emphasized by Claro et al. (2012)

in that "This concept emerged from the 21st-century skills frameworks supported by evidence showing that labor markets do not value technical skills per se but higher order cognitive abilities, especially in the context of ICT use" (p. 2).

The application of ICT skills according to Claro et al. (2012), relies on computer literacy skills being paired with the higher order information and communication literacy skills exemplified by the critical and creative use of information such as researching, evaluating, exchanging and developing information and ideas in a digital context. When testing students in these areas, Claro et al. (2012) focused on tasks that had students select, evaluate and organize information found digitally, use digital tools to identify a solution to communicate and collaborate in a larger community, and ethically understand the responsibility of using ICT to maintain digital citizenship with regard for all others.

The findings of the study found three-quarters of the students could search for information and a half could also organize and manage the digital information. Only one third were able to develop independent ideas and less than one fifth successfully could redefine the digital information and utilize it to recreate a creative effort in a digital environment (Claro et al., 2012). Based on the data collected, it is important according to Claro et al., (2012) in order to expect gains in the areas of ICT related skills development, educational plans should be designed to increase ICT use with opportunities for deliberate and creative implementation.

Focusing on Critical Thinking

Given that the intent of ICT facilitated student engagement is to foster important skills such as critical thinking, it is vital to understand better the associated key factors related to

background of students, beliefs, perceptions and attitudes and lesson design related to ICT integration in learning environments (Saade, Morin, and Thomas, 2012).

Saade et al. (2012) aimed at answering questions focused on critical thinking, especially what is the relative contribution of the various learning modules on critical thinking skills requirements. In the context of this study, Saade et al. (2012) showed that online assessment was perceived to contribute to critical thinking to a lesser extent than other learning activities. More specifically, interactive components were perceived to contribute to critical thinking more than static content. This can be explained by the concept of engagement and more specifically to our context is the notion of interactive engagement.

Saade et. al (2012), reveals critical research and practical insights for future studies/projects given that designers and teachers of online courses have one primary goal, which is to enhance the student's learning experience they need to "(1) integrate more interactive components into the course activities, (2) draw on social media principles to keep students connected to each other, and (3) tie 1 and 2 to critical thinking activities" (p.1616).

To provide more evidence as to how important 21st-century skills are to career choices, many researchers are now applying technology integration methodologies to college and career readiness. A study by Pucer et. al (2014), suggests nurses need to deal effectively with complex change, increased demands and greater accountability with improved critical thinking skills to provide comprehensive nursing care. To accomplish this they tested an approach to the effectiveness of an ICT-based modern approach for the acquisition of nursing students' critical

thinking skills. Particularly of note was skills associated with analyzing information and developing the best plan to solve the given situation resulting in better problem solving skills.

The study was implemented with the use of the e-learning management system Moodle. The web application BitStrips was used to create different characters, situations and objects in order to make situations more realistic, interactive, and engaging and analyzed for how well students used critical thinking skills to process the scenarios. The results of the moodle comic strips, recognized the improvement of participants' CT skills identified by Pucer et. al (2014). The survey results, where participants expressed a positive opinion about the acceptance, and usefulness, are also in favor of utilizing ICT to create authentic critical thinking curriculum.

Gerber and Scott (2011) state that "fostering critical thinking is fundamental to the mission of formal education, including higher education" (p. 842). In addition, there is increasing awareness that critical thinking is a vital 21st-century skill, especially considering the challenges encountered today are not easily solved and need individuals to leverage knowledge from various sources and types (Gerber and Scott, 2011). Often extracurriculars are cited as developing skills outside traditional content and now digital gaming is thought to hold promise for fostering critical thinking and other 21st century skills. The characteristics of gaming potentially experienced in types of gaming include active, critical reflective thinking; communicating, and engaging in difficult asymmetric experiences and tasks (Gerber and Scott, 2011). Although they agree that gaming engages critical thinking skills, they note different genres may factor in the emphasis on the critical thinking skills of players. At the forefront of genres potentially utilizing and improving 21st-century skills, strategy games emphasize tactics

and long-term planning rather than hand-eye coordination and reflexes solely (Gerber and Scott, 2011).

The main question that Gerber and Scott attempted to answer (2011), is whether there is a significant difference between gamers and non-gamers on measures of critical thinking dispositions. The research was done using two different data collection surveys; the Actively Open-Minded Thinking scale and a questionnaire assessing Need for Cognition. When analyzing the results of Gerber and Scott (2011), noted gamers and non-gamers graded similar critical thinking tendencies which stand in contrast to research asserting that gaming increases critical thinking skills. Gerber and Scott (2011), explain the overall results as follows:

> "...this study does highlight the importance of context when examining gaming and finds support for the relationship between playing games and critical thinking when the context is included as a factor. Specifically, it was found that strategy gamers have a greater propensity for actively open-minded thinking than non-strategy gamers" (p. 846).

These findings fall in line with what was predicted of gamers, considering that strategy games require creativity in solving problems. There is also often a need to collect information to be used in later critical thinking situations.

The worry for many educators is that promoting digital gaming as beneficial may be risky. Gerber and Scott (2011) state that it is important to note that gamers who had a casual interest in gaming, played at most 2 hours per day, with few other gaming friends. These casual gamers are not what the researchers would classify as gaming addicts, typically defined as playing more than 2 hours on average with mainly online friends and little social interaction

outside of the digital world In summary, those that were not extreme addict gamers had better results in the active open-minded thinking surveys. There are many variables that perplex the research, including some scores higher for those that play shorter times. While strategy gamers tend to play longer, they also may already be more interested in games that involve critical thinking decisions (Gerber and Scott, 2011). The overall implications as Gerber and Scott (2011) recommend, educators may find value focusing on strategy gaming/and or gamers while looking at the impact on the critical thinking skills in a multitude of subject areas.

Although the benefits of gaming have yet to fully researched, Quian and Clark (2016) comment there is immense interest in the development of 21st-century skills with the use of game-based learning. The use of gameplay and design requires a familiarity with media, technology, and creative critical thinking skills. According to Quian and Clark (2016), this can be helpful in facilitating the development of 21st-century skills. Traditional educational practices often hinder creativity by emphasizing only one correct answer, imposing high-stakes failure, and favoring conformity and standardization (Quian and Clark, 2016).

To answer the question of whether gaming can be impactful to reverse the trend, Quian and Clark (2016) conducted a meta-analysis of twenty-nine papers that reported games helped in the development of 21st-century skills, mainly focusing on critical thinking skills. Specifically, Quian and Clark (2016) discovered that to accomplish the largest growth in 21st-century skills educators need to focus on selecting or creating an effective game-based learning, emphasizing these game design elements; collaboration, competition, complexity, exploration, and discovery, role play, self-expression, and interactivity.

Lee et al. (2016) argue that in the 21st century, facts have become easier to locate. There needs to be a paradigm shift in modern education focused less on providing the factual information, and more on developing an appetite for utilizing the information with the learning and divergent thinking that will be emphasized their whole lives. Much of the focus is mediated by Information and Communication Technologies, entailing a shift from knowledge production to knowledge configuration.

The question Lee et al. (2016), sought to answer was if the interaction of a learner engaging in cooperative learning would encourage one's own cooperative learning behavior, and the result of this process would foster more critical thinking skills. The cooperative behavior was analyzed in the use of commercial games that simulate business concepts, many of these mobile games, in general, have been shown to increase collaborative problem-solving skills among learners. The players, in the role of business consultants, navigate to locations and investigate a problem presented to them at the beginning of the learning session, which is in the context of a fictional mobile phone manufacturing company that is facing some problems. When playing together, it was revealed that the students developed a more cooperative learning attitude in sharing their understandings from the game, and highly appreciated other students' perspectives (Lee et al., 2016) .

Biologically, humans are naturally inclined to self-interest, therefore, a cooperative mindset must be taught by designing opportunities for learners to see the future benefits of cooperation. In the teamwork-based gaming design, it is common that learners do not have all the items of knowledge. To emphasize this point Lee et al. (2016) had the students after gameplay, prepare a summary and presentation for the CEO (course lecturer). While providing

an asymmetric design to the learning contents, the researchers then analyzed four categories of critical thinking skills: clarification, assessing evidence, making and judging inferences, and using appropriate strategies and tactics. The groups, according to Lee et al. (2016) were solo players (group I), the pair-player group with knowledge asymmetry (group II), and the two single-players group with knowledge symmetry and (group III).

Some significant conclusions that Lee et al. (2016), made were that group II had a higher number of positive indicators in almost every dimension of critical thinking skills than group III. It was also noted that more linking ideas were created from group II connecting across multiple domains. Solo learners usually identified only simple links, using ideas based on the given learning materials with limited creativity. The key to success in interactive cooperative learning is that self-interest should quickly align with collective interest. Group II demonstrated that sharing asymmetric information boosted most areas of independent critical thinking when asked to present.

The further implications of the study done by Lee et al. (2016) allude that many ICT-based educational technologies can support knowledge sharing, but lack mechanisms to effectively establish cooperation. Cooperative skills are developed, when individuals are given a lack of information to encourage collaborative thought, and thus becomes an effective way to foster critical thinking skills. This can be seen as the leverage of ICT-based educational technologies (e.g., mobile learning, flipped learning), which cannot be achieved at a comparable level with fact-based pedagogy.

McMahon (2009) suggested that while most educators are confident that technology increases student achievement, measuring the increase is challenging. Determining the

relationships between ICT application, and other factors within the learning environment, and the development of higher order thinking skills are some of the questions that need to be answered. The results showed that students with explicitly taught programming skills, developed within a technology-rich environment, score higher on critical thinking exercises (Mcmahon, 2009). Closer analysis of the data provides there is a significant statistical difference in the critical thinking skills of students who have been immersed in a technology-rich culture more than five years compared to those not immersed for prolonged times.

According to Mcmahon (2009), research suggests that technology has a great influence on critical thinking and further research into the application of computing to the development of creative thinking needs to be investigated. Consideration should also be given to the establishment of technology-based teaching-learning programs to develop other higher-order thinking skills such as communication, collaboration, and efficiently collecting digital information.

The established importance and potential impact that 21st-century skills combined with technology command educational leaders to take action. Kong (2013), advocates for policymakers to give priority to the development of 21st-century skills when developing school plans for e-learning integration into curriculum delivery promoting a paradigm shift to learner-centered digital classrooms. The advocacy of learners' active learning and the trend of digital classrooms using various learning management systems and social network platforms place new demands on teachers for transforming pedagogical practices in school education.

The research community can contribute to the learning outcomes in digital classrooms, incorporating both core knowledge and 21st-century skills, by studying the ways to support

schools to use IT for assessing 21st-century skills with a link to core content knowledge, (Kong, 2013) Furthermore, Kong offers the idea of sustainable collaboration between K-12 schools and the research community for longitudinal studies that enable teachers to design, apply, reflect and refine their pedagogical practice for realizing learner-centered learning in digital classrooms.

In a meta-analysis of relatively current research into 21st century learning with an emphasis on technology, Kong (2013), suggests key policies schools can follow to maximize the student-centered digital classroom. Policymakers should first put effort into charting the way forward for wider and more effective adoption of e-learning in K-12 schools in their school. Second, the research community should work for the critical research issues for supporting the development and communication of theoretical-based e-learning pedagogies or resources. Third, all of the stakeholders, should put forth an effort in realizing the e-learning vision including acquiring digital devices and e-learning resources, encourage active engagement in constructive learning and peer interaction for developing domain knowledge and 21st-century skills, and business partners need to provide schools with supports on technical applications in the real world. Together these policies can result in a realization of learner-centered learning in digital classrooms among K-12 education (Kong, 2013).

Applications of 21st Century Skills

Although it may seem like a daunting task at first, the process of applying all aspects for improving 21st-century skills and emphasizing digital learning is vitally important to current and future generations of learners. Chris Dede asserts in an interview with Serim (2010) that

> "It's very important now for all students to have 21st-century skills not just as some kind of abstract goal, but because that is the key in the 21st century to having a decent

> lifestyle, a reasonable job, the chance to really engage as a global citizen….What used to be good enough to get an A and a good job is now borderline, and we need to recognize that and as advocates for kids, help them to achieve these new higher levels" (p. 21).

There are educators who argue that technology is not a silver bullet and wonderful projects can be completed without using technology. Serim (2010), counters this by asking all involved to consider the ability of technology to open up projects into improved student performance, thinking and problem solving, making the learning more visible in several ways. Embedding digital age learning tools and allowing project completion with these tools vastly expands the opportunities to build a body of evidence that documents student learning. Serim (2010) also states "by allowing students to use ICT to review and comment on one another's work you've helped them develop and apply skills of reflection" (p. 31).

The powerful combination of visual learning and technology provides four key benefits to students as summarized by Serim (2010) they

> "learn to clarify thoughts by seeing how ideas are connected by grouping and organizing, organizing and analyzing information using diagrams and plots to display large amounts of information more readily identifying patterns and relationships, integrate new knowledge by representing information both visually and verbally combined, and thinking critically with verbal and visual information linked using technologies" (p. 33-34).

Literacy takes on an expanded definition in the 21st century. Everyone must function as a reader, author-editor, researcher, publisher, and information professional then able to

communicate digitally (Serim, 2010). Communication may be the defining element of our digital age as technology brings new meaning to "anytime, anywhere", students must become fluent in the multiple forms and identify and utilize the best form for the given task.

Far too many students and teachers think that Google has all the answers, unfortunately only a select few professionals (library media specialists) are trained to effectively apply digital tools to gather evaluate and use the information, making it important to guide students in developing these critically important digital learning skills (Serim, 2010).

The amount of instructional time devoted to learning and developing 21st-century skills is in need of more attention. Serim (2010) notes the existing gap between the skills employers rank as "very important" and the skills they see in high school graduates they consider for employment is significant. Fortunately, these are precisely the skills Serim (2010) states "students develop and strengthen by completing Digital learning projects. These projects are specifically tailored to identify connections between academic subject areas and 21st-century skills" (p. 156). Meaningful connections between content areas and these skills are major components of the framework established by P21 (2016).

The literature provides an outline for how educators can start to develop a plan on how to identify the 21st century skills that are recognized by the P21 organization (2016). The steps to be taken next may include an analysis into the skills students have especially taking note of whether the students have been raised as digital natives or to what extent they are digitally literate. A large part of being digitally literate is being fluent in the types of ICT that are available and having the adaptability to a dynamically changing global landscape. The end goal

is to have students who have critical thinking skills paired with 21st century skills aided by the use of technology.

CHAPTER III: DISCUSSION AND CONCLUSION

Summary of Literature

With the continual emergence of new technologies along with research into how technology can best be applied to pedagogical practices there are several key points to make note of from previous and current research. The Partnership for 21st century learning has compiled a quality set of resources to introduce educators to ideas on how to realign quality instruction to an immersive technology classroom and society. Educational leadership teams along with teachers and other stakeholders can use the P21 (2016) framework to guide conversations surrounding integration of technology to enhance 21st century skills.

The literature review provided an introduction to 21st century skills and explained the basic premise behind what makes these skills similar and different in comparison to past educational skills focus. To add clarity van Larr et. al (2017), indicates that 21st century skills are more related to the current economic and social developments than with those of the past century prepared with relations to an industrial focused society. Stakeholders need to still find value in both the traditional skills and balance that with 21st century skills given credibility with the other literature reviewed.

If there is a question about the need to utilize the 21st century skills in lesson design Trilling (2010b) asks the questions regarding the current world. Do we ask workers to collaborate in diverse teams, with the most current technologies, solving real world problems in innovative and creative ways? Most would agree that all of the above is true for workers to gain employment and have success in many types of careers, yet without the focus on utilizing

21st century skills students are often working alone on lower level depth of knowledge curriculum and often told to put technology away. The literature review has given some suggestions on how to start applying the framework of 21st century skills from P21, (2016) to change the way students acquire career ready skills. Especially useful are resources compiled by Serim, (2012) on strengthening and assessing 21st century skills. Often teachers believe that students don't need to practice using technology in conjunction with these skills, and although digital natives have a baseline set of technology knowledge often it is not being utilized to improve collection, collaboration and communication of information in appropriate ways.

The goal of schools needs to be focused on producing students who become citizens that can utilize in work and life ICT's where information is easily moved, presented, manipulated and re-presented (Higgins, 2014). The larger population of people who can proficiently use digital technologies and associated 21st century skills provides more opportunities to accomplish the mission to critically think to solve new and more complex problems.

It should not be debated if 21st century skills need to be a focus of educational institutions at all levels but rather how these skills have long offered teachers using multiple strategies to explore new ways of thinking along with teaching students how to master these new "media of thought," otherwise they cannot benefit from the technology that is increasingly being developed and used (Pellegrino, 1995).

Professional Application

As the continual change in technology occurs, there can be no one defining resource to guide a educators path. A simple yet practical application according to Higgins (2014) is to reinforce the importance of more complex or productive thinking including both critical and creative thinking, while allowing the use and improvement in digital and technological skills, communication skills, and the acquisition and application of knowledge to problems and real-life contexts.

In summary, it becomes a focus on making technology the center of project based learning with collaborative groups being able to explore and wonder how they can address issues using their skills as digital natives while receiving guidance from educators on how to leverage the tools of the 21st century. The modern classroom will and should look different, and this paradigm shift to a student centered collaborative model has been explored by many prior research studies as becoming an effective means to educate students. There are still questions that remain as to how to adjust curriculum standards and grading practice s to match a dynamic technology project driven change, but there is precedent with standards based grading that may aid in this process.

Limitations of the Research

The lack of consistency in technologies available and the demographics of those groups that have been studied may bring into question the validity of the research. There does need to be further analysis of the equitable research being done with all groups of students across the educational spectrum, where the current research has been primarily done in schools that are

consistently not labeled as achieving below the standards. Also due to the changing technologies, longitudinal studies are difficult to maintain with consistency in the types of devices used and adoption of newer technologies that may have a larger impact on the educational outcomes desired by such instructional use.

Implications for Future Research

There are a few areas that may require further research keeping at the forefront the main objective of providing a learning environment that prepares all students for success in a post secondary career or educational pathway. Many of these areas may involve the funding needed to provide students in areas that have little to no technology the infrastructure and devices to enable researchers to study the effects of allowing all students the access to such tools to improving their 21st century skills. This is in accordance to research already done would need a plan in place to train teachers and staff on best practices to integrate the technologies with students. Along with training staff an area that may be in need of further study is how to best train teachers to be more willing to utilize technologies in their classroom that will have a significant impact rather than a substitution of already planned curriculum. Future studies may also need to involve an accurate measure of the increase in student achievement while integrating ICT, after developing digital skills, while also measuring the TEDDICS reported from a variety of content areas.

On a larger, more challenging scale, Saade et al. (2012) provided suggestions that further research be done to address the design factors and framework that allow for maximum learning utilization of interactive learning environments, mapping critical thinking in those

environments, and study the influence of acquisition of higher order thinking skills in hybrid virtual learning environments.

Conclusion

The emphasis on education is to prepare students for success in life outside of the classroom. As the world changes there is no predicting the jobs that will be available but what still holds true after many years are the skills for a successful citizen especially with respect to a growing global society. Those core skills of communication, collaboration, critical thinking and creativity have long been driving forces to advances in our society. These skills are fundamental components of 21st century skills, which empower learners to successfully acquire knowledge and advance learning in the 21st century. To achieve this Kong (2013) asserts that given the overwhelming presence of digital technologies in use that students should benefit from this type of digital learning, by developing inquiry and critical thinking skills to select and process useful and reliable information from varying sources then needed to communicate and collaborate with their peers to complete tasks and share outcomes.

This task does not abandon the importance of classroom curriculum but rather stresses the importance of adapting how students are learning and maximizing the potential of what they can do with their knowledge by leveraging the technology tools that grant them access to a global learning community. This is not just a 21st century skills focus, but will be a focal point for centuries to come as much as it has been in the past in order for us to personalize while also globalize the students that are our future.

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