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Technology Use in Education by Students and Teachers

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A Literature Review Presented

in Partial Fulfillment of the Requirements

For the Degree of Master of Education

Abstract

Technology in education is becoming more and more common in the digital era that we now live in. The purpose of this literature review is create awareness of students and teacher's feelings towards technology in education. In addition to their feelings, an abundance of positive ways to integrate technology in the educational setting were also identified. The ways to use technology in the classroom include play, digital storytelling, games based learning, blogs, coding, robotics and virtual field trips. Teachers can also use technology to make significant changes to their classroom settings by flipping the classroom, making their classrooms one to one, and differentiating digitally. A close look at drawbacks of technology use in education according to professionals in the education setting rounded out the review. Teachers feel that some challenges include cell phones, lack of policy, and lack of help from technology departments.

Keywords: students, virtual field trips, technology, teachers, classroom, flipped classroom

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Technology Use in Education by Students and Teachers

The No Child Left Behind Act of 2001 states that every student should be literate in technology by the eighth grade (Padron, 2012). Math teachers are being emboldened to change their curriculum to the implementation of more technology in the classroom (Padron, 2012). There is an unclear relationship between the teachers' educational practices while using technology, effective technology integration, and technology integration in different subject areas (Howard, 2015). However, the integration of technology is something that is being pushed by national governments and there is a need to pay attention to promoting technology in the classroom (de Koster, 2017). In order to fully understand technology, it is vital to examine integration practices by teachers (Martin, 2015). Research is needed to identify if technology belongs in the classroom and what benefits come along with the use of technology.

The purpose of this literature review is to show the benefits of using technology in the classroom along with some of the challenges faced. The majority of the literature review will be geared towards the positives of using technology in the classroom. Some topics that will be addressed include teachers and students' feelings towards the integration of technology, a variety of ways that technology is being used in classrooms around the world, the benefits of the flipped classrooms, one to one classrooms, and digital differentiation.

The literature review will also identify some pitfalls of technology in the classroom. Some of the pitfalls discussed in the literature review include cell phones, lack of school policy and lack of help from technology departments. The review will conclude with where future research is needed.

Review of the Literature

Educational Leaders/Students Viewpoints on Technology in Education

The world is changing due to society's fast paced use of technology and information. Current students will live in a future that will be driven by technology, which means that change is coming for education leaders (Preston, 2015). Technology leaders in education can be identified as support personnel, teachers, and administration (Hineman, 2015). How educators perceive technology in education differs by subject area and their perception of the integration of technology is not clearly understood because each subject has a different set of learning outcomes (Howard, 2015). Educators have slowly begun to adapt their teaching practices to accommodate the integration of technology, which has made some teachers fluent in technology use, yet some still struggle and lack the confidence necessary to use technology in the classroom (Martin, 2018).

Research has been conducted across multiple subject areas to identify some math, science, technology, and special education teachers' feelings towards the use of technology (Mohamed, 2018; Berlin, 2012; Badia, 2019). To begin the examination of educational leaders' beliefs, it has been found that special education teachers are more apt to accepting technology when they can connect it to their daily teaching routine (Mohamed, 2018). Although special education teachers have technology in their classrooms that does not necessarily mean that they are confident in using such technology and believe that they need more training and experience using technology (Mohamed, 2018).

Special education leaders are not alone in the feeling of uncertainty. Teachers' motivations to integrate technology are led by their feelings and a positive way to make teachers feel confident about integrating technology is to provide specific support such as a peer

(Howard, 2015). Experienced teachers are being asked to be efficient in using technology with differing experiences in technology use (Hineman, 2015). It has been concluded that in order for students to benefit in a technology based learning environment the most, principals themselves must help teachers, encourage the collaboration between teachers, and provide positive role models of what good teaching looks like while using technology (Hineman, 2015).

Teachers' viewpoints on technology integration are not solely based on themselves. Students are meant to benefit from the use of technology in the classroom. The types of technology available for students and how students use technology also play a role in how teachers feel about technology integration. For example, how students use technology in an engineering course outside of the classroom promotes the hesitant viewpoint for educators (Gyllen, 2018). Students do not do the recommended reading using the eTextbook outside of the classroom and spend the majority of their time working on homework problems or studying for their test (Gyllen, 2018). It was also indicated that students who are more comfortable using technology will use technology for other purposes besides the sole purpose of using it for their classroom work (Kay, 2016). These uses may have an impact on teachers' feelings.

Students are being prepared to positively participate in a global economy by learning math, science, and technology (Berlin, 2012). The educators teaching these subjects seemed to have different feelings towards technology integration than special education teachers. Science teachers in Utah tended to have a constructivist approach to teaching with technology and tended to use it most to present information to the class (Badia, 2019). Pre Service STEM teachers at Midwestern University approached using technology in their educational practices with a positive attitude (Berlin, 2012). Findings from a study from five different types of schools suggest that technology in the classroom is irreplaceable and that teachers view the integration of

technology with high importance, especially after being supported in the use of a specific type of technology (de Koster, 2017). Ultimately, the support teachers receive when it comes to technology integration and the subjects they teach do have a direct correlation with their readiness and beliefs in regards to integration and readiness (Howard, 2015; Hinneman, 2015).

It is important to also identify what students' feelings are towards using technology in the classroom. Over 200 3rd grade students were interviewed after their completion of computer science lessons. The results from the study were overwhelmingly positive for nearly all of the students and even the students who did not have positive feelings towards the computer science lessons experienced feelings of neutrality (Tran, 2019). In addition to the positive feelings, students were able to make connections between computer science lessons and day to day routines of everyday life (Tran, 2019). By introducing technology into the learning process students' engagement levels rise and puts them in the driver's seat of their own learning (Preston, 2015). Some examples of how technology motivates students and promotes positive feelings towards learning include the use of science apps in science class, using iPads to communicate with non-verbal special education students, and using an iPad for digital notes in the general education classrooms (Preston, 2015).

A more recent technique to promote positive feelings towards the use of technology includes "flipping the classroom". Flipping the classroom calls for students to complete certain work at home, while completing problem solving in an active environment during class time with peers (Cukurbasi, 2018). By flipping the classroom using LEGO applications, the teacher's role differs from the traditional role of teaching to creating videos for students to watch and being present during their active learning to give guidance (Cukurbasi, 2018). Upon completion

of the LEGO applications assignments students felt like learning was fun, boosted their

motivation and any negative perceptions were shifted to positive (Cukurbasi, 2018).

Benefits and Ways to Use Technology in Education

Play

When it comes to the benefits of using technology in education there are benefits for both

teachers and students. The way that teachers teach and students learn have changed due to the

amount of touch screen technology available for students (Disney, 2019). Kids today see adults

using technology daily, which means that kids use technology to make meaning of the world

around them (Disney, 2019). When preschoolers used touch technology in numeracy learning it

was found that their scores improved, resulting in the conclusion that students can use touch

technology to showcase problem solving skills and improve their numeracy knowledge (Disney,

2019). Clear evidence was found that preschool students were engaged in specific subject matter

content, presented with enhanced subject matter, and built on their prior knowledge by using

touch screen technology (Disney, 2019).

Digital Storytelling

Digital storytelling is another way to generate creativity and motivation in students.

While using different forms of technology students engage themselves in creating digital stories

where learning is mixed with technology skills to express themselves (Lui, 2018). The learning

experience is unlike any other while students are using different skills to tell stories, adding

multimedia, and arranging ideas appropriately to effectively communicate personal stories (Lui,

2018). Another benefit to digital storytelling is that it allows learners to be in charge of their own

learning process by letting students participate in exploring their interests (Lui, 2018). Creativity,

language performance, and student motivation are all ways that digital storytelling positively

influenced elementary students, but there was a specific correlation between elementary students'

motivation and their level of creation (Liu, 2018).

Digital Badges

  A relatively new way to enhance learning outcomes in higher level education students

that are getting more awareness is known as digital badges (Carey, 2018). If lifelong learning is

the goal, then instructional digital badges are highly effective because they increase motivation

in students, avoid the traditional letter based credentials received upon completion, and provide

more instructional support for students to improve their learning experience (Newby, 2020). In

addition, informal learning is encouraged outside of the classroom walls by the use of digital

badges (Carey, 2018). Badges are received after students complete a specific required task,

demonstrate mastery, or reach a specific performance benchmark (Gibson, 2015; Newby, 2020).

  A digital badge is more than just a symbol of completion because it can also be used by

students as a natural pathway with clear directions on how to achieve a specific learning outcome

(Newby, 2020). Students that know the direction they need to go tend to be spirited to take the

appropriate steps needed to plan out how to achieve learning outcomes (Carey, 2018).

Traditionally, students' work is submitted and a letter grade is received for their work, but with

digital badges students can submit their work and see where it does/doesn't meet the badge

requirements, then make multiple revisions where needed to receive the badge (Newby, 2020).

  When it came to resubmission, students that worked in groups to receive badges received

feedback not only more often, but it was also more personalized (Newby, 2020). Once the badge

requirements are reached and resubmission is no longer needed, students can digitally display

badges on a profile or personal portfolio (Gibson, 2015). Digital badges when accompanied with

a leaderboard can look somewhat like a game and allow students to compete with one another in a controlled educational environment (Gibson, 2015).

Games Based Learning

Digital assessments have come a long way since the 1970's-1990's where students answered multiple choice questions on a computer with a positive attitude and favored these types of assessments over paper and pencil (Shute, 2017). Since then, advancement in technology and thinking has changed the way learning and assessment occurs in the classroom to a more personalized approach through games based learning (Shute, 2017; Persico, 2019). Games based learning can be defined as using technology to learn or receive instruction rather than the use of games for entertainment (Persico, 2019). Games based learning is considered a highly effective way to gauge where students are at academically due to the fact that they are ongoing assessments (Shute, 2017; Vanbecelaere, 2020). These ongoing assessments are not limited to the classroom setting because with the use of digital games, learning can occur anywhere, even in an informal learning environment (Persico, 2019).

Games based learning is tailored to today's learner by engaging them by the use of instructional design, games, and technology (Videnovik, 2020). Gamification can increase student achievement by using game scenarios, rewards, and incentives for completion (Videnovik, 2020). While learners are engaged in games based learning they are receiving a personalized form of learning and are developing a wide range of skills (Persico, 2019). Not only are students receiving personalized learning, but they are also receiving personalized support and feedback that results in the pertinent challenge level (Shute, 2017).

The intention for games based learning is that feedback is meant to be used immediately, progress within the games is meant to be kept track of, and that games are data driven to ensure a

blue ribbon learning experience (Shute, 2017). Due to the fact that games can be played

anywhere and can be played at their students' own pace they are motivated and engaged during

play with constant adult supervision (Giannakas, 2018). Technological advances and games

based learning are causing a change in how we learn outside of the classroom and are

transforming how we communicate and work together with others (Giannakas, 2018).

Blogs

A collaborative tool that has been increasing in popularity due to its supportive

characteristics that promote students active learning is blogs (Jimoyiannis, 2012). Blogs have a

personalized approach and are being implemented in the educational setting to exchange ideas

and to reflect on course content (Stonehouse, 2012). In addition, blogs have also been viewed as

user friendly, enhance learning, and support peer interaction (Marín, 2020).

Key skills involved with blogging include, but are not limited to critical thinking,

reflection, self-assessment, peer interaction and collaboration (Marín, 2020). When engaging

with other students through the use of blogs, students are promoting a higher order of thinking

and continuously transfer ideas from learning events to solve problems (Stonehouse, 2012).

Proof of engagement is in each students' response to a classmate when they respond and validate

or question content within the blog post (Stonehouse, 2012).

Blog posts give students an opportunity to express themselves to a specific audience and

receive feedback (Stonehouse, 2012). When students receive feedback from other students, a

wide range of emotional responses occur ranging from surprise to confusion (Stonehouse, 2012).

Students prefer open ended questions that promote dialog between multiple students that might

not occur in face to face settings and appreciate the time to reflect on thoughts before posting

responses (Stonehouse, 2012). Some students feel that blogging gives them a positive sense of

accomplishment when sharing beliefs and knowledge with other students in a professional

manner (Stonehouse, 2012). Even students who do not have any previous experience using blogs

demonstrate a high level of interest to participate in blog activities (Jimoyiannis, 2012). In a blog

community each student has the chance to be influential to the group (Jimoyiannis, 2012). For

these reasons, blogging is a favorable technology based tool to promote informal learning in a

personalized environment (Jimoyiannis, 2012).

Virtual Field Trips

The use of virtual field trips in the classroom setting has been gaining ground since the

1990's (Han, 2020). Virtual field trips can be defined as a way for students to interact with a

computer generated environment that replicates or is a visual image of a real place (Han, 2020).

Students seeing an actual place virtually without actually being there is a huge part of the virtual

field trip experience (Han, 2020). Virtual field trips are a way to promote the use of technology

and get away from the sedentary traditional classroom setting by engaging students in active

learning (Norris, 2015). Researchers have included interactive whiteboards, televisions,

desktops, touch screen devices, and head mounted displays as ways to experience virtual field

trips (Han, 2020; Norris 2015).

When it comes to comparing all of the different types of experiences, some students feel

like immersive virtual field trips using head mounted displays gave them a sense of actually

being in that place, while others felt like more traditional virtual field trip avenues (interactive

whiteboards, televisions, desktops, touch screen devices) gave them more of a life like

experience (Han, 2020). At the high school level, students are able to achieve learning objectives

and retain knowledge after virtual field trips (Mead, 2019). In regards to the subject of science at

the high school level students reported that they enjoyed going on the field trip to see new places

and that the experience was engaging (Mead, 2019). In addition to being engaging, some field trips are near impossible to go on due safety implications, distance, or price, which makes virtual field trips a huge benefit (Delacruz, 2019). Virtual field trips can be created by a classroom teacher or found pre-made, however it is recommended that teachers take the time to create their own virtual field trip to tailor it specifically towards their students (Delacruz, 2019). For these reasons, regardless of the technology used for virtual field trips they allow students to visit distant places, help students explore previously impossible destinations, and use problem solving skills along the way (Delacruz, 2019).

One-To-One Classrooms

Traditionally, schools have been ruled by paper and pencils, but when a school is digitalized, teachers and students are changing how they teach and learn (Kroksmark, 2016). When a school is one to one, every student and teacher has their own technology to use continuously in all school subjects, the technology is connected to the internet, and technology can be taken home (Kroksmark, 2016). According to an abundance of self-reported evidence, Maine's middle schools have succeeded in the implementation of a one to one laptop program that is increasing and enhancing student learning (Kroksmark, 2016). Evidence also shows that one to one classrooms are more directed towards being student centered and individualized (Zheng, 2016). Student motivation to do school work also increased and the classroom environment became more fixed on the learning at hand (Kroksmark, 2016).

The teacher's role in a one to one environment has changed from being able to plan for all students doing the same thing at the same time to giving an overview and following up with students to see if they are meeting their goals (Kroksmark, 2016). Personalized student feedback in one to one classrooms is conducted more often than in classrooms that are not one to one

(Rosen, 2012). Students in a one to one environment are learning differently by choosing the avenue in which they learn and are most comfortable with (Kroksmark, 2016). Students are also encouraged to work together and ask each other questions, while the teacher is observing and engaging in student learning both in person and using their own technology (Kroksmark, 2016).

The relationship between teachers and students as well as home and school has improved because of the one to one learning environment (Zheng, 2016). While students are one to one it was observed that they interact more with their teachers than students in classes that are not one to one (Rosen, 2012). In a study that compared students' unexcused absences from the beginning of the year to the end of the year, students in one to one environments decreased where the control group increased (Rosen, 2012). While teachers are engaged in monitoring students they change their instruction based upon what they see from the students in real time (Rosen, 2012). Due to the change in teaching and learning in a one to one environment it is encouraged that professional theories get re-evaluated and become more flexible with the change in today's world (Kroksmark, 2016).

Flipped Classrooms

The trend of using technology in education has led to a rethinking of how the traditional classroom is utilized (Blair, 2015). The rethinking of the traditional classroom has led to what is now known as the flipped classroom, which means that the content being taught in the class is presented to students digitally outside the classroom, then problem solving or group activity is done in class where the teacher can be more hands on (Blair, 2015). The flipped classroom combines direct instruction and a learner centered approach in an in class face to face environment and an online environment (Mohammed, 2018). While students are engaged in lessons online they are in control of where they learn and the pace of which they learn (Asef-

Vaziri, 2015). Traditionally class time has been where content is delivered to students, however when the classroom is flipped teachers no longer spend class time delivering content, but instead focus on active learning, group problem solving, case studies, and real world applications (Asef-Vaziri, 2015).

 In order for the flipped classroom to be successful teachers must value formative and summative assessments, face to face activities, and provide students with collaboration opportunities to allow students to learn from each other (Blair, 2015). Students need to be motivated to complete their outside the classroom teacher delivery of content by games based learning and collaborative projects (Blair, 2015). Teachers spend a large amount of time creating digital content for students to watch outside the classroom, but found that spent less time preparing for in class activities, they spent less time correcting students' errors, did not have to catch students who missed class because the content is online, students were more actively involved during class, and teachers got to know student's successes and struggles more (Blair, 2015; Asef-Vaziri, 2015).

There have not been many studies conducted on academic achievement in flipped classrooms, but instead have focused on how student's thoughts and feelings towards the flipped classroom (Blair, 2015). Students feel like they are in the driver's seat of their own learning because of the flexibility when and where to watch content (Blair, 2015). In addition to the flexibility, students like using video to watch lessons and feel like class time is now utilized better due to more in class activities where teachers can be hands-on with helping students learn the content being delivered (Blair, 2015).

In traditional classrooms students come to class to listen to lectures and have access to materials for the class whereas students in a flipped classroom show up to class to apply what

they have already learned (Blair, 2015). When it comes to learning in the flipped classroom,

viewing content online is not enough to guarantee learning, which means that students must take

the learned online content and apply it in the classroom setting (Blair, 2015). Even though most

of the materials for a flipped classroom are online, students still value class and show up to

participate in the classroom (Asef-Vaziri, 2015). When students show up to class in a flipped

classroom they are likely to retain information better due to the hands on approach by their

teacher and be more engaged (McNally, 2017).

The student centered environment created by watching videos prior to class levels the

playing field among students and allows for a more personalized in class learning experience

(Videnovik, 2020). When it comes to learning outcomes and student investment, students seem

to perform better when the entire course is flipped and not just part of it (McNally, 2017). Due to

the newness of flipped learning and some students' preferences to learn in the classroom, they

may be hesitant to buy into the flipped classroom and may view it as confusing or unorganized,

however this should not stop teachers from flipping their classrooms (McNally, 2017).

Coding

Most of jobs require employees to use technology, which means that basic coding skills

are becoming more unavoidable in the workplace (Videnovik, 2020). In today's society being

able to code is very important, labeling it now as a key 21st century skill (Dohn, 2020).

Computational thinking and basic computer skills computer science and programming are being

integrated into school systems in different countries around the world as an introduction to

coding (Dohn, 2020). There has been a large undertaking to gain the interest of young people to

take up coding by developing tools and activities that are essential parts of their lives by using

technology that they're familiar with (Dohn, 2020; Videnovik, 2020).

One way to gain the enthusiasm, creativity, and motivation of students is through the visual coding environment of Scratch (Dohn, 2020). The coding environment was deemed Scratch because of the way users are encouraged to use existing code to start a new scheme, mix, or build on other users' work made public on Scratch (Dohn, 2020). Scratch is being integrated into multiple subjects such as math, science, and art (Dohn, 2020). It has been shown that Scratch is extremely useful in the mathematics classroom and has a positive effect on students' learning when students develop math games by combining mathematical thinking, problem solving, and coding (Dohn, 2020). When studying the effectiveness of Scratch compared to other entry level coding platforms Scratch not only generated a higher level of intrinsic motivation for students, but also resulted in better student performance (Dohn, 2020).

In some cases, student motivation is not increased due to the stress between school activities and student free play by using Scratch where students reach goals they have created themselves instead of repercussions created by teachers if students do not reach the desired outcome (Dohn, 2020). If teachers do not present Scratch to students in a format of tinkering and use problems that generate intrinsic motivation, then Scratch can have a negative blow to students' interest due to the controlled environment of learning tasks created by teachers (Dohn, 2020).

ScratchJr is the same tablet based programming environment as Scratch that is meant for older students, but can be changed to be directed towards students in grades kindergarten through second (Strawhacker, 2019). Some of the benefits of ScratchJr for younger students include block coding characters to move in fun ways, differing instruction difficulty, and unique projects that make ScratchJr intriguing (Strawhacker, 2019). Children engage with ScratchJr and are introduced to ideas about computer science in many ways including classroom lessons directed

by the teacher, less structured GBL, and free play (Strawhacker, 2019). Due to students showing

know-how and creativity while coding, teachers can use computer programming such as

ScratchJr to support other ways of thinking and problem solving skills (Strawhacker, 2019).

Computer programming should be a requirement for general education in primary school,

secondary school, and beyond (Strawhacker, 2019).

Robotics

The once industrial workplace has changed from doing the same work daily to a global

workplace that is ever changing and fueled by creativity, knowledge, and modernism (Nemiro,

2017). Due to the change from industrial to global workplace a different set of skills are now

needed that generate creativity, problem solving, and the ability to use new knowledge (Nemiro,

2017). With the advancement in technology in today's society, it is estimated that 65% of

students going to school today may have a job that is not out there yet as an adult (Kazakoff,

2013). This means that it is important that parents, families, and schools provide digital devices

for children to begin to understand at a young age (Kazakoff, 2013). Digital devices are

important for younger children because data is presented differently by sounds, pictures, and

different multimedia representations (Kazakoff, 2013).

One way to get students to use digital devices and help form concrete ideas is through

programming robots (Kazakoff, 2013). When it comes to robots in the classroom there are many

benefits starting with helping students gain a better understanding of math concepts (Kazakoff,

2013). Sequencing is another benefit to robotics and an increase in students' sequencing ability

can be confirmed after just one week due to the relationship between sequencing and the way

children tell stories (Kazakoff, 2013). The by-product of robots in the early childhood classroom

is excitement because it allows students to be engaged in active learning that is applicable in the subjects of math, reading, and even life (Kazakoff, 2013).

Students' motivation to use robots continues to gain tread showing to have a large impact on education in not just its own field, but throughout multiple subjects (Rihtaršič, 2016). It is clear to students that there is an importance to learn about robots due to their potential latency in the future (Rihtaršič, 2016). Due to the student's self-awareness of the importance of robots, the number of students that were motivated and the use of robots themselves, classroom discipline matters were at an all time low, even for students that typically has discipline issues (Rihtaršič, 2016). The high level of student motivation and lack of discipline problems supports the notion that robotics can be an encouraging educational tool (Rihtaršič, 2016).

While using robots, high energy levels were also witnessed especially at the beginning of an activity that involved building a robot or programming a robot (Nemiro, 2017). Robotic use in a classroom has a hectic feel to it while students work together in different spaces and oftentimes have to verbalize instructions to teachers from a long distance (Nemiro, 2017). The use of pair programming in robotics results in higher success rates in trouble shooting, achieving learning tasks, and positive peer interaction (Zhong, 2020). A successful technique while engaged in a difficult problem while building or programming a robot is to interact with peers to exchange possible solutions for problems at hand (Nemiro, 2017). In regards to robotics use in education, it is encouraged to have students work in pairs to achieve learning outcomes that were not always achieved by students working individually (Zhong, 2020).

Digital Differentiation

Teachers have many responsibilities, but one important one is identifying and teaching students that all read at different levels (Baron, 2019). When it comes to students' literacy skills

there are many reasons why they might struggle, which means that teachers need to be able to accurately identify the area students need support (Baron, 2019). One tool teachers are using to identify the needs of students is to use technology based literacy instruction (Baron, 2019). Programs such as Aimsweb and Lexia Core5 Reading can be used to not only identify reader portfolios, but also differentiate instruction for all students with reading portfolios (Baron, 2019). It can be concluded that personalized instruction using technology is an effective way to increase scores from Fall to Spring.

Online education is something that has taken off in recent years and with it came a diverse set of learners (Beasley, 2017). To be specific, there are 400,000 students enrolled in cyber schools and 2.5 million students taking online courses (Beasley, 2017). There is contradicting evidence whether cyber schools are more beneficial than the school setting. (Beasley, 2017). Regardless, with that many students taking online courses and enrolled in cyber school there is clearly a need for teachers to differentiate (Beasley, 2017). Differentiation can be defined as decision making in the classroom or online to meet the needs of all students (Beasly, 2017). Research can conclude that when teachers make professional decisions to meet the needs of their students that it has a positive impact on their achievement (Beasley, 2017).

In the northeastern United States, 118 teachers from two Moodle based cyber schools participated in a survey about how they differentiated in their online environments (Beasley, 2017). Survey results concluded that teachers look at differentiation from a couple different perspectives that include both what students need differentiated and why students need differentiation (Beasley, 2017). Although student's complete assignments at their own pace online it is not a one size fits all environment (Beasley, 2017). Teachers conclude that the content presented to students online, the process in which they complete assignments, and the

assignments themselves need to be differentiated (Beasley, 2017). Cyber schools are great for challenging and supporting all learners in a rich environment that supports lifelong learning (Beasley, 2017).

When it comes to digital literacy, students need more than a one size fits all model and prior knowledge such as technology experience and exposure to digital genres (Martin, 2015). Being able to write digital texts has become a priority in recent years for U.S. students because of the ability to access information, accomplish goals, and build relationships (Martin, 2015). Digital writing is preparing students to accomplish adulthood goals because digital texts are now being used in the workforce, university classrooms, and leisurely due to the increase in technology and globalization (Martin, 2015). Students today all have different experiences with using technology, which means that there is a need for differentiated instruction when teaching digital writing (Martin, 2015). Students need more than just exposure to digital writing tools (Martin, 2015). For students with less prior knowledge in technology, digital writing instruction creates opportunities tailored towards writing in a digital environment (Martin, 2015).

Education is always changing due to standards set by local and national governments (Haelermans, 2015). Students that are low and high achieving are not being targeted when teachers differentiate because differentiation is targeted towards the average student (Haelermans, 2015). Differentiation in the classroom leads to increased student motivation, but is hard for some teachers to achieve (Haelermans, 2015). Schools are feeling the need to change to a digital curriculum to increase student motivation and lower dropout rates (Haelermans, 2015). In a 12-week experiment, students studied biology each week in two lessons that were each 50 minutes long and after each 4-week block would take a pre-test to decide which level they were at (Haelermans, 2015). Students in the 12-week experiment used digital instruction from the

publisher, digitized sections of the book created by the teacher, and materials found on the

internet (Haelermans, 2015). During the class the teacher was available to answer questions and

give further explanation and every lesson began with a short introduction from the teacher

(Haelermans, 2015). Due to the teacher being present during class while students were

completing digital assignments, more questions were able to be answered compared to a

traditional classroom where there usually isn't enough time after the teacher explains the topic

(Haelermans, 2015). It can be concluded that digital differentiation after student pre-test has a

positive impact on students' biology post test scores (Haelermans, 2015).

Challenges of Technology in Education

Cell Phones

      With the emergence of mobile technologies such as computers, tablets, and smartphones

they have become a big part of our everyday lives (İ Bakır, 2017). These technologies have

crossed over into the classrooms to ensure an engaging learning environment, however there are

many meaningless uses for mobile technology in the educational setting (İ Bakır, 2017). By

allowing students to have or use their cellphones in class is leading to cell phone misuse (İ Bakır,

2017). Some other ways students are misusing their cell phones are engaging in inappropriate

text use, augmenting drug deals, and enticing a fight by gathering in large numbers with their

cellphones (Preston, 2015). It is believed that students have difficulty taking responsibility for

what they text and lack digital awareness when it comes to inappropriate texting (Preston, 2015).

Some schools are combating cell phone use. For example, In the United Kingdom it was reported

that students were not allowed to use cellphones in schools which resulted in high student

achievement on tests and exams (Fernandez, 2018).

Teachers Technology Concerns

Some teachers are frustrated with technology use in the classroom due to the lack of help from the school's technology department (Alenezi, 2016). When looking at data where teachers expressed their concern with technology support, the majority either felt that support was below average or average while less than half of teachers felt like the support was excellent (Alenezi, 2016). Some teachers felt like there was a lack of training included with the way technology was being integrated and was being presented to them in a figure it out on their own way which has led to teachers being reluctant in trying new technology in their classrooms (Alenezi, 2016).

When it came to access to technology only there were a very low number of teachers who felt like they could access technology whenever they needed it (Alenezi, 2016). Another obstacle that teachers run into while using technology is too many security restrictions which make it difficult to share information with students (Alenezi, 2016). Lastly, instructional time is so valuable to teachers that they fear if something goes wrong while using technology that they will lose that instructional time (Alenezi, 2016). Other concerns teachers had about technology included cost, how to manage what students are doing on their device, and how hard it would be to use the technology in the classroom (Vu, 2019).

Policies and Lack of Policy

On Prince Edward Island, not all schools have Wi-Fi due to the policy that computer technicians do not support the use of student iPads, whereas schools that do not have Wi-Fi are limiting students use of their iPad or device brought from home (Preston, 2015). Teachers are prohibited from using social media to engage in in conversation with students, how use cell phones at sporting events or field trips to keep in contact with students which contradicts school policy (Preston, 2015). Lastly, students do not have enough storage on the school's computers to

do an assignment, save it, and hand it in (Preston, 2015). If students had access to the schools

drives they could upload a virus which means there needs to be a clear policy in place for cloud

storage in education (Preston, 2015). Digital literacy policies need to be enriched to support

students' school experience to ensure students are successful in an ever changing technological

society (Preston, 2015). In addition to student support, teachers need to provide the opportunity

to engage in professional development that focuses on digital learning, pedagogy, and teaching

(Preston, 2015).

Conclusion

The education world is an ever changing place. Teachers and students all have different

feelings towards the use of technology in the educational setting. Special education teachers are

more willing to use technology than some others, but a school benefits most when school leaders

themselves are engaged in the technology process and encourage other teachers. There was an

immense feeling of positivity when students were able to use technology in the classroom.

Students feel more engaged, have better behaviors, less unexcused absences, and have a better

connection with their teachers while using technology in the classroom.

There are many ways for teachers and students to use technology in the classroom.

Technology in the classroom can be used for play, digital storytelling, digital badges, games

based learning, blogs, virtual field trips, coding, and robotics. Some ways that schools and

teachers are implementing technology is by flipping the classroom, making their classrooms one

to one, and differentiating digitally. The use of technology in the classroom is encouraged due to

the globalized world that we now live in. Students today need to be prepared for jobs in the

future that are not yet there yet instead of traditional jobs that are likely to not be there in the

years to come. Students need to create, collaborate, and be able to effectively solve problems. By

integrating technology into classrooms teachers can effectively prepare students for future success.

There is an abundance of evidence promoting the use of technology, but there is still some need for improvement. Cell phones are a part of who we are now. Therefore, they are being brought into classrooms and sometimes used inappropriately. Some teachers feel like they are being asked to integrate technology, then do not receive the appropriate support. Other teachers felt that technology is taking away too much instructional time. Cost and how to manage students on their devices were also a large concern for some teachers. Ultimately, schools' technology policies need to be more clear in order for technology to be used successfully by staff and students.

Future research is needed in a couple of specific areas. When it comes to flipped classrooms, future research is needed to identify the best way to flip a classroom. In a flipped classroom and one to one environment engagement levels rise. Future research is needed to identify if the academic success is because of the use of technology or if it is because of the curriculum and teaching practices being used along with the technology. Lastly, it is important to conduct future research on successful teaching practices while using technology to help teachers with the implementation process.

References

Asef-Vaziri, A. (2015). The Flipped Classroom of Operations Management: A Not-For-Cost-Reduction Platform. *Decision Sciences Journal of Innovative Education*, *13*(1), 71–89. https://doi.org/10.1111/dsji.12054

Avsec, S., Rihtarsic, D., & Kocijancic, S. (2014). A Predictive Study of Learner Attitudes Toward Open Learning in a Robotics Class. *Journal of Science Education and Technology*, *23*(5), 692–704. https://doi.org/10.1007/s10956-014-9496-6

Badia, A., & Iglesias, S. (2019). The Science Teacher Identity and the Use of Technology in the Classroom. *Journal of Science Education and Technology*, *28*(5), 532–541. https://doi.org/10.1007/s10956-019-09784-w

Baron, L. S., Hogan, T. P., Schechter, R. L., Hook, P. E., & Brooke, E. C. (2019). Can educational technology effectively differentiate instruction for reader profiles? *Reading and Writing*, *32*(9), 2327–2352. https://doi.org/10.1007/s11145-019-09949-4

Beasley, J. G., & Beck, D. E. (2017). Defining Differentiation in Cyber Schools: What Online Teachers Say. *TechTrends*, *61*(6), 550–559. https://doi.org/10.1007/s11528-017-0189-x

Berlin, D. F., & White, A. L. (2012). A Longitudinal Look at Attitudes and Perceptions Related to the Integration of Mathematics, Science, and Technology Education. *School Science and Mathematics*, *112*(1), 20–30. https://doi.org/10.1111/j.1949-8594.2011.00111.x

Blair, E., Maharaj, C., & Primus, S. (2016). Performance and perception in the flipped classroom. *Education and Information Technologies*, *21*(6), 1465–1482. https://doi.org/10.1007/s10639-015-9393-5

Carey, K. L., & Stefaniak, J. E. (2018). An exploration of the utility of digital badging in higher education settings. *Educational Technology Research and Development*, *66*(5), 1211–1229. https://doi.org/10.1007/s11423-018-9602-1

Cukurbasi, Baris, and Mubin Kiyici. (2018). "High School Students' Views on the PBL

    Activities Supported via Flipped Classroom and LEGO Practices." *Journal of*

    Educational Technology & Society, 21(2), 46–61.

Delacruz, S. (2019). Building Digital Literacy Bridges: Connecting Cultures and Promoting

    Global Citizenship in Elementary Classrooms through School-Based Virtual Field Trips.

    TechTrends, *63*(4), 428–439. https://doi.org/10.1007/s11528-018-0350-1

de Koster, S., Volman, M., & Kuiper, E. (2017). Concept-guided development of technology in

    'traditional' and 'innovative' schools: quantitative and qualitative differences in

    technology integration. *Educational Technology Research and Development*, *65*(5),

    1325–1344. https://doi.org/10.1007/s11423-017-9527-0

Disney, L., Barnes, A., Ey, L., & Geng, G. (2019). Digital play in young children's numeracy

    learning. *Australasian Journal of Early Childhood*, *44*(2), 166–181.

Dohn, N. B. (2020). Students' interest in scratch coding in lower secondary mathematics. *British*

    Journal of Educational Technology, 51(1) 71-83.

Fernandez, S. (2018). University Student's perspectives on using cell phones in classrooms - are

    they dialing up disaster? *TOJET: The Turkish Online Journal of Educational Technology,*

    17 (1) 1-13.

Giannakas, F., Kambourakis, G., Papasalouros, A., & Gritzalis, S. (2018). A critical review of 13

    years of mobile game-based learning. *Educational Technology Research and*

    Development, *66*(2), 341–384. https://doi.org/10.1007/s11423-017-9552-z

Gibson, D., Ostashewski, N., Flintoff, K., Grant, S., & Knight, E. (2015). Digital badges in

    education. *Education and Information Technologies*, *20*(2), 403–410.

    https://doi.org/10.1007/s10639-013-9291-7

Gyllen, J., Stahovich, T., & Mayer, R. (2018). How students read an e-textbook in an

    engineering course. *Journal of Computer Assisted Learning*, *34*(6), 701–712.

    https://doi.org/10.1111/jcal.12277

Haelermans, C., Ghysels, J., & Prince, F. (2015). Increasing performance by differentiated

    teaching? Experimental evidence of the student benefits of digital differentiation. *British*

    Journal of Educational Technology, *46*(6), 1161–1174.

    https://doi.org/10.1111/bjet.12209

Han, I. (2020). Immersive virtual field trips in education: a mixed-methods study on elementary

    students' presence and perceived learning. *British Journal of Educational Technology,*

    51(2) 420-435.

Hineman, J. M., Boury, T. T., & Semich, G. W. (2015). Technology-Literate School Leaders in a

    1:1 iPad Program and Teachers' Technology Self-Efficacy. *International Journal of*

    Information and Communication Technology Education, *11*(2), 68–79.

    https://doi.org/10.4018/ijicte.2015040106

Howard, S. K., Chan, A., & Caputi, P. (2015). More than beliefs: Subject areas and teachers'

    integration of laptops in secondary teaching. *British Journal of Educational Technology*,

    46(2), 360–369. https://doi.org/10.1111/bjet.12139

İ Bakır Arabaci. (2017). Investigation faculty of education students' cyberloafing behaviors in

    terms of various variables. *TOJET : The Turkish Online Journal of Educational*

    Technology, 16

Jimoyiannis, A., & Angelaina, S. (2012). Towards an analysis framework for investigating

    students' engagement and learning in educational blogs. *Journal of Computer Assisted*

    Learning, *28*(3), 222–234. https://doi.org/10.1111/j.1365-2729.2011.00467.x

Kay, R., & Lauricella, S. (2016). Assessing laptop use in higher education: The Laptop Use

Scale. *Journal of Computing in Higher Education*, *28*(1), 18–44.

https://doi.org/10.1007/s12528-015-9106-5

Kazakoff, E. R., Sullivan, A., & Bers, M. U. (2013). The Effect of a Classroom-Based Intensive

Robotics and Programming Workshop on Sequencing Ability in Early Childhood. *Early*

Childhood Education Journal, *41*(4), 245–255. https://doi.org/10.1007/s10643-012-0554-

5

Kroksmark, T. (2016). The stretchiness of learning the digital mystery of learning in one-to-one

environments in schools. *Education and Information Technologies*, *21*(1), 35–52.

https://doi.org/10.1007/s10639-014-9308-x

Liu, K. P., Tai, S. J. D., & Liu, C. C. (2018). Enhancing language learning through creation: the

effect of digital storytelling on student learning motivation and performance in a school

English course. *Educational Technology Research and Development*, *66*(4), 913–935.

https://doi.org/10.1007/s11423-018-9592-z

Marín Victoria I. (2020). Research-based learning in education studies: design inquiry using

group e-portfolios based on blogs. *Australasian Journal of Educational*

Technology, *36*(1), 1–20.

Martin, N. M., & Lambert, C. (2015). Differentiating Digital Writing Instruction. *Journal of*

Adolescent & Adult Literacy, *59*(2), 217–227. https://doi.org/10.1002/jaal.435

Mead, C., Buxner, S., Bruce, G., Taylor, W., Semken, S., & Anbar, A. D. (2019). Immersive,

interactive virtual field trips promote science learning. *Journal of Geoscience Education*,

67(2), 131–142. https://doi.org/10.1080/10899995.2019.1565285

McNally, B., Chipperfield, J., Dorsett, P., Del Fabbro, L., Frommolt, V., Goetz, S., Lewohl, J.,

      Molineux, M., Pearson, A., Reddan, G., Roiko, A., & Rung, A. (2017). Flipped

      classroom experiences: student preferences and flip strategy in a higher education

      context. *Higher Education, 73(2*), 281–298.

Mohamed, A. H. H. (2018). Attitudes of special education teachers towards using technology in

      inclusive classrooms: a mixed-methods study. *Journal of Research in Special*

      Educational Needs, *18*(4), 278–288. https://doi.org/10.1111/1471-3802.12411

Nemiro, J., Larriva, C., & Jawaharlal, M. (2017). Developing creative behavior in elementary

      school students with robotics. *Journal of Creative Behavior, 51(1)*, 70-90.

Newby, T. J., & Cheng, Z. (2020). Instructional digital badges: effective learning tools.

      Educational Technology Research and Development, 68(3), 1053-1067.

Norris, E., Shelton, N., Dunsmuir, S., Duke-Williams, O., & Stamatakis, E. (2015). Virtual field

      trips as physically active lessons for children: a pilot study. *BMC Public Health*, *15*(1).

      https://doi.org/10.1186/s12889-015-1706-5

Padron, Y. N., Waxman, H. C., Lee, Y.-H., Lin, M.-F., & Michko, G. M. (2012). Classroom

      observations of teaching and learning with technology in urban elementary school

      mathematics classrooms serving English Language Learners. *International Journal of*

      Instructional Media, 39(1), 45+.

Persico, D., Passarelli, M., Pozzi, F., Earp, J., Dagnino, F. M., & Manganello, F. (2019). Meeting

      players where they are: digital games and learning ecologies. *British Journal of*

      Educational Technology, 50(4), 1687-1712.

Preston, J. P., Wiebe, S., Gabriel, M., McAuley, A., Campbell, B., & MacDonald, R. (2015).

      Benefits and Challenges of Technology in High Schools: A Voice from Educational

Leaders with a Freire Echo. *Interchange*, *46*(2), 169–185. https://doi.org/10.1007/s10780-015-9240-z

Rihtaršič, D., Avsec, S., & Kocijancic, S. (2016). Experiential learning of electronics subject matter in middle school robotics courses. *International Journal of Technology and Design Education*, *26*(2), 205–224. https://doi.org/10.1007/s10798-015-9310-7

Rosen, Y., & Beck-Hill, D. (2012). Intertwining digital content and a one-to-one laptop environment in teaching and learning. *Journal of Research on Technology in Education, 44(3)*, 225–241.

Shute, V., & Rahimi, S. (2017). Review of computer-based assessment for learning in elementary and secondary education. *Journal of Computer Assisted Learning*, *33*(1), 1–19. https://doi.org/10.1111/jcal.12172

Stonehouse, P., Keengwe, J., & Shabb, C. (2012). Using blogs as a technology tool to promote teaching goals in education. *International Journal of Information and Communication Technology Education, 8(1),* 44+.

Strawhacker, A., & Bers, M. U. (2019). What they learn when they learn coding: investigating cognitive domains and computer programming knowledge in young children. *Educational Technology Research and Development*, *67*(3), 541–575. https://doi.org/10.1007/s11423-018-9622-x

Tran, Y. (2019). Computational thinking equity in elementary classrooms: what third-grade students know and can do. *Journal of Educational Computing Research*, *57*(1), 3–31.

Vanbecelaere, S., van den Berghe, K., Cornillie, F., Sasanguie, D., Reynvoet, B., & Depaepe, F. (2020). The effectiveness of adaptive versus non-adaptive learning with digital

educational games. *Journal of Computer Assisted Learning*, *36*(4), 502–513.

https://doi.org/10.1111/jcal.12416

Videnovik, M., Vlahu-Gjorgievska, E., & Trajkovik, V. (2020). To code or not to code: Introducing coding in primary schools. *Computer Applications in Engineering Education*. Published. https://doi.org/10.1002/cae.22369

Vu, P., Fredrickson, S., & Gaskill, M. (2019). One-To-One Initiative Implementation from Insiders' Perspectives. *TechTrends*, *63*(1), 62–67. https://doi.org/10.1007/s11528-018-0359-5

Zheng, B., Warschauer, M., Lin, C. H., & Chang, C. (2016). Learning in One-to-One Laptop Environments. *Review of Educational Research*, *86*(4), 1052–1084. https://doi.org/10.3102/0034654316628645

Zhong, B., & Li, T. (2020). Can pair learning improve students' troubleshooting performance in robotics education? *Journal of Educational Computing Research, 58(1)*, 220-248.