

Screen Time, How Much is Too Much? The Social and Emotional Costs of Technology on the
Adolescent Brain

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Signature Sheet

This thesis, written under the direction of the candidate's thesis advisor and approved by the Chair of the Master's program, has been presented to and accepted by the Faculty of Education and Counseling Psychology department in partial fulfillment of the requirements for the Degree of Master of Science in Education. The content and research methodologies presented in this work represent work of the candidate alone.

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Abstract

Screen time no longer means just the amount of time one spends in front of the television. Now it is an aggregate amount of time spent on smartphones, computers as well as multitasking with different devices. How much are the glowing rectangles taking away from adolescent social and emotional health? How is it changing how students learn and how they communicate with the world? How much is too much?

The purpose of this study is to determine whether the 1-1 student-to-iPad pilot at an affluent public school in the greater San Francisco Bay Area is helping students succeed in their education and critical thinking skills or if it is hindering their progress and attention span. Whether adding technology at school is allowing students to be more connected, or if they feel forced to use technology. How is the additional technology affecting their brains? How is it affecting their social and emotional wellbeing?

Students from a local high school in two small learning communities (SLC) were given iPads as part of a pilot program within the New Tech Network. Two general education art classes were given a survey to find the emotional and social factors of this added technology in their lives. Of the forty-one students surveyed, thirty-one were part of the iPad pilot programs. Nine teachers both within the SLC's and without were interviewed about their technology use in the classroom as well as their opinions on the effects of technology on adolescents outside of the classroom. One school counselor was also interviewed.

The findings indicated that all students surveyed have access to the Internet and only one student of the forty-one students surveyed does not own a cell phone. All students who own a cell phone send and receive texts. Students are constantly using some form of technology in and

outside of the classroom, whether for schoolwork or to stay in touch with friends. All students are using some form of technology within two hours of going to bed. Texting is rampant in all classrooms. Many of the teachers interviewed agreed that there is an epidemic of anxiety and depression as well as an addiction to texting. Students are less connected to their peers and teachers because of technology. Four out of five iPad Pilot teachers are using the iPads 50-75% of class time, that's an additional two or more hours of screen time per day, and at least six hours more of screen time per week in school. All teachers know students use their various devices in and outside of class in addition to the added class work on those devices.

Chapter 1 Introduction

A group of five students have sat together in the courtyard at lunch. Under the California sun, they are grouped on the grass, in the shade while a warm breeze blows. They are not talking, they are not looking at each other or the environment they chose, they are all on their phones.

Each one of them is huddled over their device avidly moving thumbs texting.

Occasionally, a student reaches for their lunch and takes a bite of their sandwich. Eventually a student looks up and asks their peers if they have seen what so-and-so wrote on their Facebook wall, and the others immediately go back to their phones to read the post. The same day a group of teachers gather in a discussion to ponder the amount of screen time students are accumulating and the effect it is having on them. Many of the teachers were not wholly for or against the use of technology in schools. Many admitted that they themselves have many of the same gadgets. However, the over-arching question was, what does all this screen time *do* to the students? Are they becoming less emotionally savvy with all their interactions online? Are they learning the correct way to navigate the digital world or are they drowning in the technology? Is this new equipment helping or hindering adolescent students to be prepared for their future?

Statement of Problem

Technology is everywhere and changes almost instantly. It includes television, computers, laptops and smartphones at home. It is also television monitors at the gas station and in the hands of students on tablets, iPods, and iPads. And now it is in the schools. Technology changes so frequently that there are few current studies available to determine the effect of the media in the hands of students. In order to understand how to help shape education towards

ethical use of technology, data are needed in order to understand what happens to the students' brains with so much screen time and what is needed to create balance.

Purpose Statement

The purpose of this study is to identify how screen time, with all types of media, affects adolescents and whether or not it is causing them to be more emotionally and socially active or inactive due to the time spent on their devices. It is also to find out whether adding an iPad at school is hindering students' abilities to learn, or whether it is helping them adjust to the technological world. Is students' emotional and social intelligence being negatively affected by the amount of screen time they accumulate?

Research Question

The main question for the research study is: What are the social and emotional costs of technology and how does amount of screen time affect the teenage brain? Please note that technology and screen time equate to the use of computers, tablets, iPhones, iPads, iPods and all other digital devices used for both personal and educational purposes.

Theoretical Rationale

Howard Gardner

In the 1980s Gardner described his theory of multiple intelligences, that each person is made up of several intelligences, spatial, bodily kinesthetic, musical, logical-mathematical, linguistic, interpersonal and intrapersonal (Gardner, 1983). Each person has a unique makeup and some thrive in different learning environments than in others. For the purposes of this study, the focus

addresses his last two, interpersonal and intrapersonal intelligence, which combined is referred to as emotional intelligence.

Peter Salovey & John Mayer

Emotional intelligence (EI), was coined by Salovey and Mayer in 1990 (Mayer, Salovey, Caruso & Cherkasskiy, 2011). They define emotional intelligence as “a set of skills hypothesized to contribute to the accurate appraisal and expression of emotion in oneself and in others, the effective regulation of emotion in self and others, and the use of feelings to motivate, plan and achieve in one’s life” (p. 26). Social intelligence is defined as “the ability to understand and manage people.” How can students’ EI and social intelligence be changed by the amount of screen time consumed? Can students define the skills necessary to appraise and express emotion when much of their day is focused on a screen?

Albert Bandura

The social cognitive theory set forth by psychologist Bandura (1991) is the idea that one’s actions and reactions are based on those learned and observed in others. That what one views another doing shapes their own behavior and decisions. This theory is important when discussing the changes in adolescent brains when not actively observing peer groups or others but rather focusing on inanimate objects and screens.

Assumptions

Students may be able to spend hours on end using their devices to text, while watching television, and while surfing the Internet however, this is not healthy. The brain can multitask but only by

separating those tasks in the mind. The ability to do many things at once means the brain is splitting itself.

If students engage in this each day for several hours, their brains will be forming neural pathways in a shortened capacity. It is similar to the difference between muscles used for sprinting and muscles used for long distance. Long and lean muscles need to be active for longer amounts of time and thus are used more. Tight and bulky muscles are used for speed, not endurance. We are training our brain for bursts of energy and not the contemplative long haul of life in a global world.

It is the researcher's perspective that technology, while enhancing the access to information, is stunting the ability to process information and think critically. Students are losing their ability to reflect, take time to think and ponder about questions to which they do not know the answer. The new generation's solution is to immediately pick up the nearest device and ask Google. What is that teaching the students? Are they going to be able to solve the global problems facing our world when the answer is not online? The researcher believes handing students iPads is not a solution to the growing technological advancements of our time it is a crutch.

Background and Need

Rideout, Foehr, and Roberts (2010) of the Henry J. Kaiser Family Foundation conducted a longitudinal study from 1999 to 2010 with over 2,000 subjects beginning at ages eight and tracking those same students up to age eighteen. One highlight of the research is that not only did they study the time spent interacting with various media, but they also studied the amount of time the subjects interacted with various media at the same time as other devices and their

multitasking capacities. The findings were substantial in showing the growing use of media in the lives of adolescents and how much screen time they actually accumulate (Rideout et al., 2010).

Another important longitudinal study is that of the University of Southern California's Annenberg School Center for the Digital Future and has been publishing the Digital Future Report for ten years, to study the impact of the Internet on Americans. The Center for the Digital Future (CDF) was among the first to study the major trends in the Internet and its use and impact on Americans. Their most recent study in 2011 was a meta-analysis of their previous studies, providing a view of the changes the Internet has played since 2000. To achieve their data they surveyed 2,000 households throughout the United States and year after year returned to these same individuals to study the changes and impacts the Internet and other various factors had on their technological lifestyle. One important aspect of their studies is to not only look at who is online and what they do online, but how it affects values, behavior, attitude and perceptions (Lebo & Annenberg School of Communications, 2011).

These two studies will be discussed at greater length in the review of the literature that follows, however the growing trend of media use in the United States prompted both the medical world as well as the educational world to take notice of the effects of digital media on adolescents and though it will continue to be the case, it has been shown that over time the findings change. It is important to note these changes and continue to question media use and technology in education.

Summary

Everyday technology shifts as new gadgets are being brought to the market. It is essential that these technologies and the effects they have on students be documented in up-to-date studies. Many of the reports found are out of date almost instantaneously due to the nature of technology. What was MySpace five years ago is Facebook today, and no one knows where technology will stretch next. However, in the interim the researcher intends to focus on two of the longitudinal studies that have brought to light a significant amount of data about technology use, amount of time spent on certain aspects of technology and the effects on those researched.

It is the researchers intent that though the current media is growing at an alarming rate, that the most important aspect of the shift in technology is to monitor its effects on continued use by adolescents. What are the benefits and costs of this technology on adolescents' abilities to connect to peers and form relationships in their world? Based on the findings of others can educators add technology into the classrooms while maintaining connections and strengthen students' abilities to think critically without having technology hinder their progress?

Chapter 2 Review of the Literature

Introduction

In order to understand the shift in technology one must understand the historical context in which it was born. Thus the researcher begins with describing the history of the personal computer, the cell phone and the Internet, in order to put it in perspective of the timings and trends of certain technologies. Also discussed are the following: the relevance of effects of technology on adolescents and their ability to multitask and the ever-changing nature of time spent with each technology. Statistical information is included to offer a perspective on the changes that have come since the implementation of the various devices.

Historical Context

There are many inventions prior to the personal computer, but the researchers focus is on the personal emotional and social impact of technology and thus will focus on these inventions as they began to be commonplace in the home. This includes the use of personal cell phones, smartphones, tablets of any kind, desktop computers and laptop computers.

Growing interest in owning computers in the home began in the 1970s and 1980s that brought about more competition and lower prices (Computer History Museum, 2013a). Before 1977 computers were only available to those who could build them themselves from kits (Computer History Museum, 2013a). Within a relatively short period of time, personal computers became available to those without the expertise to put them together. The three

influential computers of 1977 were the Apple II, Commodore PET, and the Tandy Radio Shack's TRS-80 which became available to the mass markets (Computer History Museum, 2013a).

In 1982 Time Magazine chooses the *computer* as Machine of the Year rather than Man of the Year. Time publisher John A. Meyer at the time wrote, "Several human candidates might have represented 1982, but not symbolized the past year more richly, or will be viewed by history as more significant, than a machine: the computer" (Computer History Museum, 2006). The idea of having a computer on the go was not a new idea either, in fact, the laptop, or mobile computer, began at almost the same time as the personal computer (Computer History Museum, 2013b). The first laptop computer produced by IBM, the PC Convertible, was made in 1986 and weighed twelve pounds (Computer Hope, 2013a). From then on computers have come into the everyday lives of those who could afford them.

Parallel with the invention of the computer came the Internet. The Internet was originally developed in the late 1960s and the first message was sent in 1969 (Computer Hope, 2013b). By 1993 the Internet had the largest growth to date and computers were able to talk to each other through TCP/IP networks and the World Wide Web grew (Computer Hope, 2013b).

Along with personal computers of various kinds cell phones made their debut in the 1970s and early 1980s. In 1973 Motorola engineer Martin Cooper made the world's first public call from a mobile phone (CBC Radio-Canada, 2013). However, it took a decade before the U.S. Federal Communications Commission approved the first DynaTAC phone, from Motorola, in 1984 (CBC Radio-Canada, 2013). In 1993 Bellsouth and IBM created the world's first "Smartphone" the Simon personal communicator phone, which had a pager, access to email, stylus, keypad and calendar (CBC Radio-Canada, 2013). In 2002 Nokia cell phones included built-in cameras. In 2003 Blackberry released the first phone with access to the Internet, email,

and texting (CBC Radio-Canada, 2013). And in 2007 the iPhone was released, prompting a world-wide shift in technology with touch screen capability and the streamlined integration of three devices in one, mobile music, Internet access and wireless communication via cellular service (CBC Radio-Canada, 2013).

Since the 1970s, computers have gone from the size of rooms to small sleek handheld models. Cell phones have gone from chunky devices that only the wealthiest owned to the hand-sized device most children can fit in a pocket. The invention of the Internet has brought humans closer together in the global market that is growing ever smaller as the years progress. All of these inventions have brought about the changes we have seen in the use of digital media.

General Information and Statistical Evidence

Multitasking and Continuous Partial Attention

Seven years ago in 2006 Time Magazine published a cover story entitled “The Multitasking Generation: Are kids too wired for their own good?” This article was one of many to follow but brought about a good question. Are children multitasking too much? What is that doing to their brains? The prefrontal cortex is one of the last regions of the brain to mature and one of the first to decline with aging, young children do not multitask well according to Grafman and Stroke (as cited in Wallis, 2006, p. 51). Meyer also says that multitasking is a hindrance. “If a teenager is trying to have a conversation on an email chat line while doing algebra, she’ll suffer a decrease in efficiency, compared to if she just thought about algebra until she was done... With such complicated tasks [you] will never, ever be able to overcome the inherent limitations in the brain for processing information during multitasking. It just can’t be, any more than the best of all humans will ever be able to run a one-minute mile” (Meyer as cited in Wallis, 2006, p. 53).

According to Rosen, Cheever and Carrier (2012), “The more tasks we take on – with the assistance of very attractive and distracting sounds and visuals from advanced technology – the more our brain gets stressed and overloaded, and the worse we do at all of the tasks” (p. 106).

Multitasking has another cohort now called Continuous Partial Attention (CPA) and was coined by Linda Stone in 1998. The former manager at Apple refers to this concept as the situation in which the individual does not focus on any one thing in reality while he or she is engaged in and follows everything. While multitasking can be defined as doing many things at once in order to be more productive, CPA is constant fragmented attention that is motivated not by productivity, but by the desire to be connected (Firat, 2013).

In May of 2013 Time Incorporated at Innerscope Research did a biometric study in order to understand media use in various generations. During 300 hours digital immigrants, those who have adjusted to technology as adults, and digital natives, those who have grown up with technology, wore biometric belts and also wore glasses with video capture. Their findings were that the digital natives switch their attention between media platforms every other minute (Frank, Martin, Marci, Rule & Williams, 2013, p. 3). Digital natives switch their attention at the first sign of boredom. The frequent switching results in low attention that limits their emotional response (Frank et al., 2013, p. 4). “This study strongly suggest a transformation in the time spent, patterns of visual attention and emotional consequences of modern media consumption that is rewiring the brains of a generation of Americans like never before,” Marci (as cited in Marketing Profs, 2013). Small and Vorgan state that, “Under this kind of stress, our brains instinctively signal the adrenal gland to secrete cortisol and adrenaline. In the short run, these stress hormones boost energy levels and augment memory, but over time they actually impair cognition, lead to depression, and alter the neural circuitry in the hippocampus, amygdala, and

prefrontal cortex- the brain regions that control mood and thought. Chronic and prolonged techno-brain burnout can even reshape the underlying brain structure” (Small & Vorgan as cited in Bauerlein, 2011, p. 93).

Adolescent Media Use

In 2010 Rideout, Foehr and Roberts conducted the final section of their longitudinal review of children use of digital media. Through more than 2,000 children the studies focus on the digital media use of children from ages 8 to 18. It explored the use of television, video games, music, print, cell phones and movies. In 2010 youth pack a total of 10 hours and 45 minutes worth of media content into their daily 7 ½ hours of media use. According to the study 20% of all media consumption occurs on mobile devices (Rideout et al., 2010, p. 1-4). Nearly half (47%) of heavy media users, those who consume more than 16 hours of media content per day, say they usually get fair or poor grades, and are also more likely to say they get into trouble a lot, are often sad or unhappy and are often bored. Of the light users, who consume less than three hours of media in a typical day, only 23% said the same (Rideout et al., 2010, p. 4). “The relationships between media exposure and grades and between media exposure and contentment, withstood controls for other possibly relevant factors such as age, gender, race, parent education and single vs. two-parent households” (Rideout et al., 2010, p. 4). In 2010, 66% percent of all the children surveyed had their own cell phone. Of those who own their own cell phone, 46% say they text, and those that text say they estimate an average of 118 texts per day (Rideout et al., 2010, p. 18).

According to a recent study by Lenhart, about one in four teens say they own a smartphone (Lenhart, 2012, p. 1). Rideout et al. (2010) found that 46% of teens text, and Lenhart (2012) found that 75% teens now text. In a little over two years the amount of texting

went from about half to two-thirds of children's primary form of communication. Ninety-one percent of teen smartphone owners use social networking sites (Lenhart, 2012, p. 7). According to O'Keefe, "A large part of this generation's social and emotional development is occurring while on the Internet and on cell phones" (O'Keefe as cited in Cerra & James, 2012, p. 110).

Ranie, Lenhart and Smith (2012) found that 40% of teens ages 12-17 go on to social networking sites several times a day (p. 8). According to Palfrey and Glasser,

For these young people, new digital technologies – computers, cell phones, Sidekicks – are primary mediators of human-to-human connections. They have created a 24/7 network that blends the human with the technical to a degree we haven't experienced before, and it is transforming human relationships in fundamental ways. They feel as comfortable in online spaces as they do in offline ones. They don't think of their hybrid lives as anything remarkable (Palfrey & Glasser as cited in Haugen & Musser, 2013, p. 39).

Social and Emotional Factors of Technology Use

According to Rosen, avid technology users are starting to exhibit signs of psychological disorders. Anxiety, obsessive-compulsive disorder, attention deficit disorder and depression are the most commonly displayed. The identity that students are attempting to create is one of online presence as well as physical representation. "Our online self is an invention that, for most people, is a continual approximation of presenting our sense of self to the world" (Rosen et al., 2012, p. 34). This identity and the idea of always being "plugged in" create a state of anxiety for high use media users.

According to Rosen, “51% of the iGeneration feel highly anxious if they can’t check in with their text messages as often as they’d like” (Rosen et al., 2012, p.53). And for some people, the anxiety from being disconnected is severe and leads to extreme behaviors (Rosen et al., 2012, p 51). Students exhibiting cell phone overuse also were more likely to exhibit bodily complaints, insomnia, social dysfunction, anxiety and depression” (Rosen et al., 2012, p.64). Some people even have what is known as *phantom vibration syndrome* in which one feels a pocket vibrating, but there has not been a call or a text (Rosen et al., 2012, p.54). Gardner and Davis (2013) discuss the different social and emotional effects of what they call the “app” generation and state that, “despite their many electronic connections to one another, many young people today paradoxically have a sense of isolation” (p. 44).

“For teenagers, the same set of predictors (too much media in general and video gaming specifically) was identified as a cause of depression, but now another causal factor – excessive time spent online – was also identified as predicting depression and other psychological maladies” (Rosen et al., 2012 p. 89). Rosen et al., also relate findings to Bandura’s social cognitive theory by stating that, “Positive interactions leave us feeling better while negative ones pose a threat to our coping abilities. If we are already experiencing depressive symptoms, negative evaluations – such as someone mocking a posted Facebook photo – can have a devastating impact on our self-evaluations and, in turn, on our depression. This is particularly true given the wealth of research and robust findings showing that depressed people demonstrate selective attention to negative comments far more than positive ones and allow those negative comments to linger and occupy attention far longer than positive ones” (Rosen et al., 2012, p.90). Sherry Turkle, MIT technology and society specialist, also relates to Bandura’s theory, “Today’s adolescents have no less need than those of previous generations to learn empathic skills, to think about their values

and identity, and to manage and express feelings. They need time to discover themselves, time to think. But technology, put in service of always-on communication and telegraphic speed and brevity, has changed the rules of engagement” (Turkle, 2011, p. 172).

Technology Use and Sleep Deprivation

Along with the use of all the digital media there have been several studies relating to the impact that technology has on lifestyle and especially on sleep. Electronic media exposure in children and adolescents was most consistently associated with later bedtimes and shorter sleep duration, and the presence of a media device in the bedroom was associated with increased exposure, later bedtime and shorter sleep (Shochat, 2012, p. 23). It has also been projected that digital media exposure may have alerting effects, possibly because of the suppression of melatonin because of the light from electronic screens as well as the engaging and exciting content. Also, sleep disruption can include physiological delay in circadian sleep/wake rhythm as well as mental and cognitive excitement (Shochat, 2012, p. 23).

Kremer, Elshaug, Leslie, Toumbourou, Patton and Williams (2012) found that high levels of leisure-time screen use were associated with depressive symptoms. As found “this may be partly due to children having greater vulnerability to negative socio-cognitive outcomes from screen use, where there are fewer opportunities for social connectedness, problem solving and development” (Kremer et al, 2012, p. 4). Also, children may be vulnerable to physiological responses of arousal of the central nervous system and associated negative effects on sleep patterns with high rates of screen time (Kremer et al., 2012).

Summary

While multitasking used to be a boost in productivity, Constant Partial Attention can be harder on students' brains than focusing on one thing at a time. Students are constantly trying to focus on several things at once while being "plugged in," connected at all times to the tethers of their devices. Texting is now the preferred mode of communication. Students are connected via text and Facebook, but how many conversations are they having face-to-face to read facial cues and be aware of their personal social factors? Students have their cell phones on them at all times, even as they sleep and the research shows that this can hinder their sleep patterns and circadian rhythms from the bright light during the time before sleep. Adolescents identity creation has not changed, they still look to try on new hats and see what feels right to them, however now it is documented online and via texts and can hinder their experimentation. They are shown to be more connected than ever, but feel more isolated and depressed.

Chapter 3 Method

Research Approach

The age of technology rapidly changes everyday, and the use of technology with students is also influx. To try to understand the social and emotional costs on these students is the basis of this research. The researcher attended two Ed Camp presentations, discussions, or presentations that are facilitated by faculty for faculty in topics of interest, with colleagues during professional development. These sessions were to try to understand both how the technology is being used in the classroom and also what the concerns are for the students daily screen time and technological consumption outside of school. The researcher then constructed a short history of personal computer technologies as well as a thorough literature review in order to understand the components and current research on the effects of technology on the brain as well as in social impact of being constantly “plugged-in.” The means by which the researcher is obtaining data is both qualitative and quantitative.

Ethical Standards

This paper adheres to ethical standards in the treatment of human subjects in research as articulated by the American Psychological Association (2010) by approval from Dominican University of California’s Institutional Review Board for the Protection of Human Subjects (2013), assigned number 10175.

Sample and Site

Students in two general education art class at a school where two small learning communities are participating in a one-to-one iPad distribution at a local public high school will be given a survey on their technology use and the social and emotional factors of that use. The teachers, who are teaching in the small learning communities in the iPad pilot as well as those who are not, will be interviewed about their technology use in the classroom and how they see the students interacting with the technology. One site counselor will also be interviewed.

Access and Permissions

The school administrator granted permission for the researcher to conduct this study as part of her master's thesis. The researcher sent out an opt-out correspondence to the students' guardians to allow any student who did not wish to participate the chance to decline. The researcher administered the survey to students enrolled in two general education art classes wherein some students are participating in small learning communities that were piloting the one-to-one iPad distribution. Teachers and the counselor interviewed were colleagues at the same school site.

Data Gathering Procedures

The surveys were given to the appropriate students, and administered in class over a thirty-minute period. Student data were reviewed and analyzed by the researcher. Interview responses were reviewed and synthesized by the researcher.

Data Analysis Approach

Once all data were collected, the survey data responses were depicted in graph form. The interview responses and themes were organized from teacher responses.

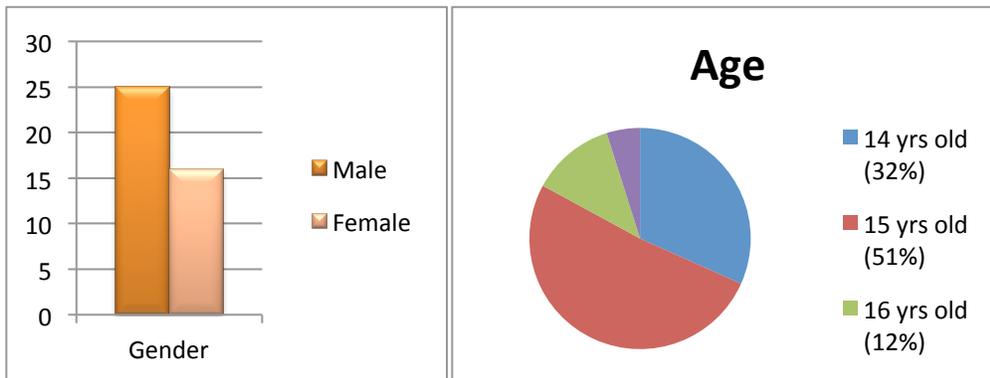
Chapter 4 Findings

Description of Site

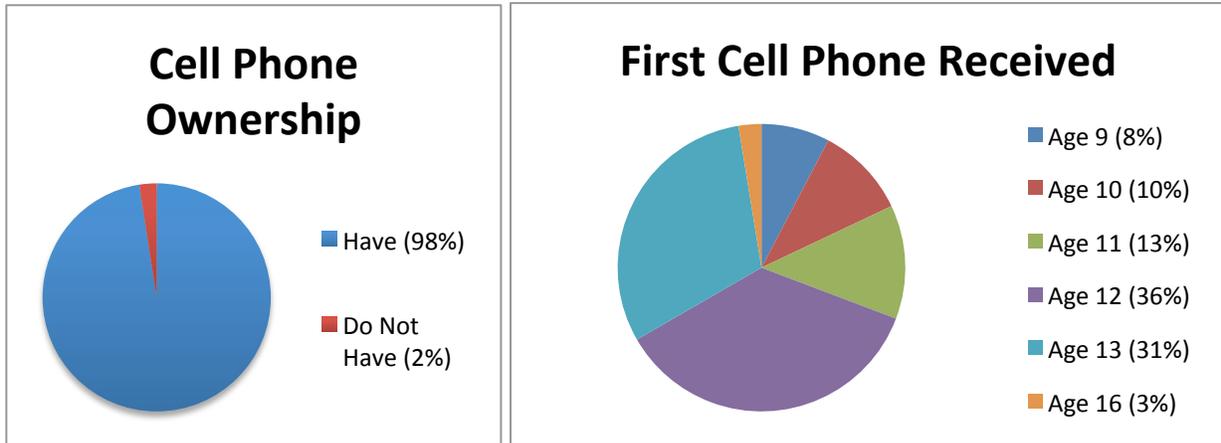
In a local public high school forty-one students were surveyed in the researchers general education art classes. All teachers that were personally interviewed were employed at the same school site. Nine teachers were interviewed, five teachers who were participating in the iPad pilot and four who were in a separate small learning community. One site counselor was also interviewed.

Student Data

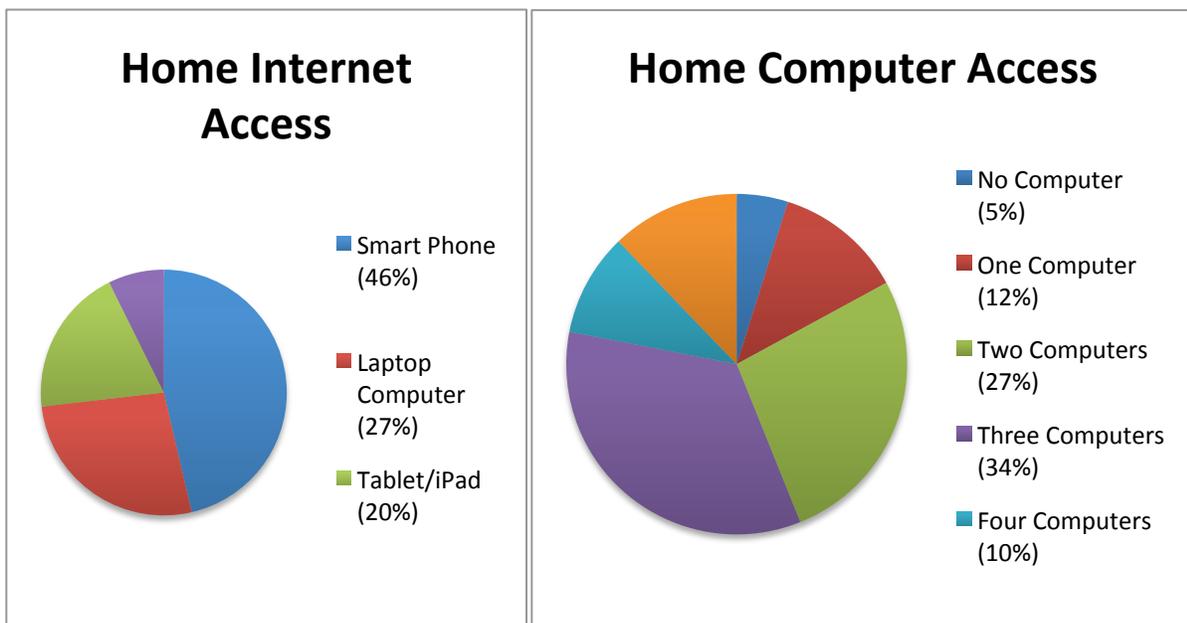
Of the forty-one students sixteen were female, and twenty-five were male. The ages of the students range from fourteen to seventeen. Seventy-six percent of the students surveyed were concurrently enrolled in one of the two iPad pilot programs.



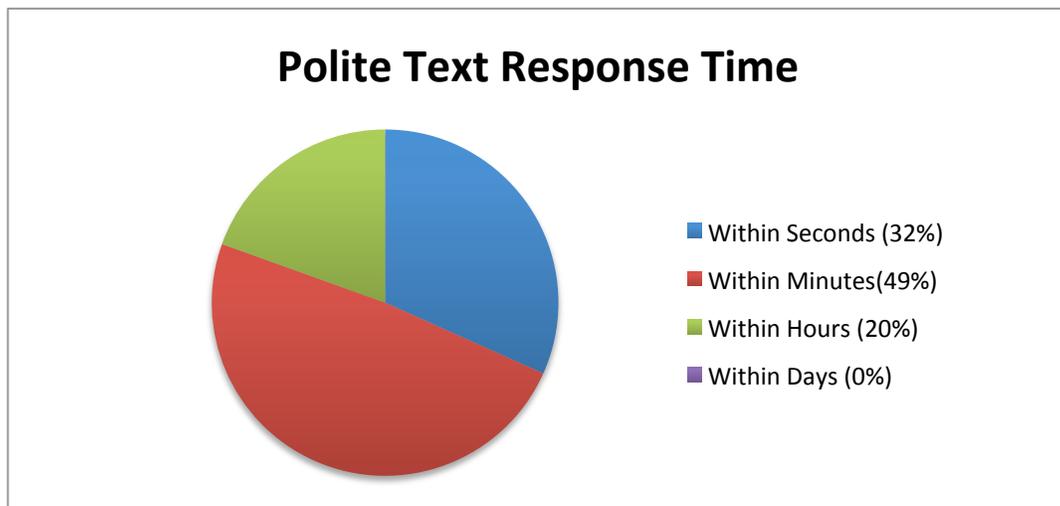
All but one student has a cell phone and the age at which they were first given the cell phone ranged from nine to sixteen years old.



All forty-one students have Internet access in their homes. All students have some way to access the Internet at their homes, whether by smartphone, tablet, desktop computer or laptop. The most common way to access the Internet is their smartphone. The majority of students have three computers in their home.

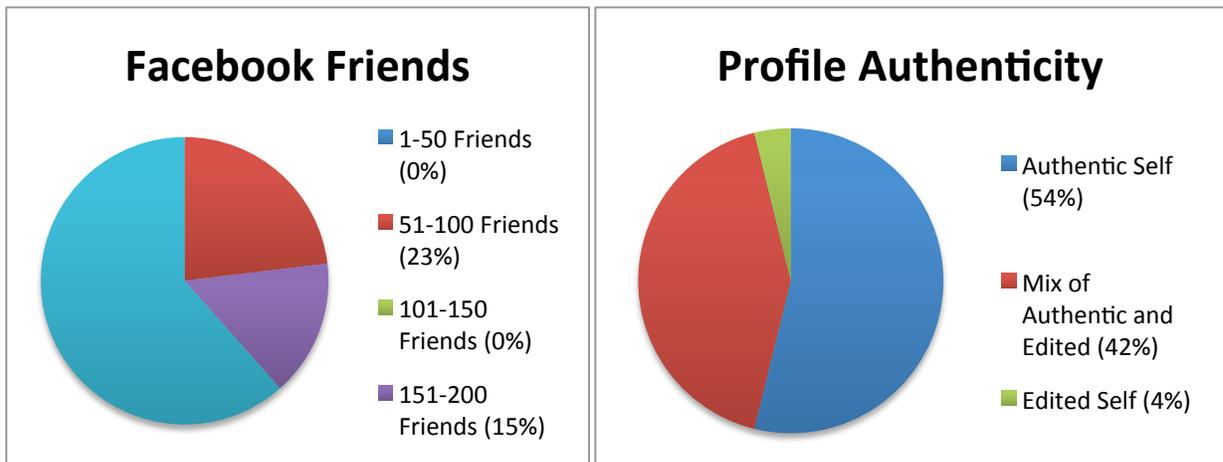


All students who own a cell phone send and receive texts. Of those who own a cell phone 18% send 0-25 texts per day, 17% send from 25-100 texts per day and 6% send more than one hundred texts per day. Ninety-three percent of students respond to texts quickly or instantaneously once receiving a text. According to *all* students the polite amount of time to respond to a text is within two hours or less.

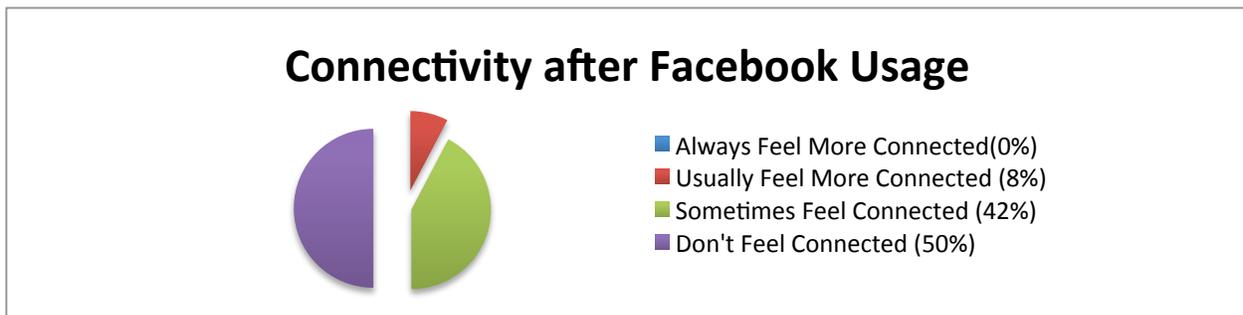


Of those students who have a cell phone 59% of students use their phone to text rather than calling people. When asked between talking face-to-face or texting only 7% prefer texting. When asked how often texting leads to face-to-face conversations 61% of students said sometimes. While interacting with their peers 93% of them said they text other friends who are not with them. When bored 95% of students check their phones for texts. Ninety percent of students surveyed text their friends and parents while in class. Forty-nine percent of students have had their cell phones taken away from them during school for misuse of the technology contract. Of those students who have had their cell phones taken away 50% have had them taken away more than once.

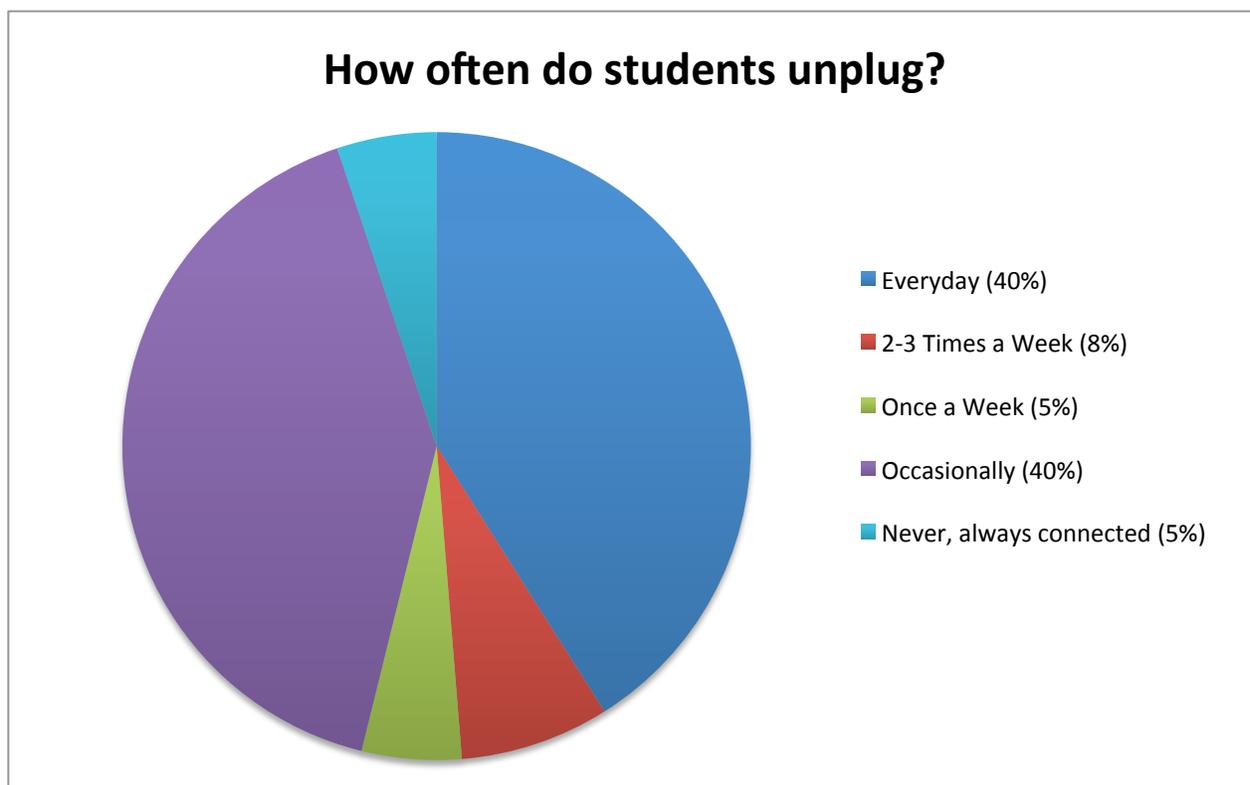
Sixty-three percent of students surveyed have a Facebook account. Of those students 23% have 51-100 friends, 15% have 151-200 friends, and 62% have more than 200 friends. When asked whether these friends are “real,” only 1% said all of them are real the other 99% percent were a mixture of real and friends they don’t necessarily know in person.



Those of the students with a Facebook account were asked if their representation of self on their profile was their authentic self, a mixture of real and what they’d like others to see, or only what they think others would like to see. Fifty-four percent said it represents their authentic self, 42% said a mix and only 4% said what they’d like others to see. Of those using Facebook when asked if they felt more connected after spending time on the site 50% said they do not feel more connected, 42% said sometimes feel more connected and only 8% said they usually feel connected. None of the students said that they always feel connected after Facebook use.

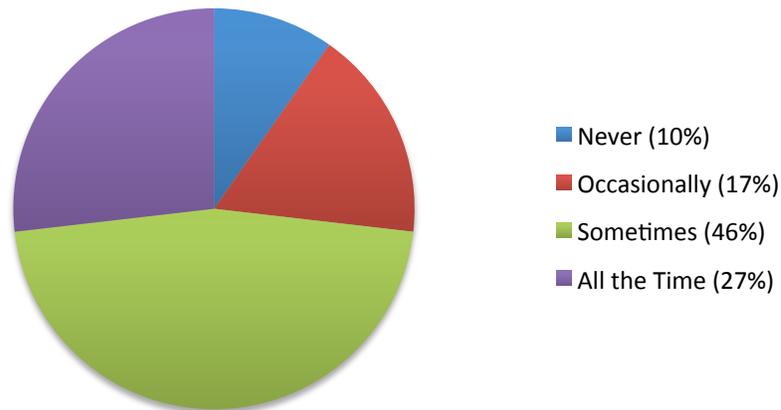


When asked how often they “unplug” and don’t use any technology, of those students who responded, 39% said everyday, 7% said two-three times a week, 5% said once a week, 39% said occasionally, 5% said they are always connected.

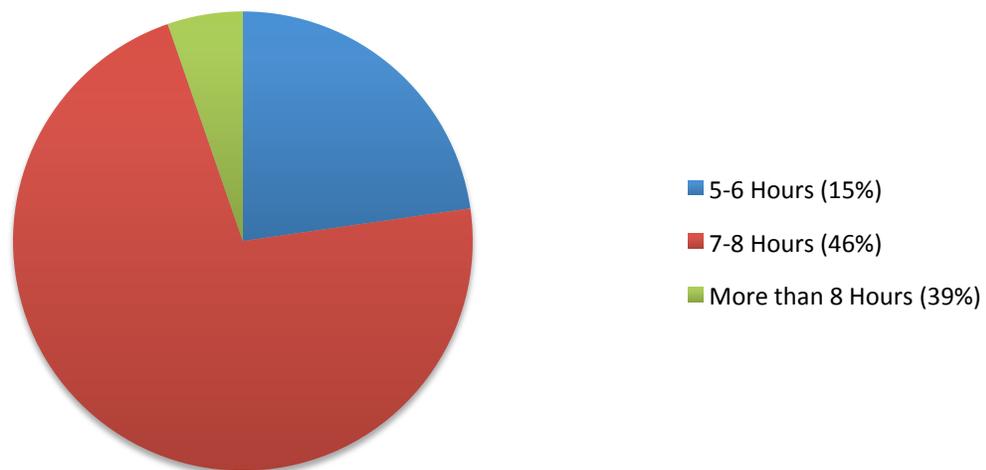


Ninety-five percent of students use some form of technology within two hours of going to bed. When asked about multitasking, only 10% say they focus on one thing at a time and the other 90% are using multiple technologies at various degrees at the same time. Sixty-one percent of students are getting five to eight hours of sleep on average per night.

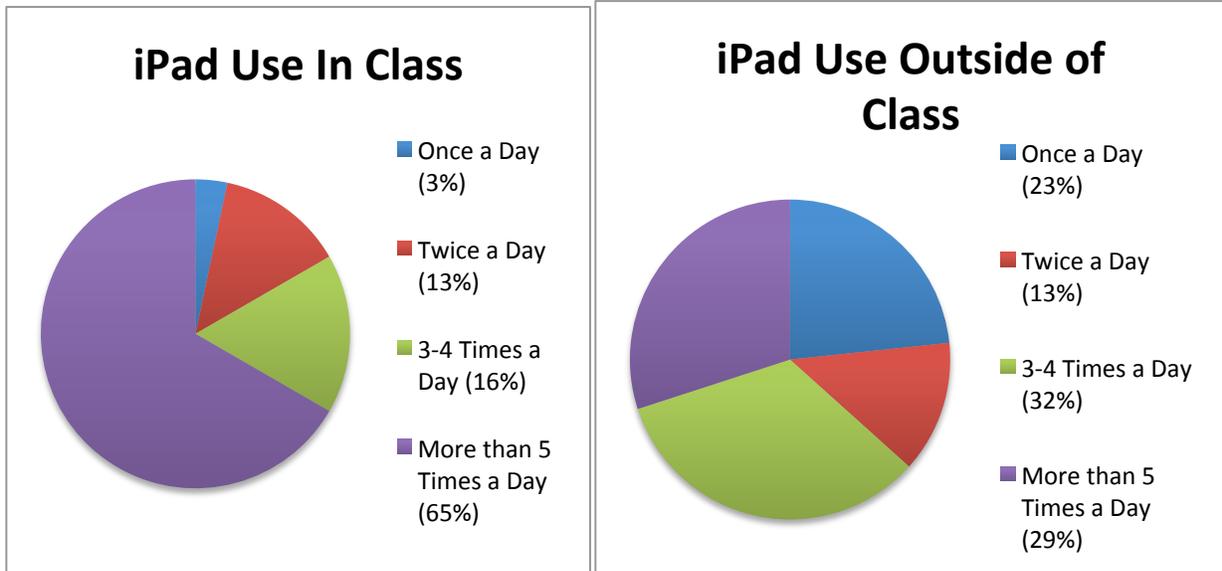
Multitasking with Technology



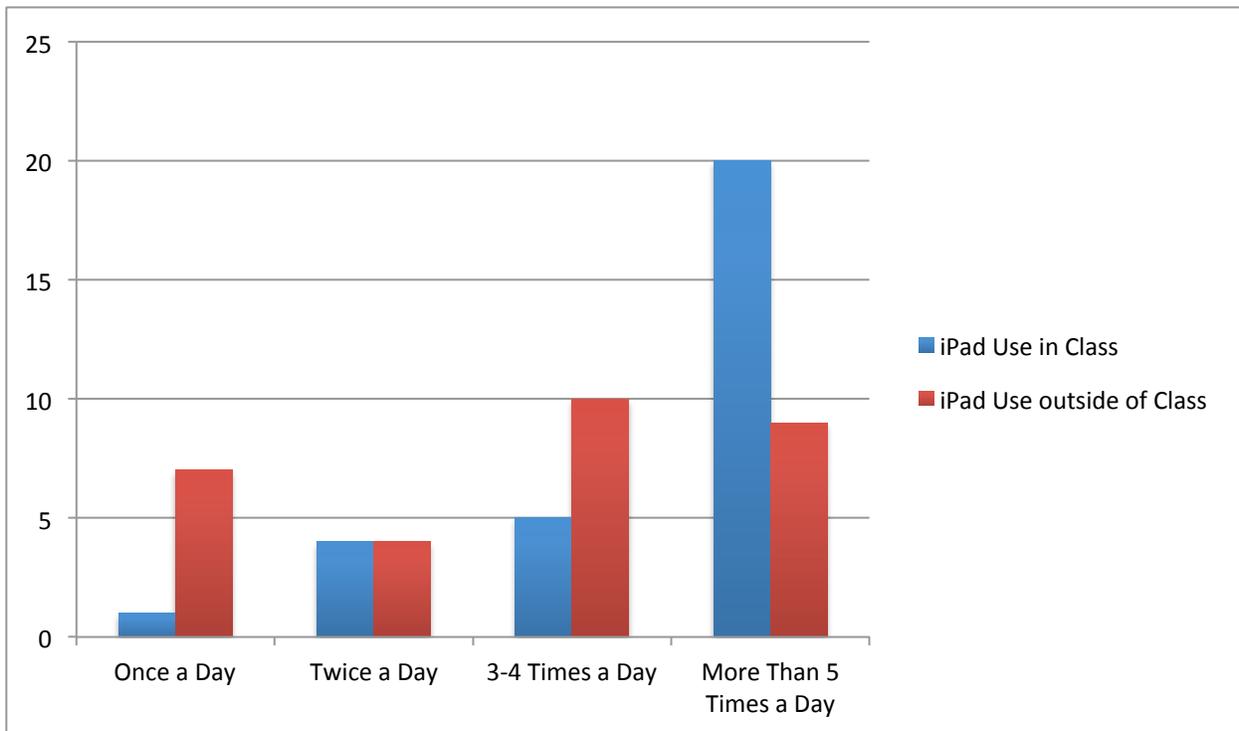
Average Hours of Sleep



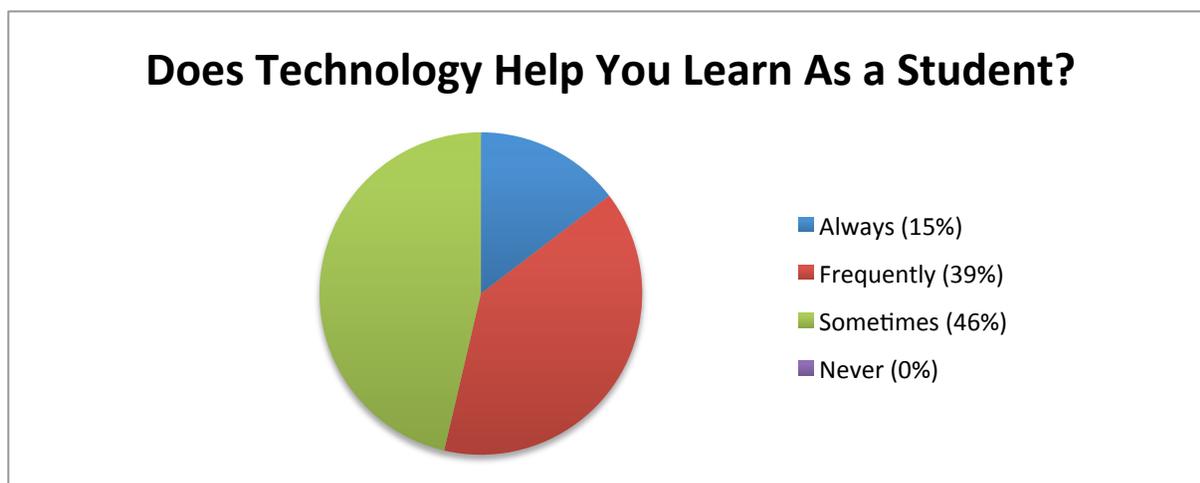
Of the students in the iPad pilot programs, 65% use them in class more than five times a day, and *all* of them use their iPads outside of class.



Below is the side-by-side comparison of daily student use of iPads in class and outside of class.



When asked how technology helps students learn, 46% of students said that technology helps them learn sometimes, but not always best, 39% said frequently but they don't always like using it and 15% said that they always learn best with technology.



Teacher Data

Nine teachers were interviewed, five teachers who were participating in the two iPad pilot programs and four who were in a separate small learning community. One site counselor was also interviewed. All names have been changed for anonymity and confidentiality.

| Name | Sex | Ethnicity | Age | Years of Service | Subject Area | In iPad Pilot |
|--------|--------|----------------|-----|------------------|--|---------------|
| Shelly | Female | White | 50 | 17 | Guidance Counselor | N/A |
| Jay | Male | White | 45 | 14 | Art | No |
| Dev | Male | White | 50 | 16 | Science | No |
| Em | Female | Cherokee/White | 57 | 22 | English & Integrated Projects | No |
| Peter | Male | White | 55 | 24 | Social Studies | No |
| Joe | Male | White | 36 | 9 | Science | Yes |
| Rich | Male | White | 44 | 13 | Technology – Web Design, Computer Graphics, Computer Programming, Advanced Placement Computer Science and Yearbook | Yes |
| Renee | Female | White | 45 | 15 | History | Yes |
| Brett | Male | White | 53 | 20 | Integrated Science and Engineering | Yes |
| Kathy | Female | White | 57 | 25 | English | Yes |

1. How do you feel about the implementation of technology (both the iPads and other technology over time)?

Em: I find it increasingly difficult, and this year markedly more, to get kids to put down all other distractions and read a book. The iPad is a great research and writing tool, but it can also be a time suck for the kids who don't know how to balance it with interacting with *people* face-to-face.

Kathy: I've been getting increasingly involved in technology and was a heavy user. I really wanted to do the pilot because I'm so interested in it. The iPads facilitate all kinds of learning and immediate access to info, the thing that I like best about them is that the kids have access whenever they need it, they can produce their own authentic work, they can make films, interview each other, and write it up. There are so many things this tool can do. I also really like that it makes explicit for us the relationship between technology and learning and that

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| <p>conversation with the students. In this context it's a tool for learning.</p> |
| <p><u>Dev</u>: I am skeptical. It seems like this year we have this epidemic of "anxiety and depression." So-and-so is too sad and sensitive to come to school. Where's that coming from? We never used to see that, and the main thing that's changed is Facebook and texting. The Porcelain Generation is an expression. And the parents are always swooping in to save them at the slightest problem.</p> |
| <p><u>Brett</u>: I think there's an issue with just issuing the students an iPad. I think there could be some dangers there that the student then just feels entitled to the technology, they don't respect it because they didn't earn it. I personally couldn't imagine coming to school and spending half of my day, or three-sevenths of it head down in a screen. The reliance on the screen technology to deliver curriculum, as a tool that students use, maybe the main tool. It's nothing that I see as an advantage, I'm not impressed with what I've seen. Personally I spend more time telling kids to put them away. Some of these kids are addicted to screens. I'm not sure giving additional screen time to these kids that are already addicted to the screens, is a good idea.</p> |
| <p><u>Peter</u>: I'll use anything that enhances my student's learning, but I want to see the data that shows that using iPads are useful and here's why, rather than just be given them and told to use them without research on best practices.</p> |
| <p><u>Joe</u>: The iPads accomplished what we intended them to do. But they also come with effects that aren't as desirable. We aren't really able to control what they do with them outside of school, so we might want to look at that, whether we send them home or not. That part is challenging. Different views the parent community has about them, different views about how our staff feels about them, but the district has been very supportive.</p> |
| <p><u>Renee</u>: Getting kids to understand that technology is not always the option is good, getting them to understand how to use it successfully as a tool is important. They are probably not using it at home as a learning tool the majority of the time. Trying to get them to make those decisions has been an interesting conversation. Trying to make them understand that's not the focus of the classroom. Sometimes it's the paper and pencil; sometimes it's the iPads.</p> |
| <p><u>Jay</u>: The addition of the computer projector and YouTube have been revolutionary in my classroom. And I feel that some of the tools that are features, like Google Docs, very powerful to collaborate with. What I'm concerned about is the lack of kids looking at each other in the same room and the power of that, and whether these kids are losing the skill of taking turns. When it's your turn to talk, eye contact, nodding, you know, attentive listening. You don't need to attentively listen if you're on a virtual collaboration.</p> |
| <p><u>Rich</u>: I feel it's brought a lot of value to the school as a whole, because it's reduced the pressure of our sign-out labs by 200 students. It's an inexpensive way to have a mobile cart – it's nothing compared to a computer lab. Looking at students at-hand ability to access information has real value for them and does dovetail beautifully with students being more inquisitive about their own learning and work. There's not as much feeding them the information. We need to make sure and not misconstrue one-to-one access to an iPad to be getting deep tech instruction. I feel pretty strongly that the digital native concept is a total fallacy and that's based on thirteen years in the</p> |

classroom teaching kids and they still have the same questions, how do I make a folder? Just because someone sits in front of a screen a lot doesn't mean they have deep tech knowledge. Same thing goes for Google Docs, just because you're using it doesn't make you now more technically proficient than when you started. I think money spent on technology without an equivalent amount of attention paid to professional development is wasted. That comes down to having built a good culture. Bottom line you will get more tech adoption if teachers have the confidence to know they'll get training and support when there are problems. That's what's going to make or break it. The technology will come and go but the human support will be really critical.

2. How much time would you say on average do your students use their phones or iPads in your class? And outside of class?

Em: I hardly ever use the iPads for in-class work, we'll use the computers for typing up essays, but I want them to read physical books and be able to look up and have a conversation without distraction.

Kathy – Everyday in my class. The students are actively using them half to 2/3rds of the time.

Dev: I don't use cell phones or iPads in my class usually, but I do use laptops, but it's mostly hands on.

Brett: I hardly ever use the iPads, we use computers sometimes, but it's very hands on. Outside of class I've seen mostly the adolescent boys using the iPads. It's not long in their day that they spend without their iPads up and accessible to them. It's the first thing they do. It's not all kids, but it seems to be more of a guy thing. These adolescent boys seem to be nose to the screen at break, during advisory, all the time.

Peter: We all know there's just an epidemic of texting during the school day. And as much as I talk about it and handle it as an adult issue with the kids it's rampant in my class. I don't use the iPads, and I don't want to, I want them to be able to discuss what's happening not be in the virtual space when we're all here together.

Joe – Everyday in my class. The students are actively using them half to 2/3rds of the time.

Renee– 4 hours we see them, two hours of that they are on the iPads. Outside of class, I have no idea, depends on the kids. Could be nothing, could be many hours. They have a contract – we'll bring it up and talk about it. We're really clear, if your kid knows how to toggle back and forth and knows how to task-switch effectively, knows when to work and when to play, you can make that decision. Great, but when the iPad goes home it's the family's responsibility, it should never be an obstacle and a challenge.

Jay: I make a point of noticing that they're playing video games all the time. The iPad kids. Our kids are too, but on their phones. They're constantly stimulated with their phones. And watching videos. If they get a free moment when you don't insist that they put it away then they

do (use their phone). It's like it bubbles up immediately.

Rich: Less than 10%, sometimes it's a peripheral source of info. Most of the time it's having to be put away because it's a distraction and their primary tool is the desktop computer. In terms of the Trek classes 65% of the time. Outside of the class, it's hard to tell, because the teachers are using tools that are also accessible through laptop or desktop, I wonder if the students gravitate towards "real" computers rather than the iPads. In class, there is no "can I use the computer?" They are comfortable with the iPads. I wonder if they switch devices when they get home. As far as homework, there may be some in the two SLCs that are app specific; predominantly it can be accessed on laptops or other device. They have to use Echo to access the homework, projects etc. They have to use it to submit work, it's not the only way to communicate with the teacher, but it's definitely one of the preferred ways.

3. Do you discuss the emotional or social impact of technology in class? How do you see technology in the classroom?

Em: We talk about it a lot. There's been a rise, concurrent with the use of technology, of anxiety and depression. It could be seen as false causality, but I can't help but think there's a causality there. Because I have a very limited Facebook use, but every time I go on my Facebook news feed it makes *me* feel anxious that I'm not doing everything I should be doing. So how could they be resistant to it, when I have all this armor? I have years of armor against it and it still bothers me. Kids aren't as tough.

Kathy: We talk about it a lot.

Brett: I do, but I don't make it part of the curriculum, but there are times when students are kind of forced to hear my philosophy on it. And personally I'm not sure what the ramifications are, but I think there's going to be negative ramifications with this generation that doesn't know how to *not* have something to do at every moment. I see it with people of all ages outside of school, this inability to take some down time and look around and take a deep breath and experience the people around them and interact with the people around them. I've had a lot of positive feedback from students just by doing the most basic and fundamental hands-on experiments. Where we bring in raw materials like wire, light bulbs, batteries and having them building certain things. These adolescents really dig working with their hands, and a lot of them can clearly articulate that they're happy to have their heads away from the screens. And it seems girls have been more vocal about it they're burnt out about it. They've made specific claims that they want to do more posters and more hands-on, kinesthetic things, more artistic kinds of things in their other classes, which now seem banished in support of digital presentations and all that stuff. It does seem like this drive towards technology in education is really being forced down educators and students without adequate thought as to what the teacher ramifications are and it just seems, from the literature I've read, and the meetings I've been to, it seems to be that technology's a good thing and the more technology and the more you organize it the better. Perhaps this push toward technology is going to have a negative impact.

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| <p><u>Peter</u>: We wanted to have an all-Rock unplugged day and even the parents were against it. They have their phone in their hand when they get the pass for the bathroom, and I say, “You need your phone for the bathroom?” “Yeah.” They can’t be without it. It’s a crutch.</p> |
| <p><u>Renee</u> – The first two-weeks of school were full of culture building and producing a user agreement. We would have partner, group and whole class discussions about how to effectively use technology and what’s balance. Later on in Social Issues we talked about nature and choices and how screen time affects them.</p> |
| <p><u>Jay</u>: FOMO is a thing, Fear of Missing Out. It’s constant, I want to see whether there’s an iPad a TV or a computer or a phone is directly related to kids’ health, negatively and the quantities and so I’m worried about the lack of considering that in the children’s lives.</p> |
| <p><u>Rich</u>: I talk with my students about social emotional impact constantly; I think that is something in the realm of all my tech classes. In graphics we talk about body image, how the marketing uses it in fashion and cosmetics. We use it in journalism how images are being represented. We don’t have a course at the moment that lends itself to talking about building a positive digital reputation. But in the work with Trek/Galileo blogs were intended to be on the digital rep side that is your audience. It’s not a consistent thread through my classes. When we had intro to computers, it was a unit. I think it could be part of social issues, but I think it’s one of those areas that’s best team taught. A social issues teacher might focus on what not to do, my tendency is to include that, but also, here’s what we’re going to do with the intent of creating something positive and not just following an abstinence model.</p> |
| <p><u>Shelly</u>: Well according to the stress survey half of the kids are distracted. At least half said that, and even though they didn’t say in the survey that they were distracted by technology, a student of mine was saying he always has a Facebook tab on his iPad open. And even though he hates typing papers on the iPad and doesn’t necessarily love Google Docs he goes to Facebook all the time, he can’t stop and he said the most he ever went without it was a week. This whole this is missing (pointing around to the researcher in conversation). A lot of my kids are saying that they miss that; they miss feeling connected to a teacher. They are addicted to technology and texting.</p> |

4. Please explain the benefits and costs of technology in education from your perspective.

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| <p><u>Em</u>: It means that they’re never away from school. They’re never free from it. From Mom and Dad, never free from us, or their friends.</p> |
| <p><u>Dev</u>: Costs: Money, distraction, opportunity costs, students aren’t learning hands-on. They are losing face-to-face interaction. Technical glitches and repair issues are also a distraction. There is an emotional ambiguity to using too much technology. Benefits: Students get computer skills, don’t have to buy textbooks, and there’s a “cool” factor.</p> |

Kathy: It's not like we can weigh the costs and benefits before we have to participate in the world today. It's already here, that would be malpractice. Whenever we make an advancement there are things that are lost but I don't know if we'd call those costs. It's an inevitable trade-off. A benefit is being almost 100% paperless in my classroom. It's easy for the kids to collaborate with Google Docs and the iPads. They are always in groups face-to-face so they're always in conversation and able to produce something seamlessly together. They can create content for authentic audiences. They have had blogs, we have produced and iBook for poetry. They are publishing a magazine. There are countless ways technology enhances the classroom. You can give them access to something at the drop of a hat. It enables you to prepare an environment where they can work within the tools they are given and discover their own answers.

Joe – You can differentiate so much more with it than without it. You can reach so many more people through the Internet. The old way was to make a poster, now it's on Twitter, Facebook, you can reach so many more people. It's easy, it's a few clicks of a button. I think some of our kids grumble about some aspects of this, but we've seen them be much more digitally literate. The greatest cost is *not* doing this. Whether they learn it here, or outside here, they are going to have to learn it in order to operate in the 21st century. They are going to have to compete for work in a new way.

Brett: I think technology enhances the classroom by allowing students the creativity to work with a digital format, to create graphs and reports. It also enables them to modify and upgrade their work somewhat seamlessly. They can make improvements to their work, I'm just looking at the most current version, they can keep making improvements on their webpages seamlessly without having to hand in another paper. It's easier and more welcoming in a digital form that doesn't show it's previous errors. It facilitates reworking.

Peter: The groups that are somewhat dysfunctional, because of lack of communication and things like that, have gone up. The promise of technology that you can work from anywhere and everyone's on the same page, we haven't had that experience. And what I heard again and again was that most of our 9th and 10th graders really don't like Edmodo. Because, and I don't know if this is fair or not, but from their perception, teachers, instead of just telling them this is your assignment, it's due Thursday, say oh just check Edmodo tonight. And for them it's an extra barrier, it's an extra hurdle. It doesn't really facilitate communication as well as one may imagine it would. Technology absolutely enhances the access to information, but the costs outnumber that.

Costs:

1. Tech hurts community
2. Tech drives up student stress
3. Tech makes school a 24 hour a day experience
4. Texting borders on addiction
5. Parents are tech enablers
6. Teaching is a person-to-person experience; it shouldn't be a technological interaction

Renee – The kids who are successful at school find it hard to give up the teacher as the conduit of the information. When you're direct instructing, they are clear about what they need to know

and need to do. It's a major shift to get them to understand that I'm just part of it. But I'm not the best teacher for everything they need to know. I am facilitating their ability to access information and be owners of their learning. Some of the kids fight it because it's unusual, it's scary, they're not used to not knowing. Technology has allowed us to answer the larger questions that we need to solve together. I can help you with that, I can facilitate that, but what you might discover is so much bigger than this classroom.

Rich: Google Docs is essential, I've eliminated all Microsoft Office. It's reduced our district need for space, it's a non-issue since we don't need the shared illuminated anymore, Dropbox has replaced it. The 3D printer has made my classroom blow up in the most positive way. It has brought students in the door who otherwise wouldn't have been here. There is a significant gender component to that, but gender aside, there's also just a component for students who really prefer the tangible at the end of the day.

The benefits are the instant access to information, They don't have to go to a library, they can look it up instantly. The ability to satisfy a students' curiosity, or for a teacher to help them satisfy that by saying look it up and then talk about it together.

My concern, the costs, the moving target that can exist of educational initiatives that are based around technology. Schools are always going to try and be current. Time and resources and cash, for the next three years we're going to do this. Then after three years, all the other stuff is irrelevant, and you have to hit reset. Tech can be scarier because it's a cost issue, having the "new" each year.

Shelly: The thing with tech is you have to work all the time. It's always there. You can't get away from it. It has absolutely arrested the students' emotional growth. I do think that it's ramped up their anxiety and also you can't, everyone says "assume best intentions" and then someone sends an email and twenty people attack them. Wow, I sent an email that said thank you! And then I said it the "wrong" way? How'd that happen? Stuff like that's happening with kids and emotionally they're not grounded enough to handle what they think their friend meant when they type this thing, that he didn't intend at all. And not because it's ill intentioned. All of my sophomores told me the same thing; they want less tech and more this (pointing to us in collaboration/conversation). The biggest thing I've seen is the ability of students to grow into their own independence and responsibility has been hijacked. The idea that part of our job is to create responsible, independent thinkers, who can make decisions and develop relationships with their teachers, is gone, because the parents can't stop emailing questions. The parents can't step back and let their kids do anything anymore. It used to be a parent would call me when something big happened, now it's every-other minute. I have several students who are concerned for their younger siblings getting into this culture of cell phones and always being plugged in. They say, "I don't want them to have them yet. It's too much too soon." It's interesting to hear from 11th and 12th graders to say they can't disconnect from Facebook, but that they don't want their younger siblings on a device yet.

Themes

The findings show that while students are attached to their phones and iPads much more so than they were even two years ago, the struggle continues to be the emotional and social effects that these devices have on adolescent students. Addiction, anxiety and depression are all on the rise and, according to the teachers, are rising due to the influx of technology. Teachers are noticing that students used to spend hours together on projects and group work, now they collaborate online, and would rather text than be on the phone. The teachers believe that interpersonal communication is struggling with the digital world. While technology means students have access to many more avenues of learning and knowledge, there is a battle between real versus digital. Even when students are interacting in person, they are also connected to others digitally. Has virtual interaction replaced face-to-face group collaboration? It has been seen by the teachers, who were not part of the iPad pilot program, that the group sessions are dwindling. The concern remains that personal connectivity in and out of the classroom in the digital age is slowing and interaction face-to-face is being shifted to online and digital collaboration.

Chapter 5 Discussion /Analysis

Summary of Major Findings

All students surveyed have access to the Internet and only one student of the forty-one students surveyed does not own a cell phone. All students who own a cell phone send and receive texts. Students are constantly using some form of technology in and outside of the classroom, whether for schoolwork or to stay in touch with friends. All students are using some form of technology within two hours of going to bed. Texting is rampant in all classrooms. Many of the teachers interviewed agreed that there is an epidemic of both anxiety and depression as well as an addiction to texting. Students are less connected to their peers and teachers because of technology. On average a student has three core teachers in their program. Four out of five iPad Pilot teachers are using the iPads 50-75% of class time, that's an additional two or more hours of screen time per day. That's at least six hours more screen time per week for the students in the iPad pilot program. This being screen time in class, it is not accurately known how long students spend on their devices outside of class. However, all teachers know students use their devices in and outside of class in addition to the added class work on those devices.

Comparison of Findings to the Literature

Multitasking and Continuous Partial Attention

According Rosen et al. (2012), "The more tasks we take on – with the assistance of very attractive and distracting sounds and visuals from advanced technology – the more our brain gets stressed and overloaded, and the worse we do at all of the tasks" (pg. 106). According to the findings 93% of students respond to texts quickly or instantaneously once receiving a text. And

according to all students the polite response time to reply to a text is within two hours. That means that regardless of time or place students are available to text quickly, and believe it is expected that one reply within two hours. According to Stone, Continuous Partial Attention is constant fragmented attention that is motivated not by productivity, but by the desire to be connected (Firat, 2013). According to the findings 93% of students said that while with peers they are texting other friends who are not currently with them. According to Time Inc. and Innerscope Research, digital natives switch their attention at the first sign of boredom. The frequent switching results in low attention that limits their emotional response. (Frank et al., 2013, p. 4). According to the findings 95% of students check their phones immediately when bored. Small and Vorgan state that, “Under this kind of stress, our brains instinctively signal the adrenal gland to secrete cortisol and adrenaline. In the short run, these stress hormones boost energy levels and augment memory, but over time they actually impair cognition, lead to depression, and alter the neural circuitry in the hippocampus, amygdala, and prefrontal cortex – the brain regions that control mood and thought” (Small & Vorgan as cited in Bauerlein, 2011, p. 93). When asked how often students unplugged and don’t use any technology, 39% said everyday and 61% ranged from never to two-three times per week. This means that the majority of students are using technology everyday and do not unplug. According to Small and Vorgan, “Chronic and prolonged techno-brain burnout can even reshape the underlying brain structure” (Small & Vorgan as cited in Bauerlein, 2011, p.93). When asked about multitasking only 10% said they focus on one thing at a time and the other 90% said they use various degrees of technologies at the same time. According to the teachers surveyed many believe that students texting is rampant. They can’t be without it and that they are constantly stimulated by their phones. Brett, (anonymous, February 13, 2014, personal communication) an integrated science

and engineering teacher of 20 years says he sees it all the time with people of all ages, the inability to take some down time and look around, take a deep breath and experience the people around them and interact. He's also had quite a few students ask for more kinesthetic and artistic options rather than digital presentations. They tell him they're happy to have their heads away from screens and they really enjoy working with their hands. Peter, (anonymous, February 13, 2014, personal communication) a Social Studies teacher of 24 years said they when their SLC wanted to an unplugged day that even the parents were against it. According to Shelly, (anonymous, February 13, 2014, personal communication) a counselor of 17 years, students tell her all the time that they miss feeling connected to their teachers and that they don't want to be on iPads all the time.

Adolescent Media Use

According to the research of Rideout et al. 20% of all media consumption occurs on media devices (Rideout et al., 2010, p. 1-4). According to the findings smartphones are the most common way students access the Internet. Rideout et al. also found that 66% of all the children had their own cell phone. Of those who own their own cell phone, 46% say they text and those that text say they estimate an average of 118 texts per day. (Rideout et al., 2010, p.18). In Lenhart's study about one in four teens say they own a smartphone and 75% of teens now text (Lenhart, 2012, p. 1). According to the findings 98% of students surveyed had their own cell phone. Of those who own a cell phone 100% send and receive texts, 18% send 0-25 texts per day, 17% send from 25-100 texts per day and 6% send more than one hundred texts per day. According to O'Keefe, "A large part of this generation's social and emotional development is occurring while on the Internet and cell phones" (O'Keefe as cited by Cerra & James, 2012, p. 110). According to the findings of the students who own cell phones 59% use their phones to

text rather than calling people. But 93% prefer talking face-to-face than texting, while only 61% said that texting leads to face-to-face interactions. So even though students may prefer to be in front of one another, their cell phones have become their primary form of communication, and texting may not lead to interpersonal face-to-face interaction. According to Shelly tech is always there, and it's hard to get away from it. She has seen it first hand that technology has absolutely arrested the students' emotional growth. The biggest thing she's seen is that the ability of students to grow into their own independence and responsibility has been hijacked. "The idea that part of our job is to create responsible, independent thinkers, who can make decisions and develop relationships with their teachers is gone."

Social and Emotional Factors of Technology Use

According to Lenhart 91% of teen smartphone owners use social networking sites (Lenhart, 2012, p.7). According to the findings only 63% of students have a Facebook account. This decrease in social media use on Facebook does not represent the rise in other forms such as Snapchat, Tumblr, Twitter and Instagram. However, when asked whether the friends on these sites were "real," 99% said they had a mixture of friends and people they don't necessarily know in person. "Our online self is an invention that, for most people, is a continual approximation of presenting our sense of self to the world" (Rosen et al., 2012, p. 34). In the researchers findings 54% percent said their Facebook represents their authentic self, 42% said a mix and only 4% said what they'd like others to see. Of those using Facebook when asked if they felt more connected after spending time on the site 50% said they do not feel more connected, 42% said sometimes feel more connected and only 8% said they usually feel connected. None of the students said that they always feel connected after Facebook use. "Positive interactions leave us feeling better while negative ones pose a threat to our coping abilities... depressed people demonstrate

selective attention to negative comments far more than positive ones and allow those negative comments to linger and occupy attention far longer than positive ones” (Rosen et al., 2012, p.90). According Shelly, students are much more anxious and stressed, they are addicted to technology and often have increased anxiety from the mixed messages they are reading into texts and Facebook posts that they don’t know how to interpret. According to Em, (anonymous, February 13, 2014, personal communication) an English teacher of 22 years experience, even *she* is anxious when using Facebook. “Every time I go on my Facebook news feed it makes me feel anxious that I’m not doing everything I should be doing. So how could our students be resistant to it, when I have all this armor? I have years of armor against it and it still bothers me. Kids aren’t as tough” (personal communication). Jay, (anonymous, February 13, 2014, personal communication) an art teacher of 14 years brought up the idea of FOMO; fear of missing out. This concept highlights the idea that if students aren’t connected digitally then they aren’t a part of what’s going on. The inability to be unplugged is prevalent in his classroom. This very idea is described by Gardner and Davis, “Despite their many electronic connections to one another, many young people today paradoxically have a sense of isolation (Gardner & Davis, 2013, p.44).

Technology Use and Sleep Deprivation

According to Kremer et al. (2012) children may be vulnerable to physiological responses of arousal of the central nervous system and associated negative effects on sleep patterns with high rates of screen time. In the findings 95% of all students surveyed use some form of technology within two hours of going to sleep everyday and 61% of students are getting on average 5-8 hours of sleep per night. Students were surveyed about their use of devices in classrooms on a daily basis. Students who were enrolled in the iPad pilot program 65% said they use their iPads in class more than five times a day and 100% say they use their iPads outside of class everyday.

Of the teachers interviewed, one out of five stated they do not use the iPads in class while the other four said they use the iPads 50-75% of the time everyday in class. On average per week students will see their core teachers three times a week. They have one 50-minute period and two 90-minute class periods. If students are using the iPads 50% of the time, that's 25 minutes in a short day and 45 more minutes per period on block days, which is a total of an hour and 55 minutes of added screen time per week in a single class. If they are in three classes with iPads, and they are using them 50% of the time that's an added 6 hours and fifteen minutes per week. If they are using them 75% of the time in the three class periods that's three hours and 28 minutes of screen time per day. That's nine hours and 23 minutes a week of added screen time. This is not taking into account the amount of time students use their iPads outside of class, nor texting, television or computer use. Of the students in the iPad pilot programs, 65% said they use them in class more than *five* times a day. The projections above are for *three* core classes and may be smaller than the true amount of time spent on their iPads during the school day. Brett isn't sure giving additional screen time to kids that are already addicted to screens is a good idea. "I personally can't imagine coming to school and spending half of my day or three-sevenths of it head down in a screen." Jay is concerned that students are losing their ability to communicate and attentively listen. "They are losing the skill of taking turns. When it's your turn to talk, eye contact, nodding, to attentively listen. You don't need to attentively listen if you're virtually collaborating." Rich, (anonymous, February 6, 2014, personal communication) a technology teacher of 13 years teaches a wide range of classes, from Computer Graphics to Programming and believes that the digital native is a fallacy. "We need to make sure and not misconstrue one-to-one access to an iPad to be getting deep tech instruction. Just because someone is in front of a

screen a lot doesn't mean they have deep tech knowledge. Technology will come and go, but the human support will always be critical.”

Limitations/Gaps in the Research

The limitations of the research are that the data was only collected from one school. The school is a wealthy public school and does not reflect the use of technology in other public schools. The data was only from two classes and a handful of teachers and did not include all students or all teachers. There is not an even number of female to male students of the same age, nor are there an even number of students enrolled and not enrolled in the iPad pilot programs. The research was not longitudinal and will not have follow-up data to review.

Implications for Future Research

Through the findings of this study it is clear that technology has an effect on students. Texting has started to replace face-to-face communication. Virtual collaboration has replaced multi-hour long research projects. It is important to study how technology in education effects students brains and learning capacities and it should continue to be studied at length as technology changes and is brought into the school system.

Overall Significance of the Study

This study shows that technology use is rising in school. Even from the most recent studies in 2012 the statistics are rising to show increased use of texting. The social and emotional effects are being seen by teachers and the counselor by student's inability to put away their devices, their constant texting in and out of the classrooms as well as the rise in anxiety and depression.

It is clear that this is a field of study that will not go unnoticed and that adolescent screen time and device use is still very much in the outskirts of current research, while being no less important than those studies on younger students.

About the Author

The author is a 29-year-old female Art Teacher from the San Francisco Bay Area. She is what research calls a “digital native” and has often questioned the push for ever-present technology, both in her home and in her schools.

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