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The relationship between internet usage habits and student achievement

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The Relationship between Internet Usage Habits and Student Achievement

by

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Dedication

This work is dedicated to Dr. Susan I. Duley (more commonly referred to as “Mom”). Through her hard work and perseverance over the last 30 years, she has shown me that nearly anything is possible, and no one can stand in your way if you are willing to put in the work. She is the most generous person I know, and I am very thankful that she pushed me to finish this degree. Thanks, Mom! I love you!

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Abstract

The invention of the Internet has brought countless advancements in communication, research, knowledge, and entertainment. Over the course of time, and as the Internet expanded, there have been mixed opinions in regard to the Internet's place in schools. This has brought on the need for schools to develop policies to monitor and regulate student Internet activity in order to teach students to use the Internet as a tool to increase academic achievement. Michigan has consistently been one of the lowest performing states in regard to the SAT; thus, it is important for teachers and administrators to determine why. Through an Internet use survey adapted from The Pew Research Center's Internet and Technology report titled "Teens, Social Media & Technology Overview 2015," this study surveyed 12th grade students at Blueville High School in Blueville, MI, to determine their levels of Internet access, Internet usage habits, and overall opinions of the Internet. Additionally, a focus group interview was conducted to further gain an understanding of Internet usage impact on student achievement. Survey results were compared to individual composite and component SAT scores, grade point averages, and socioeconomic factors (free/reduced lunch status). Results indicate some connection between Internet usage habits and student achievement, especially for those students who use the Internet for school-specific work.

Keywords: Internet usage, SAT, student achievement, self-determination theory, flow theory

Table of Contents

List of Tables

List of Figures

Chapter One

Introduction and Background

The role of the school has changed significantly over the last 30 years. Schools previously focused on instruction mostly using books, paper, pencil, and the occasional use of limited technology. School libraries began to expand from simply supplying books and a quiet place to study, to hubs for students to gain access to technology and the Internet. Email began to change the way students communicated, websites became more and more focused on entertainment, instant messaging gained traction through America Online, and social media began to expand in popularity through sites like MySpace and Friendster, which were user-profile-based sites that connected people through common interests. The Internet was quickly becoming a platform for more than just learning as students found ways to instantly connect with each other around the globe for recreational purposes. Schools followed the trend, and classrooms became more and more technology-driven. Soon, high-speed Internet became more affordable, and families were able to purchase similar connectivity at home as schools had, thus bringing technology capabilities into many homes. However, high-speed Internet wasn't affordable for everyone. The term *digital divide* was coined as a result of the disparities between those who could afford access to the Internet and those who could not. Even now, we find that a digital divide still exists in many parts of the country.

As technology changes from year to year, and high-stakes testing becomes more of the overall focus of student success and failure, researchers have begun to examine the relationship between usage of the Internet and how it impacts student performance. There are numerous studies showing positive relationships between access to the Internet and student achievement, along with how the Internet is used by students. Those studies range anywhere

from a basic examination of access to the Internet verses demographics, all the way to detailed analyses reporting how different Internet usage types impact standardized test scores (Larson & Miller, 2011). In earlier studies, results show a positive correlation between higher and faster levels of access to the Internet and higher student achievement. However, as access and usage of the Internet grows, a shift has occurred. New research has shown negative correlations between high levels of usage of the Internet and technology and student achievement. In a 2014 study by Wentworth and Middleton, a negative correlation was found between the frequency of technology use related to academic performance. Even as far back as 2005, there was evidence to suggest that "providing universal access to home computers and high-speed Internet access would broaden, rather than narrow, math and reading achievement gaps" (Vigdor, Ladd, & Martinez, 2014, p. 1). This study attempts to identify the correlation between access and usage types of high-speed Internet and student achievement (composite/component SAT scores and cumulative GPA from 9^{th} to 11^{th} grades) of senior students at Blueville High School in Blueville, MI. This study is rooted in self-determination theory, which is a theory of motivation based on the work of Deci and Ryan (1985). This theory examines the impact on motivation through perceived autonomy, perceived competency, and perceived relatedness. Furthermore, through the lens of self-determination theory in relation to student achievement, this study will collectively investigate how Internet self-efficacy, online exploratory behavior, curiosity, enjoyment, and flow impact student achievement. Additionally, Mihály Csíkszentmihályi's flow theory is used to determine if Internet use encapsulates students in a sense of focus that either increases or decreases student performance.

It should be noted that Blueville is a fictional name used to maintain the confidentiality of all human subjects involved in this study.

Problem Statement

In this age of nearly constant technology advancement and ever-increasing access to high-speed Internet, schools struggle to keep students engaged in the classroom. Smartphones, tablets, Chromebooks, and numerous other connectivity-based devices are an added component to many schools around the country. However, as access to this technology increases, so does the possibility that this technology distracts from actual learning, thus impacting student achievement. Michigan schools are now being tasked with ensuring that students are tech-savvy through Michigan Integrated Technology Competencies for Students (MITECS), formerly the Michigan Educational Technology Standards for Students (METS-S). However, it is nearly impossible to monitor and control all student Internet activity to guarantee that it is positively contributing to the overall mission of that initiative. Additionally, students are more connected than ever before to the Internet (Anderson & Jiang, 2018). Much of this time spent online is recreational in nature and focused on entertainment and communication with peers (Lenhart, 2015), where previously this connectivity may have been more narrowly focused on learning.

Internet use among teens continues to grow each year with 95% of American teens surveyed reporting having access to a smartphone, while 45% say that are online nearly constantly (Anderson & Jiang, 2018). In 2015, only 24% reported being online nearly constantly (Lenhart, 2015). It is this data from the Pew Research Center, along with other supporting studies, that drives the question regarding recreational Internet use and how it impacts student SAT scores and cumulative GPA.

According to CollegeBoard (2018), Michigan students in 2017 performed the fourth worst of all states (1000.1 average, which is down from 1007.6 just one year prior). Blueville High School's average SAT score for 2018 was 1014.9, which is above the state average, but it is

the second lowest in Blueville County. Additionally, Blueville High School's score of 1014.9 is well below the national average of 1082. The highest performing state is Minnesota at 1295.

Purpose of the Study

The purpose of this study is to determine if there is a significant relationship between Internet use and student achievement (SAT) of Blueville High School seniors in Blueville, MI. Further, the study will examine the relationship between free/reduced lunch status and access to the Internet, and how, if at all, this impacts student achievement. The study will compare responses of 12th grade students on an Internet use survey that focuses on access, speed of connectivity, usage types, usage frequency, and overall satisfaction when using the Internet.

Significance of the Study

In educational leadership, it is sometimes said that more and better technology leads to higher student achievement, but is this really true? In Anderson and Jaing's 2018 overview study of teens, social media, and technology, they report that 45% of teens are online almost constantly. Further in the same study, 98% of teens report going online daily. With such a large percentage of students being online, it is important to examine the impact of this trend. Furthermore, it is important to examine why students are online so much. With the idea of self-determination theory and flow theory, this study inspects the impact of being online on the self-efficacy components of autonomy, relatedness, and competency, and the overall state of flow. Further, for many teens, these components at one time were most likely fulfilled by something else. The researcher, through this study, hoped to find a relationship between autonomy, relatedness, competency, and flow, and Internet use in order to determine if there is an impact on student achievement.

By studying how the access, usage types, and frequency of use of the Internet impacts

student achievement, research-driven conversations can be had, and decisions can be made that appropriately and productively guide Internet use both at school and outside of school. In addition, the findings of this research will contribute to the current research of the impact of Internet use on student achievement, but more specifically on that of rural communities. Because Blueville Public Schools (BPS) is partially funded by Title V and Title VI dollars, BPS is classified as rural for the purpose of this study and all budgetary decisions of the district.

Research Questions and Null Hypotheses

The approach of conducting research in mixed methods was chosen in order to pinpoint significant relationships between Internet use and composite/component SAT scores and cumulative GPA from 9th to 11th grades of seniors at Blueville High School. The following two main research questions drive this inquiry:

R1---Is there a significant relationship between Internet use and composite/component SAT scores and cumulative GPA from 9th to 11th grades of seniors at Blueville High School?

Null Hypothesis: There will be no significant relationship between Internet use and composite/component SAT scores and cumulative GPA from 9th to 11th grades of seniors at Blueville High School.

R2---Is there a significant relationship between types of use of the Internet and composite/component SAT scores and cumulative GPA from 9th to 11th grades of seniors at Blueville High School?

Null Hypothesis: There will be no significant relationship between types of use of the Internet and composite/component SAT scores and cumulative GPA from 9th to 11th grades of seniors at Blueville High School.

Theoretical Base

Self-determination theory.

Overview. According to its developers, Deci and Ryan, self-determination theory is a macro theoretical framework that seeks to study human personality and motivation through autonomy, relatedness, and competency (Joo, Lim, Han, Ham, & Kang, 2013; Jeno, 2015; Ryan & Deci, 2018). Motivation is a learning engine in the sense that it largely influences what students hope to learn, when to learn it, and how to learn it. The above thoughts are backed by Brooks and Young (2011), who emphasized the importance of student motivation. Again, according to Brooks and Young (2011), student motivation is an important element in education in the sense that it largely influences the learning process. As such, the motivation of students is core for any successful learning experience and eventual student achievements. Based on the already documented evidence, highly motivated students are willing to take exceedingly challenging activities both within and outside the classroom (Ryan & Deci, 2018; Jeno, 2015). Nevertheless, students are highly inspired toward adopting deep learning approaches, are more creative and innovative, are actively engaged and involved in the learning process, and generally exhibit outstanding academic achievements when compared to the unmotivated learners. Given this important and strong connection between motivation and learning outcomes, a relatively large number of researchers have embarked on studying a myriad of educational settings, how they influence student motivation, and eventual performances (Joo et al., 2013). Based on the findings established from these different studies, it has been determined that self-determination is an essential precursor toward achieving success across different domains in life (Bieg, Rickelman, Jones, & Mittag, 2013). As such, the theory has been applied in different research areas such as health, employment, and education (Ryan & Deci, 2018).

Intrinsic and Extrinsic Motivation. In their study, Noour and Hubbard (2015) note that self-determination theory (SDT) outlines three different categories of motivation, which influences the human behavior. These can be categorized into Amotivation (AM), Intrinsic Motivation (IM), and Extrinsic Motivation (EM) (Ryan & Deci, 2018). AM denotes the lack of intentionality, which then follows that the particular individual will be demotivated in undertaking any activity (Noour & Hubbard, 2015). This means that the individual does not value the particular task at hand. On the other hand, IM refers to the internal driving force for a person to engage in a certain behavior or perform a given activity because it is naturally satisfying to him/her. In other words, a person is likely to experience pleasure, joy, satisfaction, and high levels of interest when engaging in the particular activity (Noour & Hubbard, 2015). Further, Noour and Hubbard note that a person is likely to be intrinsically motivated when he/she is working towards meeting personally meaningful goals, being curious, seeking recognition, pursuing fantasy, competing, and wanting to gain control. For instance, within the educational setting, students are likely to get highly motivated whenever they want to achieve outstanding academic results and have a strong desire toward learning and therefore are pursuing their inherently and naturally developed goals (Deci & Ryan, 2018). It should be noted that some learners, just like adults, are naturally eager and curious to acquire new knowledge, skills, and competences. As such, they will be intrinsically motivated and self-driven toward learning (Andrade & Valtcheva, 2009).

EM refers to the behavior that is primarily influenced by the means to an end rather than self-sake (Noour & Hubbard, 2015). In other words, it denotes the behaviors that are influenced by a wide range of external factors such as money, praise, fame, grades, and a wide range of other rewards (Noour & Hubbard, 2015). For instance, within the educational setting, students

may put more efforts in their studies since they want to get better grades, receive accolades, or just because education has been regarded as a channel toward better life. According to the theory of the SDT, EM can be divided into four categories. There is the integrated regulation that occurs when a person behaves in a certain manner primarily because it has been fully integrated into self. Also, there is the identified regulation, whereby a person engages in an activity because it is in accordance with his/her identity. Further, there is the introjected regulation, which entails behaving in a certain way in order to promote high levels of self-esteem while avoiding any negative feelings. The above is associated with the last type of EM, which is external regulation that is largely influenced by a myriad of external factors. In this case, according to Vlachopoulos et al. (2013; as cited in Noour & Hubbard, 2015) a person will be trying to avert issues of negative feedback while at the same time seeking some recognition and rewards.

Core psychological needs.

Competency. Based on Deci and Ryan's theory of self-determination, the self-determination of an individual is influenced by the desire to achieve three core psychological needs, which include competence, autonomy, and relatedness (Joo et al., 2013; Brooks & Young, 2011). Bieg et al. (2013) define competence as the desire to achieve success and experience high levels of satisfaction in the midst of challenges. On the other hand, Joo et al. (2013) defines competence as a psychological concept in which an individual is seeking to have control over outcome and, at the same time, experience some level of mastery. Competence becomes highly essential in undertaking any activity as it makes an individual feel excited and enjoy the particular process, which in the long run improves motivation and satisfaction (Joo et al., 2013). SDT suggests that different people will attempt to gain mastery in different tasks through the acquisition of different skills and knowledge, resulting in them performing outstandingly well in

their respective fields. According to the notions of the theory, people, including students, are highly likely to take actions and execute different activities whenever they feel they have the necessary knowledge and skills in helping them achieve pre-determined goals and objectives (Bieg et al., 2013). Joo et al. (2013) outline different ways through which students can build their competence and these include, among others, seeking regular feedback on completed tasks, being decisive, gradually learning new skills, embracing team work, and asking the right questions. For instance, positive feedback from teachers approving student work can be a motivational factor that helps improve a student's self-determination (Bieg et al., 2013). However, it should be noted that with advanced technologies, students can self-assess by enrolling in different online classes while at the same time taking up different online tests (Ryan & Deci, 2018; Ndon, 2014). By getting the correct answers, students feel that they possess the needed skills to complete different tasks, eventually augmenting their levels of motivation to study in order to continue gaining better results in their studies (Ndon, 2014). Based on the tenets of the SDT, people should always seek new highly interactive platforms that encourage teamwork for cross-examination of skills as well as sharing of insights, experiences, ideas, and opinions. For instance, social media networks and other online platforms provide such an opportunity for competence growth (Taylor & Parsons, 2011).

Autonomy. With regard to autonomy, Joo et al. (2013) define it as a tendency toward achieving self-regulation and self-organization. According to Bieg et al. (2013), autonomy refers to a prevailing situation when people are able to achieve desired interests, values, and personal goals. According to SDT, autonomy within the school setting is likely to be realized when teachers identify with and nurture the needs, preferences, aspirations, and interests of students (Bieg et al., 2013; Ryan & Deci, 2018). Similar to adults, most learners want to take control of

their actions as well as the goals and whenever an external force tries to limit such freedom, students are likely to feel demotivated. In this digital era, an increased number of schools, homes, and a range of other social settings have access to the Internet. Students tend to want to exercise more autonomy in utilizing this information, which is readily available at their disposal. SDT notes that there are different approaches that can be utilized in promoting autonomy (Bieg et al., 2013). An example of this would be where teachers needs to build trust in their students. They need to provide them with the essential skills and knowledge through appropriate interactions. This will prevent students from engaging in anti-social behaviors. Additionally, teachers and school administrators must provide students with the necessary tools required in achieving the particular underlying goals. The same may be required of the parents who are supposed to effectively mold their children's behaviors as they mature. When people are given autonomy, they feel valued and appreciated (Joo et al., 2013; Ryan & Deci, 2018). However, it is also imperative to emphasize the fact that irresponsible use of autonomy may result in negative outcomes (Jeno, 2015).

Relatedness. The final psychological drive as presented in SDT is the concept of relatedness. Relatedness, which is also referred to as connection, refers to the level of attachment that a person has with the other people and situations. This refers to the internal desire to interact and relate with other human beings (Joo et al., 2013). The definition is supported by Bieg et al. (2013), who define relatedness as the desire to feel connected and valued by significant others. It is a sense of belonging, and within the educational context, school administrators, teachers, society, and parents must appear to care for students (Bieg et al., 2013). As determined from the previous section, one of the ways through which learners can perceive as being cared for is through increased freedom in whatever activities they undertake. In the modern context, different

people from all parts of the world can virtually relate and interact through the use of different online platforms such as social media networks, blogs, and websites. The social media networks (SMNs) provide an opportunity through which people share different insights and experiences (Rudestam & Schoenholtz-Read, 2010). This is unlike in previous generations when physical meetings were necessary for interactions and engagement. It is on this basis that an increased number of people are pushing for increased access to Internet and Internet-supporting devices. Through such connections, people feel valued and appreciated. However, and in the absence of the relatedness feelings, some people may feel socially isolated, which may eventually predispose them to stress and depression. As such and based on the notions of SDT, relatedness is highly essential for mental stability and psychological growth (Ryan & Deci, 2018).

In the writings of Noour and Hubbard (2015), SDT advocates for an environment that promotes self-determination as well as motivation. This is highly important considering that it largely influences the ways in which people operate across different domains in their daily lives. According to the theory, people want to feel in control of their actions, experience that intrinsic drive, and receive rewards for their actions. Eventually, this increases aspirations and makes people feel motivated, committed, dedicated, and satisfied in whatever they do. However, SDT warns that with increased motivation and self-determination towards achieving autonomy and control, people must be willing to take responsibility. Another key point underlined by SDT is the importance of embracing the concept of relatedness (Ryan & Deci, 2018). The world is highly dynamic and new human interaction methods are increasing. For instance, as earlier denoted, the SMNs have brought about a new way through which people can virtually interact unlike in previous generations when engagements mostly took place via face-to-face communications. In order to ensure continuity, it is highly important to embrace these new

dynamics but, at the same time, take caution as the nature of interaction has an effect on the overall lifestyle outcomes of different individuals. For instance, although online learning may promote higher levels of interactions among students and their teachers, it may also culminate to negative outcomes when not appropriately controlled and monitored (Joo et al., 2013).

Flow theory.

Overview. Flow theory, developed by Mihály Csíkszentmihályi in 1975, states that flow is the psychological state that different individuals experience as motivational factors in their daily engagements (Santos et al., 2017; Csikszentmihalyi & 3M Company, 2009). In other words, it denotes a situation when a person undertaking an activity is fully immersed, involved, and engaged with energized focus eventually resulting in the full concentration of the task (Zeytounian, 2005). Eventually, such concentration results in deep learning, improved output, enjoyment, and improved personal satisfaction (Santos et al., 2017). During the flow state, the application of skills and knowledge is at the optimal levels. Similarly, the challenges of the underlying task are at peak as well, requiring optimal concentration and focus to the point that the student feels as if he/she is losing track of time since he/she is fully immersed in the activity (Santos et al., 2017).

According to Csíkszentmihályi and 3M (2009), there are different requirements for a person to reach flow state (Zeytounian, 2005). From the onset, and as indicated from the preceding paragraph, it is required that there is full concentration on the task. In the educational context, fully psychological immersion provides the student with an opportunity to learn and gain intense focus. Any disruptions are likely to interfere with concentration and the desired goals. In the current context, social media networks have been found to bring about disruptions amongst some learners, for instance, through the regular notifications, thereby hindering their

concentration (Bedassa, 2014). Another core requirement for achieving flow state is the clarity of goals by the student. Similar to the notions of the SDT, flow theory notes that goals can be intrinsically motivated through the inherent desire that a learner has toward achieving outstanding academic achievements (Noour & Hubbard, 2015). This is further linked to the other essential requirement of flow theory, which requires the activity or process to be intrinsically rewarding (Santos et al., 2017). In the education context, some learners are self-driven and have the desire to excel in their academics. When learners have that inherent desire, they will utilize the Internet for the right purpose. However, when IM is lacking, they are likely to divert their attention and any disruptions are likely to interfere with flow state.

In addition, according to Santos et al., (2017), flow state requires the task performer to have a feeling of control over the particular process or activity. This is linked to the autonomous component of SDT (Bieg et al., 2013). When the desire to succeed in education is naturally developed, students are likely to put their optimal concentration on any activity they engage in as long as it is heading toward achieving their academic goals. In such instances, they are bound to give full commitment, focus, and concentration and ignore any form of disruptions, including those emanating from the social media for those leaners who utilize the different online platforms (Zeytounian, 2005). Another important factor to consider for one to achieve flow status is ensuring a balance between the skills and underlying challenge (Csikszentmihalyi & 3M Company, 2009). As earlier stated, flow state requires both skills application and challenge to be at their optimal levels. When learners are well equipped with Internet utilization skills and are fully prepared, then they will be able to balance between their levels of concentration and incoming interruptions from online platform notifications (Santos et al., 2017). Nevertheless, they must be in a position to merge their level of awareness and actions. In a nutshell, students

can achieve good outcomes if they are able to fully utilize the Internet through full immersion of thoughts and concentration. The lack of such focus may be detrimental toward task completion, including school assignments and other academic requirements.

Another core requirement for flow status is the fact that the activity should be done effortlessly and with ease as well as taking key consideration of the time factor. Based on the ability of information intake, a learner may decide to either speed up or slow down the process for easier uptake of ideas, skills, and knowledge (Csikszentmihalyi & 3M Company, 2009).

Conceptual Framework

This researcher-developed conceptual framework is conceived from the previously established research and results, and will guide the current study's examination of the relationship between use of the Internet and student achievement. It is theorized that different levels of access and usage habits of senior students at Blueville High School will either positively or negatively impact student achievement. More specifically, the researcher believes that the highest levels of Internet access and frequent, non-academic usage habits will negatively impact student achievement. Figure 1 shows the connection between these variables and how they impact student achievement.

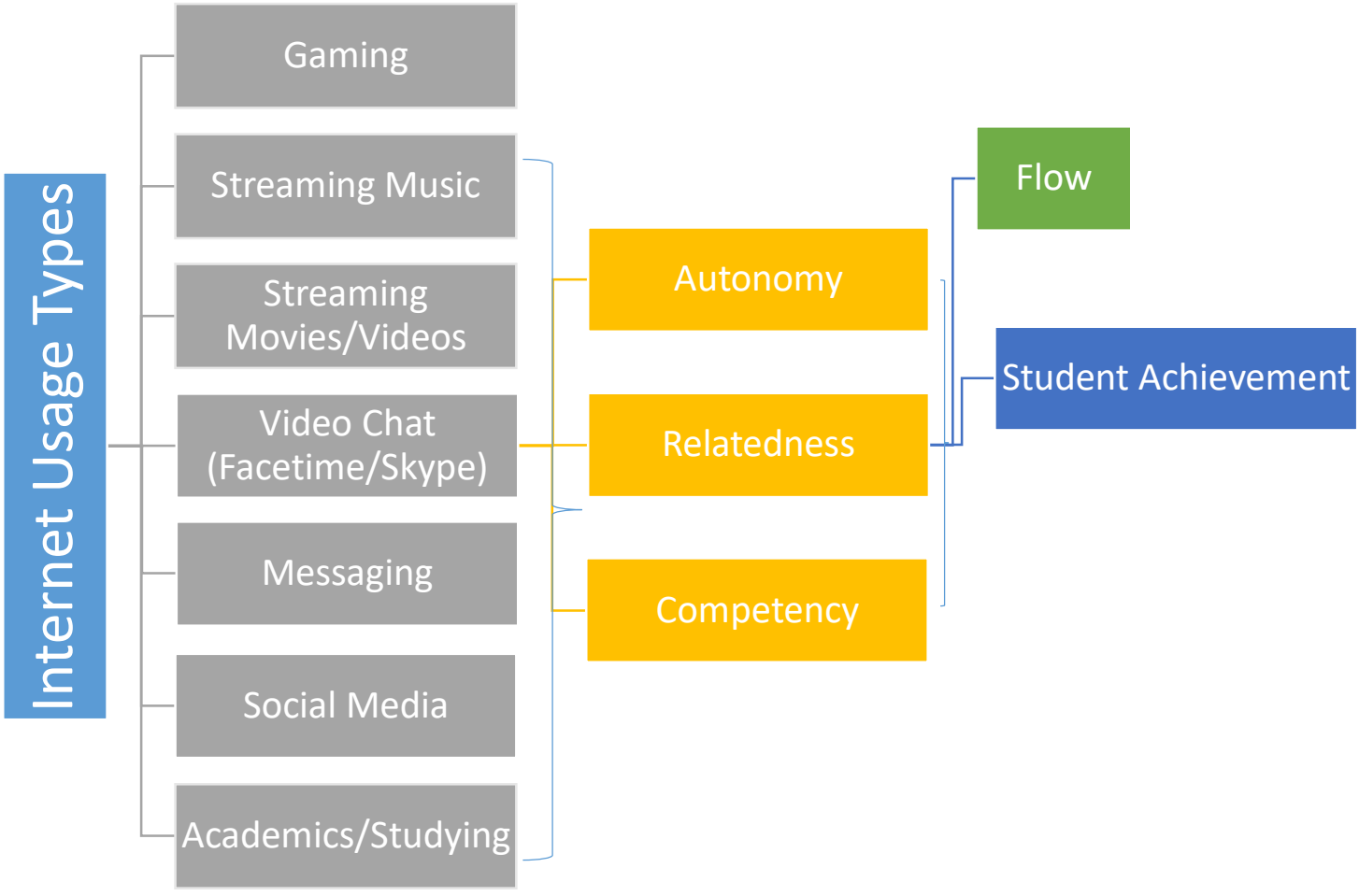

Figure 1. Conceptual framework.

Operational Definitions

- *Scholastic Aptitude Test (SAT)*: The SAT is a curriculum- and standards-based educational tool that assesses students' academic readiness for college.
- *Computer*: For the purpose of this study, "computer" refers to a desktop, laptop, tablet, and any type of netbook.
- *Data*: For the purpose of this study, data are individual parts or groups of information processed or exchanged by devices capable of computing (Zikopoulos, P., Eaton, C., & IBM, 2011).
- *Smartphone*: For the purpose of this study, a "smartphone" is any handheld cellular communications device that transmits data to and from the Internet.
- *Student Achievement*: For the purpose of this study, student achievement is measured by the composite/component SAT assessment score of each student. Additionally, cumulative GPA scores is a factor of student achievement.

Overview and Organization of the Study

This study is meant to contribute to the overall knowledge of the relationship between Internet use and student achievement (SAT scores and cumulative GPA from 9^{th} to 11^{th} grades). Some studies pertaining to Internet use follow a qualitative research tradition, asking students how their usage changes their outlook on academics and homework; however, the researcher in this study uses survey data to conduct a mixed methods analysis in order to contribute to the global picture of the Internet's efficacy for overall student achievement.

Many studies of the relationship between student achievement and the Internet are based strictly on the concept of the digital divide but do not take into account the study of *usage* of the Internet and how those usage habits relate to student achievement. While these research case

studies have blazed a trail for further understanding of how access to the Internet contributes to student performance, very few have examined, quantitatively, the relationship between usage habits and standardized test scores and GPAs. Inferential statistics and structural equation modeling (SEM) are used in this causal-comparative mixed methods study: "SEM is a statistical technique that seeks to explain the covariance among a set of variables" (McQuitty & Wolf, 2013, p. 59).

Limitations and Delimitations

Literally thousands of reports, books, articles, and presentations have been issued in the last twenty years regarding the digital divide. In Tsatsou's 2009 report titled *Digital Divides Revisited: What Is New About Divides and their Research?*" she questions "whether the extent to which research on digital divides over the last two decades has managed to capture the scope and role of interactions between technology, society, and politics when examining the nature and especially the importance of digital divides" (p.14). She further reports that scholarly works have redefined the digital divide into two groups of the informational haves and the informational have nots. Economically speaking, these can also be referred to as the information rich and the information poor. Tstatsou furthers explains:

> "Scholars continue to believe that politics can alleviate digital divides and thus strengthen social inclusion and people's sense of citizenship. However, what remains untouched is how socio-cultural and politics elements of the broader system can interact, entailing ambivalent and varying results not only for the extent of digital divisions but also for the effects of those divisions on social inclusion and participatory democracy" (p. 14).

Finally, Tstatsou (2009) concludes by making the point that digital divides are very

complex because decision-makers use problem solving to impact the lives of ordinary people. Research needs to move beyond the binary indicators of access and usage, and into the realm of quality use and diversity of usage in context.

In light of Tstatsou's discussion points, it is interesting to note that some recent studies have shown some very different results compared to those of previous two decades. In a middle school study from 2006, researchers were already seeing that the presence and frequency of technology was not as important at the quality of the time spent using that technology (Zhou, Huang, Wang, Wang, Zhao, Lei & Yang, 2006). Their study showed that when the quality of technology usage is not ensured, more time on computers can actually prove to be harmful to student achievement. This shows that perhaps specific and focused use of technology may be more important than general access.

In 2006, Van Dijk and Jan presented five gaps in research in their article titled *Digital Divide Research, Achievements and Shortcomings*. The first gap notes that in the past 5-10 years, the research has all been at the descriptive level (demographics of income, education, age, sex, and ethnicity) and not focusing on the social, cultural, or psychological causes of inequality in access. The study also reports that human inequality has not been studied nearly enough and that the digital divide is a much larger issue.

The second issue is concerning the lack of *interdisciplinary research*. Essentially, this issue identifies that there needs to be research to discover attitudes towards technology (e.g., technophobia and computer anxiety), how new media is diffused, how education views digital skills, and a cultural analysis of daily usage patterns and lifestyles.

The third issue is that of *qualitative research*. Qualitative research has dominated this field of research, which results in a void of thorough knowledge. VanDijk reports, "Most of

digital divide research is based on qualitative data collection and tries to describe the large picture of the problem. Although this produces vast amounts of correlations, it does not bring forward the precise mechanisms explaining the appropriation and division of the technology concerned in everyday life" (VanDijk, 2006, p. 232).

Fourth, Van Dijk and Jan (2006) report that the research is rather static and that there is a lack of *dynamic approach*. For example, the theory states that because computers are becoming more and more available as they become less expensive, the ability to be connected to the Internet will be more readily available to everyone. Van Dijk and Jan disagree with this, though, because technology changes so rapidly and as soon as it becomes affordable, the next leap happens making previous technology obsolete.

Finally, the fifth (and noted as the most serious) omission of current digital divide research is "the lack of *conceptual elaboration and definition*. Filling this gap is the most urgent task. Unfortunately, even the most basic terms and concepts are still ill defined. The most important seems to be the concept of access itself" (VanDijk, 2006, p. 233).

Summary

There are many studies that have been conducted and theories that have been developed which guide this study. Surveys of access to the Internet and discoveries of Internet usage habits of teens are the driving forces behind the research. The current study takes many of those studies into consideration, along with Deci and Ryan's self-determination theory and Csikszentmihalyi's flow theory, and employs some of the techniques previously used, and develops an examination of the relationship of Internet access and usage habits in comparison to student achievement (composite/component SAT scores and GPA).

Chapter Two

Literature Review

Introduction

Since the inception of rating based on student performance, schools have struggled to level the playing field in the classroom. Achievement gaps in reading, math, science, and social studies were, and still are, some of the main concerns for schools. However, the digital divide brought on a new set of concerns for districts (Vigdor et al., 2014). Van Dijk (2006) explains "The origin of the term digital divide goes back to an unknown American source in the middle 1990s and was first used in an official publication by the Telecommunications and Information Administration" (p. 221). This term has been at the forefront of student achievement conversations for nearly twenty years (Huang & Russell, 2006) and continues to be a hurdle for districts and communities to overcome.

Social equity, not just finances, plays an important role when discussing the digital divide. Because of this, several organizations have addressed the issue.

> "The digital divide that separates predominately white, middle-class Internet users from predominately minority, lower-income non-users has attracted the attention of policy makers (NTIA, 1999) and social scientists (Hoffman & Novak, 1998) is undoubtedly one of the most important social equity issues facing the information society (Benton Foundation, 1999; Hoffman, Novak, & Slosser, 2000), and is international in scope" (Van Dijk & Hacker, 2000, p. 1).

This indicates that even from as early as 1998, and perhaps before, the digital divide had the attention of influential organizations and decision-makers.

Additionally, rural America is a major part of the digital divide (LaRose et.al, 2007),

widening the disparity between the haves and the have-nots. However, many of those who were considered to be the have-nots have found a way to be connected. According to the U.S. Census Bureau's 2013 survey of Internet Access and Usage, only about 24% do not have broadband Internet access at home. That still leaves 7.6 million people without an Internet connection of any kind at home (U.S. Census Bureau, 2014). The Federal Communications Commission (FCC) has set a new standard for connectivity that changes the statistics of high-speed connectivity. This will be explained further in this section.

Cellular phones with data plans have significantly changed how students access the Internet. Nevertheless, the issue of the digital divide now goes much further beyond what it previously did. As data from cellular providers becomes the norm for teens to connect to the Internet at home (Brown, Campbell, & Ling, 2011), students, especially those in rural areas, are finding themselves without access to the Internet at home once their monthly data allowance is reached (Chen, 2012).

The information regarding the digital divide has been well documented. There is little evidence to show that the digital divide is not a concern among schools, governments, and communities. Previous studies have shown that there is a connection between student achievement and technology. However, there remains much question in regards to the levels of access to technology, technology access points (home, library, community center), and usage of that access in relation to student achievement (Wentworth & Middleton, 2014). Students can be given all the resources needed to be successful, but if those resources are not used in their intended manner, the results may not be favorable in regards to student achievement.

Previously, the lack of access to technology outside of school had become apparent as technology had surpassed the current grade school generation (Huang & Russell, 2006).

Presently, students enter into the education system with the idea that they will have equal access to technology and equal opportunity to succeed. However, as education becomes more and more technology-driven, students who do not have broadband Internet and access to computers (including handheld devices) at home are being left behind (Lenhart, 2015). These students will have to bridge the achievement gap and the digital divide with more obstacles in their way than students who have higher levels of access to technology outside of the classroom. This will naturally put those students at an academic disadvantage from the first day they enter the classroom (Huang & Russell, 2006).

Differences in usage of technology can also impact student achievement (Huang & Russell, 2006). Simply having more technology at home does not guarantee any improvement in academic achievement. On the contrary, newer studies are showing that higher access to technology is being attributed to lower scores in both math and reading (Vigdor et al., 2014). The issue is one of types of usage, and not simply of access.

This study of the relationship between Internet use and student achievement (more specifically composite/component SAT scores and GPAs) is meant to be an overview of the current technological variances and diversities in access and usage of the Internet of senior students at Blueville High School. It is also meant to shed light on the possibility that it is usage of Internet and not simply access to the Internet that has an impact on student achievement. Further, this review of literature will highlight several areas of interest to this study:

- the digital divide;
- mobile technology, home access, and data;
- trends in internet usage of teens;
- relationship between internet use and academic achievement;

- the SAT as a measure of student achievement; and
- gaps in research.

The Digital Divide

A very common and widely accepted interpretation of the digital divide is the number of people who have access to broadband Internet and those who do not. More specifically, the digital divide refers to personal computer ownership and Internet access (Parker, 2003). However, a common belief across the IT (information technology) community is that the digital divide dates back as far as the late 1960's or early 1970's, well before broadband Internet was available to the public. Steven Levy (1984) reports "access to computer terminals was going to link people together with unheard-of efficiency and to change the world" (p. 38). It was the work of Paul Baran of the Rand Corporation from 1964 to 1967 that sparked the exchange of digital information as we know it today through the development of packet switching (Leiner, Cerf, Clark, & Kahn, 1997). During that time, Lawrence Roberts and Thomas Marill negotiated a contract with the Advanced Research Projects Agency (ARPA) to build the first wide-area network (WAN) where computers exchanged packets of information through wired dial-up connections between Massachusetts and California. It was from this technology that the first public WAN was finally initiated in 1982, laying the foundation for the eventual creation of the World Wide Web in 1989 (Leiner et al., 1997). Finally, in 1991, the World Wide Web was opened to the public, creating the initial carvings of the digital divide.

Just like much that is new to the technology market, computers and connectivity were very expensive, especially compared to current prices. Computers are nearly 75% less expensive today, on average, compared to computers in 1995, yet connectivity still remains an issue (Megrey & Moksness, 2009). This issue caught the attention of the Clinton Administration, and

in 1996, Clinton made the term digital divide a widely accepted idea (Trotter, 2001). While Clinton and Gore did not coin the term digital divide, it was through their efforts that K-12 education was largely included in conversations concerning the digital divide (Trotter, 2001).

Since the late 1990's and the early 2000's, many programs such as One Laptop One Child, a charity-based organization focused on giving children in low-income countries access to technology and connectivity, have been funded by philanthropists around the world in an effort to slow the digital divide. However, as these efforts came to fruition, it became more and more clear that the issue was no longer about access, and more about the benefits that come from having that access (Monahan, 2015).

The digital divide falls along the lines of region and socioeconomic status. Grabill (2003) reports below that the Clinton administration tracked computer ownership and network access, and that much knowledge was gained because of that:

> "The 'digital divide' of course, has considerable social, political, and intellectual currency. We know a great deal about this divide because tracking it was a priority of the Clinton administration---as were policies to remedy it. The Department of Commerce's National Telecommunication and Information Administration's (NTIA, 1995, 1998, 1999, 2000, 2002) reports, generally *Falling Through the Net*, have been the primary and most consistent way to track computer ownership and network access across broad demographic categories over a relatively long period of time" (p. 459).

Regionally and geographically, the digital divide hits rural areas very hard. Even in areas where access is readily available, adoption has lagged behind of that in urban areas. LaRose et. al (2007) report that it is well established that broadband Internet usage among rural areas is skewed as the access improves rapidly, allowing rural area citizens more access to the Internet.

Because of new demands in technology (more demanding processors, streaming video and audio requirements, etc.), in 2015, the FCC increased its 2010 broadband definitions from 4 Mbps for uploads and 1 Mpbs for uploads, to 25 Mbps for downloads and 3 Mbps for uploads. The FCC found that the standard set in 2010 is dated and inadequate for evaluating whether advanced broadband is being deployed to *all* Americans in a timely way (2015). This, once again, changed how the digital divide is defined. Because of these new parameters, the findings of who has access to broadband Internet has changed. Key findings from the FCC's 2015 report are as follows:

- 17% of all Americans (55 million people) lack access to 25 Mbps/3 Mbps service.
- 53% of rural Americans (22 million people) lack access to 25 Mbps/3 Mbps.
    - By contrast, only 8% of urban Americans lack access to 25 Mbps/3 Mbps broadband.
    - Rural America continues to be underserved at all speeds: 20% lack access even to service at 4 Mbps/1 Mbps, down only 1% from 2011, and 31% lack access to 10 Mbps/1 Mbps, down only 4% from 2011.
- 63% of Americans living on Tribal lands (2.5 million people) lack access to 25 Mbps/3 Mbps broadband
- 85% living in rural areas of Tribal lands (1.7 million people) lack access.
- 63% of Americans living in U.S. territories (2.6 million people) lack access to 25 Mbps/3 Mbps broadband.
- 79% of those living in rural territorial areas (880,000 people) lack access.
- Overall, the gap in availability of broadband at 25/3 narrowed with 20% lacking access in 2012 and only 17% in 2013.

- Americans living in rural and urban areas adopt broadband at similar rates where 25 Mbps/ 3 Mbps service is available, 28% in rural areas and 30% in urban areas.
- Approximately 35% of schools lack access to fiber, and thus likely lack access to broadband at the Commission's shorter term benchmark (adopted in its July 2014 E-rate Modernization Order) of 100 Mbps per 1,000 users, and even fewer have access at the long term goal of 1 gigabytes per second (Gbps) per 1,000 users (FCC, 2015).

Since the researcher's focus group is located in a rural community, the statistic that 53% of rural Americans lack access to 25 Mbps/3 Mbps is alarming. Additionally, as previously mentioned and as will be explained further, when cellular data allowances are reached for a billing cycle, students find themselves with minimal, at best, access to Internet connections that are conducive to today's web navigating demands.

It is important to note that the FCC has not changed their definition of broadband since 2015:

- Only 50.9% of Blueville County has access to the FCC's current standard of broadband speed.
- According to the FCC's 2016 Broadband Progress Report, an increasing number of schools have high-speed connections, however approximately 41% of schools, representing 47% of the nation's students, lack the connectivity to meet the Commission's short-term goal of 100 Mbps per 1,000 students/staff. Blueville Public Schools does not meet that goal.

Further, the problematic issue is the lack of access to satisfy the newer demand for a digital economy in rural areas. Even in 2003, Malecki noted that "rural America is already digital. The question is whether it is digital enough. Serving distant customers in dynamic or

even volatile commodity markets has reinforced use of Internet by farmers and agribusiness" (p. 207). Reflecting on Malecki's statement, it is clear to see that the digital divide is as far-reaching as America's Heartland and its producers. The easiest answer is that rural communities need to have the same levels of access and service as those that are available in urban communities (Malecki, 2003).

Further, the Internet sometimes requires development and adaptation of a further set of skills that, to the novice user, at least, may be daunting (Eastin & LaRose, 2000). Considering this, it is understandable why people from lower socioeconomic groups (minorities, elderly, disabled) could find themselves trapped in the lower system of the digital divide. This divide, which has caused many users to fall through the net, has been part of the decline in educational success of minority youth and elderly (Eastin & LaRose, 2000).

The digital divide is also the line between those who have access and can effectively use the Internet and those who cannot. Globally speaking, this issue is far greater than the divide that exists in the United States (Acilar, 2011). However in the United States, the digital divide affects more people regarding percentages of people who have Internet access compared to people who do not when taking into consideration the overall population of the US (Recabarren, Leiva, & Nussbaum, 2008).

According to Hoffman and Novak (1998), "The differences between whites and African Americans in the United States with respect to computer access, which is the current prerequisite for Internet access and World Wide Web use, were studied" (p. 1). This shows how narrowly focused the research was in the late 1990's. In regard to Internet access, the prerequisite was computer access, but now the prerequisite can be anything from cell phones, iPods, smart cameras, smart televisions, and Blu-ray players with the appropriate applications.

There has been a very large jump in usage and access from the late 1990's to now; however, the jump has been through all demographics. Therefore, the digital divide and gap has not narrowed, but has stayed the same. One of the major issues concerning the lack of technology for groups of people with lower access to technology is the fact that government assistance, political campaigns, and healthcare now rely greatly on access to the Internet. Seong-Jae (2010) notes, "One area where the Internet is bringing new kinds of social interaction is the realm of politics. The Internet at present is characterized as being, among other things, multimodal, interactive, horizontal, low-cost, and non-territorial" (p. 25). However, the problem with this is highlighted by Shelley, Thrane, & Shulman (2006) who indicates that if some citizens are able to work with the government more easily because they have higher/better access to technology, the digital divide will get even larger and social barriers with be compounded.

Recabarren et al. (2008) brings to light another problematic issue, but this time regarding culture:

> "None of the works consider the existence of subcultures inside the (macro) cultures they studied. Very few have attempted to analyze the culture of their sample subjects without making the assumption that people from the same country belong to the same culture. Indeed, most studies do not give a definition of what the authors understand by 'culture,' a term that can be interpreted in many ways given the wide array of existing definitions of the concept" (p. 2918).

This can be paralleled in today's society still as we find many subcultures still being ignored within the realm of technology. Without examining those subcultures, it will be very difficult to close the gap between the haves and the have nots.

Van Dijk and Hacker (2011) reported that there are "heated debates concerning questions of whether there is a so-called 'digital divide' and if there is, how important it might be" (p. 315). After reviewing the research, one would be hard pressed to make claims that there is an even playing field regarding access and usage of the Internet and its components/vehicles of access. Even when just considering age, the roots of the digital divide are deep. DeMaria (2008) notes that "a generation gap in digital knowledge and skills is generally acknowledged to exist" (p. 771). He further explains that "just as foreign languages and athletic skills, such as skiing, are learned more readily at a young age, it is easier to master digital technology if you are immersed in at as a youth" (p. 771).

An interesting, controversial, and problematic issue in bridging the digital divide/gap is presented by Eastin and LaRose. In 2000, Eastin and LaRose stated "Internet self-efficacy, or the belief in one's capabilities to organize and execute courses of Internet actions required to produce given attainments, is a potentially important factor in efforts to close the digital divide that separates experienced Internet users from novices" (Eastin & LaRose, 2000, p. 1)

The digital divide has a long history, and as technology advances, there is a trickledown effect keeping the gap between those who have and those who have-not intact.
It is important to note that 56% of Blueville County, MI, does not have access to the FCC's new standard of broadband Internet.

By identifying the current trends in the digital divide at Blueville High School, this study will shed light on current access and usage disparities of the studied students.

Mobile Technology, Home Access, & Data

As the focus of the digital divide changes from simply having access to the Internet at home, to access speeds, access types, and data plans, it is important to examine what the new studies report and how those reports shape the thoughts of what it means to be connected at home. Beginning with IBM's Simon in 1992, non-traditional Internet connectivity began to rise (slowly), setting the platform for today's much more advanced smartphones. Following the Simon, Palm Computing introduced the Palm Pilot in 1996, the first widely recognized PDA (personal digital assistant). However, the more user-friendly combination of cellular communications and digital assistants came with Palm's introduction of the Treo line of smart phones in 2002 (Martin, 2013). The Treo aligned Wi-Fi capabilities with cellular data in a touch screen format; however, it was still a very expensive option and out of the financial reach of many, especially students (Martin, 2013). Cellular data was very expensive, but Wi-Fi hotspots were still not common, leaving this technology a product for businesses and members of the corporate world.

The major shift in mobile, non-cellular technology happened in 2007, though, when Apple Inc. introduced the iPod Touch, a full-color, wireless music player that could browse the Internet from anywhere that had Wi-Fi. By this time, Wi-Fi hotspots were much more common, but computers, both desktops and laptops, were still too expensive for many (Brown, 2009). The iPod Touch was a relatively affordable option at $299 that brought the Internet to the hands of many, but especially to teens looking to be online who previously could not afford to be. With this new technology, the digital divide was greatly impacted and information became much more readily available to America's middle class. However, this was still not a game-changer for those living in poverty, or those living in rural areas who did not have access to the Internet or places

with Wi-Fi services (Brown et al., 2011).

As technology improved and became less expensive, the combination of cellular communications and affordable digital assistant/media players/web browsers from several companies became more prevalent among those who previously could not afford to be connected (Brown et al., 2011). Additionally, as more and more teens having access to their own smart phones became the norm, constant access to the Internet outside of school, even in rural areas, was becoming more and more common (Breneman et.al, 2009).

According to a study by the Pew Research Center by Anderson and Jiang (2018), 88% of teens now have access to cell phones, and 95% of those are smartphones. Mobile access to the Internet is very common among American teens, and the cell phone has become an especially important access point for certain groups:

- 45% of teens report being online almost constantly.
- Nine of ten teens are cell-mostly Internet users — far more than the 65% of adults who are cell-mostly.
- Half of teenage girls surveyed (50%) are online nearly constantly compared to 39% of boys.
- 90% of teens go online multiple times per day.

However, there is an underlying issue that continues to plague lower socioeconomic groups: “In overall Internet use, youth ages 12-17 who are living in lower-income and lower-education households are still somewhat less likely to use the Internet in any capacity—mobile or wired” (Lenhart, 2015, p. 2). These students, however, are more likely to use their cell phones as their main access mode as compared to students from higher income households (Lenhart, 2015).

The next logical step involves the question of wireless data being available in all areas,

especially those rural areas where the FCC's new standard for high-speed Internet is not being offered. Are those households left without connectivity options? Nearly one third of households in United States have no choice in broadband providers, making them at the mercy of whatever speed that provider offers (FCC, 2015). Additionally, there are thousands of pockets in the United States, especially in the Heartlands and Rocky Mountain regions, which do not have any options at all for broadband service. On top of that, much of those areas do not have access to cellular voice or data coverage (FCC, 2015). Just in these areas alone, it is easy to see how there is still a large part of the United States that is still disconnected. Rural America suffers the most when it comes to connectivity (Kim & Orazem, 2017). Opportunity gap is the term they use to notate the disparity between urban and rural communities (FCC, 2015). In considering rural and urban households, only 1.8% of non-rural households lack access to high-speed Internet, while 23.7% of rural households lack this access.

With these statistics at the forefront of many ever-changing digital divide conversations, we then look to the option of cellular data and its impact on the digital divide. In 2011 alone, over 420 million smartphones were sold worldwide, and one fourth of those were sold in the United States (Drain, Grier, & Sun, 2012). Now, according to a 2015 study by the Pew Research Center's by Smith study titled U.S. Smartphone use in 2015, nearly two thirds of all Americans own a smartphone. Additionally, they report that many of that two thirds use their smart phone as their only means for accessing the Internet (Smith, 2015). The information on the following page from the Smith's 2015 Pew study shows some important factors about cell phone usage in America and how this impacts the need for home access to cellular data. Again, the report shows that 64% of all adult Americans own a smartphone, yet 7% of them have limited options for getting online (including cellular data connections). Fifteen percent have limited options for

online access other than their cell phone, and 10% have no broadband service at home other than their smartphone plan. Additionally, certain groups of Americans rely on smartphones much more than others:

- Younger adults—15% of Americans ages 18-29 are heavily dependent on a smartphone for online access.
- Those with low household incomes and levels of educational attainment—some 13% of Americans with an annual household income of less than $30,000 per year are smartphone-dependent. Just 1% of Americans from households earning more than $75,000 per year rely on their smartphones to a similar degree for online access.
- Non-Whites—12% of African Americans and 13% of Latinos are smartphone-dependent, compared with 4% of Whites (Smith, 2015).

It is easy to understand why having as many connectivity options as possible, even if not considered high-speed by the FCC's new standards, is so important for rural households.

In order to stay connected, those lower income rural areas with limited access to the Internet choosing the right cell phone provider becomes very important. Many cell phone companies charge exorbitant usage fees when their customers use more data than their plan allows. Of those who use their smartphones as their primary mode to connect to the Internet, 51% report frequently exceeding their monthly data allowances, incurring overage charges. In a consumer population that is already registering in the lower socioeconomic category, this can become detrimental to being connected. To that point, that same Pew Research Center report shows that 48% of users who rely on their smartphones to connect to the Internet have had to cancel or suspend their service due to financial constraints (Smith, 2015). To this end, it is important to discuss the financial implications of relying on cellular data as a primary mode of connection to

the Internet.

As previously reported, many households have chosen to eliminate home broadband services and elect to use cellular data services only. This, however, becomes a balancing act between one's monthly data needs and how much he can afford to spend on a data plan (Hussain, Kehl, Lennett, & Lucey, 2012). For example, households who are on a family shared data plan might have 10 gigabytes of data allowances per month. When they meet that limit, overage charges can average about $10 per gigabyte over the allowance. With only four people in family, data overages can add up very quickly, especially because teens tend to use more data than their parents (Hussain et al., 2012).

The average smart phone user in the United States uses 1.8 GB of data each month. With younger users, the average is higher, though, and gender uses are not equal (Mobidia, 2014). Smith's 2015 Pew Research Foundation report shows usage types across age ranges. Younger users are using their smartphones mainly for social networking, which can use up nearly three times the data as simply emailing and web browsing (Smith, 2015). With this in mind, it is easy to see how data overages can occur, especially in households where Wi-Fi or wired Internet services are being purchased. These overages lead to higher bills that can lead to making the decision to stop data use, or even cancel cellular data service. Twenty-three percent of all smartphone owners have reported turning off services for a duration of time because the services had become too expensive (Smith, 2015). Of that group, the age ranges of 18-29 and 30-49 report the highest instances of canceling or cutting off services. Troubling enough, these two age ranges are the age ranges of many parents of school-age children. If cellular data is the only mode of access to the Internet at home, connectivity can quickly be eliminated, reintroducing the digital divide.

For years, the culture of education has suggested that there is a great divide between students who have and those who have-not in relation to access to the Internet at home. The review of literature and studies surrounding this concept has proven it to be factual and an overwhelming deterrent to staying current in today's growing communications and technology world. Cellular communications devices have advanced over the last 10 to 15 years, and the accessibility to the Internet at home has grown exponentially (Smith, 2015). However, as cellular providers have transitioned to a new focus of unlimited minutes and text messages, but charging a premium for data, students are once again finding themselves disconnected at home when their data plan has run out (Chen, 2012). Data overages can range anywhere from $5 per gigabyte over the plan allowance to $12 per gigabyte over the plan allowance (Sen, Joe-Wong, & Ha, 2012). Additionally, if there are multiple people in the household on cellular data plans, the overage charges can add up very quickly. Even in group plans, once the data allowance for the billing cycle is used up, overage charges can exponentially increase the cost of being connected.

As the digital divide changes over time, focus has begun to shift toward usage habits instead of simple access to the Internet. Previously, students who had access to high-speed Internet at home were more likely to succeed in school. Now, however, the focus has changed to how the Internet is being used at home and if those usage habits have an impact on student achievement (Tossell et al., 2015).

Trends in Internet Usage of Teens

Much has changed in the last 10 years in Internet usage among teens. Teenage Internet usage has grown exponentially in just the last three years (Lenhart, 2015). With the huge jump in smartphone usage and ownership since 2012, teens who live in households with access to the Internet (either Internet service or cell data) are able to be connected as

much as they want to be. Twenty-four percent of teens go online "almost constantly," made possible by the widespread availability of smartphones. Ninety-two percent of teens between the ages of 13 and 17 go online every single day (Lenhart, 2015). But in a more recent study, Internet use among teens continues to grow each year with 95% of American teens reporting having access to a smartphone, while 45% say they are online nearly constantly (Anderson & Jiang, 2018).

Interestingly, though, African American and Hispanic teens report a higher frequency of going online than White teens. Thirty-four percent of African American teens, and 32% of Hispanic teens report going online almost constantly, yet only 19% of White teens reported going online that frequently (Lenhart, 2015). Not surprisingly, teens from higher income households go online more frequently than do teens from lower-income households.

Social Media.

Today's teens report using social media as their primary purpose for going online (Lenhart, 2015). In 2015, Facebook was, of course, the most popular social media platform; YouTube and Snapchat are now the most widely-used social media platforms (Anderson & Jiang, 2018). In 2015, Lenhart reported a breakdown of which social media platforms were used the most. Twitter, Google+, Vine, and Tumblr were all included in the top six most popular social media sites among users between the ages of 13 and 17. However, teens were not using just one social media source: "A majority of teens---71%---report using more than one social network site out of the seven platform options they were asked about. Among the 22% of teens who use one site, 66% use Facebook, 13% use Google+, 13% use Instagram, and only 3% use Snapchat" (Lenhart, 2015, p. 1). Now, YouTube, Instagram, Snapchat, Facebook, Twitter, and Tumblr round out the top six.

There are differences in user demographics, too. Forty-five percent of boys use Facebook more, compared to 36% of girls. Girls tend to use Instagram more than boys (23% of girls, 17% of boys). Teens between 15 and 17 are more likely to use Facebook, Snapchat, and Twitter, while teens ages 13 and 14 tend to use Instagram as their social network of choice (Lenhart, 2015). Teens from wealthier households tend to use Instagram and Snapchat more than teens from lower socioeconomic brackets. While Lenhart's study from the Pew Research Center (2015) does not give a reason for the differences in usage, the researcher, based on previously reviewed literature and studies, concludes that it could be an issue of data and connection speeds. Uploading and downloading of pictures and videos on Instagram and Snapchat takes up much more data and requires faster connection speeds than Facebook; therefore, teens from households in the upper brackets of socioeconomics might have higher levels of access to high-speed Internet and higher data caps. The same 2015 Pew Research Center study by Lenhart reports that girls are more likely to use visually-oriented social media platforms than boys. Still in 2018, Anderson and Jiang report that Facebook is the most widely used social media networks among lower income households.

Finally, teens are using social media for messaging purposes as well. Kik and WhatsApp are beginning to gain popularity among teens with 33% reporting having used at least one of these messaging apps. The demographics are similar to more popular social networking sites, too. Forty-six percent of Hispanic teens report using a messaging app, and 46% of Africa American teens report the same, while only 24% of White teens report using a messaging app (Lenhart, 2015).

Gaming.

Playing video games has become a very popular pastime for school age children. “It has been estimated that 82% of children ages 8 to 18 live in households that have video games and that the average playing session exceeds an hour” (Geller, 2004, p. 1).

Geller reported this in her research in 2004; eleven years later, this trend continues upward. The American Psychological Association (2015) reports that the average American between the ages of 8 and 18 years old plays video games for 13.2 hours per week. According to a 2015 Pew Research Center report by Lenhart, boys are far more likely to play video games than girls. Additionally, 72% of teens play video games online or on their smartphone; however, 84% of boys report playing games online, while only 59% of girls do. African American are significantly more likely to play games online: 84% of African American teens play video games online compared to 71% of White and 69% of Hispanic teens. Socioeconomics does not seem to be a factor in teens who play video games (Lenhart, 2015). Currently, 90% of all teens with access to the Internet and a smartphone play video games (Anderson & Jiang, 2018).

Streaming Music.

In addition to social media and gaming, teens between the ages of 13 and 17 report streaming at least one hour of music from services like Pandora and Spotify. Edison Research (2015) released a study of 2,021 Americans ages 13 to 17 to show their music listening habits. The report shows that teens in this age range use the Internet for an average of 64 minutes each day to stream music (Edison, 2015). All streaming, whether it be audio or video, uses data. On average, streaming music from the Internet uses 115.2 MB per hour (Edison, 2015), which translates to about 1 GB every eight days. If the average teen streams music for just one hour per day, data usage for streaming music

alone will reach 3.75 GB per month, which is well over the average data plan of two GB per billing cycle. At an average of $10 per GB over the monthly allowance, overage charges can add up quickly (Chen, 2012).

Streaming Video.

With the onset of companies like Netflix, Hulu, YouTube (Google Video), and Amazon Video, it is easy to understand why video streaming popularity is quickly growing. The ease of not having to leave your home to rent a movie is very convenient, especially for households in rural areas. Sharing videos with friends, and video chatting has become very popular. This convenience has caught on immensely with teens in recent years. The Pew Research Center's Internet and American Life Project published a 2012 report by Lenhart entitled *Teens & Online Video*. This report shows that 37% of Internet users ages 12-17 participate in programs for video chatting (Skype, Zoom, YouTube, etc.). Twenty-seven percent of surveyed users report uploading self-recorded videos to the Internet (Lenhart, 2012). O'Reilly (2015), through Forester Research, Inc., polled a panel of 4,709 people in the United States regarding their video and television watching habits. They categorized their survey-takers into Generation Xers and Millennials. The survey found that 40% of Generation Xers streamed from a paid online video service like Netflix or Hulu. Additionally, the survey found that 40% of Millennials streamed from an online service for free (O'Reilly, 2015).

The Relationship Between Internet Usage Habits and Student Achievement

With the increased use of the Internet among students, different researchers have investigated the various ways through which this impacts academic outcomes. An example research study was conducted by Shahibi and Ku Rusli (2012), where it was determined that the Internet promotes easy access and navigation to expansive information access and broader

reading. Posso's (2016) study supports the above findings noting that the introduction of the Internet has created a platform through which technology can be advanced. According to Posso (2016), advanced technologies have provided the human race with a widened platform for easy access to a wide range of information. For instance, through the use of search engines like Google, Yahoo, and Bing, students can access a wide range of articles within a short time (Shahibi & Ku Rusli, 2012). This has been attributed to the relatively large number of online publishers from across the world, thereby making information relatively easy to access and therefore contributing to knowledge growth. In fact, and according to Selwood (2012), this is partially the reason why the current era is referred to as the Information Age as a wide range is easily accessible following a single click on a computer. Due to their curious nature, most students are likely to try and search for more information regarding a particular concept other than what is being taught in the classroom. This curiosity is enhanced by the multitude of search results that any search engine provides whenever fed with different keywords or research topics. In the end, as observed by Arkorful and Abaidoo (2014), this helps promote the reading culture among students, thus enhancing knowledge acquisition for improved academic performance.

Information Access.

Based on the observations made by Jafre, Pour-Mohammadi, and Jesmin (2011), increased access to the Internet has helped reduce the travel time to physical libraries. Unlike previous generations when students would be required to physically visit the library building for them to access study materials, the Internet has simplified the entire process (Rosli et al., 2012). As explained from the preceding segment, through a simple search, an Internet user is able to navigate through a wide range of resources. The fact that a student does not have to physically move from one place to the other in search of library materials and instead is able to access a

wide range of online resources at the comfort of home or a classroom can promote the reading culture (Jafre et al., 2011). Students can easily complete their school assignments and in so doing, they are also encouraged to read more owing to the excess information at their disposal. Consequently, this promotes knowledge building through increased information intake, both of which are core to students' class performance and improved grades (Shahibi & Ku Rusli, 2012).

Self-Guided Work and Relationships.

Nevertheless, Ndoye (2017) acknowledges that through the use of different online platforms, students can self-assess their skills regarding different topics, concepts, and formulas that they have been taught in the classroom. There are some students who are inherently motivated to read and study on their own as a way of advancing their knowledge. This means that a teacher or an adult does not have to be around for them to study. Unfortunately, some of the self-assessment questions, despite being derived from concepts taught in the class, may require some guidance. As observed by Andrade and Valtcheva (2009), the Internet has helped bridge this gap whereby a teacher does not necessarily have to be present for a student to under-take self-assessment tests. The authors observe that different academic blogs and school based websites provide a wide range of these self-assessment tests, which can be used promoting learning and achievement amongst students. Moreover, students do not have to disrupt their teachers during off-class or holiday periods in asking them questions and seeking clarifications. Instead, and according to Ndon (2014) learners have an opportunity to enroll for different online classes anytime regardless of their geographical location as long as they have access to the Internet and necessary devices such as a smart phone, computer, or laptop. Such extra online classes keep students engaged and highly focused in their school work, thus leaving no time for

them to engage in anti-social behaviors, which would otherwise take up all their leisure time (Andrade & Valtcheva, 2009).

In another study by Alshuaibi, A., Alshuaibi, M., Mohd-Shamsudin, & Arshad (2018), it was determined that the augmented access to technology has promoted increased engagement as well as collaboration between teachers and their students. In the same context, it has enhanced interactions among students on academic grounds for enhanced student performance (Wankel, Blessinger, & International Higher Education Teaching and Learning Association, 2012). Through modern technologies, it is relatively easier for the teachers to post assignments online where students can download in real-time. Further, different online platforms including social media networks (SMNs) provide students with a unique opportunity where they can engage with their teachers through live chats for any clarifications that may be required (Nelson, 2008; Alshuaibi et al., 2018). Such real-time clarifications of any unclear issue are a motivational factor to the particular student and therefore a driving force toward the academic engagement of students (Nelson, 2008).

Differentiated Digital Learning.

Increased Internet access encourages individualized learning. As observed by Jethro, Grace, and Thomas (2012), people, including students, have different skill sets and as such have diverse needs and abilities. For instance, some students will understand different concepts taught in the classroom at different speeds. In the presence of technology and the Internet, learners have an opportunity through which all different student needs can effectively be met. This is primarily because students will be able to review concepts at their own time, at their own speed for better understanding, and skip whenever they feel like doing so. Nevertheless, as observed by Yılmaz and Orhan (2010), the Internet provides a myriad of ways through which they can study such as

visual observations, listening, or simply reading through the provided materials. This is considering the fact that some students may want to experience a certain concept for them to have a clear understanding of whatever is being taught and the Internet helps them achieve that objective. The above findings were supported in another study that was conducted by Loveland (2017), whose conclusions observed that the Internet provides an opportunity where students can visually follow different concepts, including mathematical formulas. This means that after they have been taught in class, they can later on access different video demos for better understanding of the particular concepts (Loveland, 2017). Teachers can provide relevant video links or students conversant with basic technological skills can make random searches on their own in order to access the particular examples.

Taylor and Parsons (2011) note that through well integrated school blogs and other online platforms such as the school website and official social media network pages, parents are able to interact with teachers and school administration and enquire about the attitude and performance of their children. This can be done with little effort and relatively quickly. This is unlike in previous generations where the parents would be required to physically visit the particular learning institution in order to make follow up on the child's performance. In a study by Lakhani, Jain, and Chandel (2017), it was concluded that collaborative efforts between parents and the school were highly essential for better academic achievement in the sense that each has a role to play in molding the child's behavior, which has a positive correlation with educational performance.

Usage and Achievement.

Based on the research findings by Ip, Jacobs, and Watkins (2008), increased access to different gaming activities can help promote the creative and innovative abilities of students. For

instance, as determined by the above three cited researchers, gaming increases the amount of concentration among students. The findings conform to the ones established by Blumberg and James Hosmer Penniman Book Fund (Ip, Jacobs, & Watkins, 2008), who concluded that online gaming was essential in helping develop different cognitive skills. Some of these skills may include perception, spatial navigation, reasoning, and focus. Through gaming skills that gamers acquire, they are able to gradually build on their problem-solving skills. These skills can thus be replicated within the classroom setting, for instance, in the uptake of different mathematical formulas (Ip, Jacobs, & Watkins, 2008). This demonstrates the ability of technology to improve the overall academic performance of students.

Additionally, the ability to search, access, and read many success stories from different people can rejuvenated motivation (Rudestam & Schoenholtz-Read, 2010). Such motivational information can be obtained from personal blogs, official websites, or people sharing them via the different SMNs. With increased access to the Internet and the growing number of people using social media networks, insights, opinions, and experiences are regularly being shared by people of diverse backgrounds. Some of this information can be highly motivating and can enhance the performance of different personalities (Rudestam & Schoenholtz-Read, 2010). Eventually, when students have access to this information, they can utilize the tips they gain as a mechanism towards uplifting their self-encouragement. Their desire to excel like the people sharing the success stories is a motivating factor that increases personal commitment in their respective academic undertakings. In the same context, students can Google what to do whenever they feel weighed down and unwilling to study. Similar to adults, children will sometimes have to grapple with mental breaks whereby they are unable to focus and concentrate in their studies. However, their ability to access different online platforms gives them an

opportunity to Google search different strategies they can use to overcome their particular underlying challenge at any given time. This is especially in the case where they are alone. Further, they can utilize different SMNs to share their stories with peers who might eventually encourage them. Such encouragement is a highly motivating factor towards academic concentration, which eventually helps learners get good grades in school (Yılmaz & Orhan, 2010).

Negative Impacts of the Internet.

Despite the positive contributions that the Internet has brought to the educational sector in terms of improved student achievement, some studies have faulted technology for negative student outcomes in academics. For instance, according to Garcia et al. (2015), access to Internet can culminate into increased addiction to the different SMNs among students. The addictive behavior toward the use of SMNs is a risk factor to increased cases of procrastination among learners. The increased prone to procrastination and Internet addiction means that students will have relatively little time to focus on their academic work such as homework. When this happens, Rouis (2012) warns that the academic outcomes of learners will negatively be affected.

Moreover, Rouis (2012) acknowledges the vulnerability of students to access in-appropriate information with freedom of information access from the Internet. As per Rouis, at times it can be very difficult for parents and teachers to monitor the type of content that a child can access. For instance, the Internet promotes increased access to violent images as well as erotic materials, which may not be age-appropriate for learners. Besides these images, some of the inappropriate sites may also expose students to violent plays, games, and movies that promote anti-social behaviors among teens. For instance, watching action movies that require

parental guidance may promote aggression and violent behaviors among students (Voogt & Knezek, 2008).

It is also imperative to underscore the fact that some learners do not use online information for the intended purpose. An example scenario can be demonstrated from the preceding sections whereby a substantial number of learners use the Internet for video gaming and streaming. Although some of the above activities may have a positive impact on the student's creativity, they may also promote negative outcomes such as addiction (Voogt & Knezek, 2008). When children pay too much attention to video gaming, they have very little time left for studies, which eventually inhibits their overall school performance (Bedassa, 2014). The addictive nature of SMNs also makes it highly challenging for students to focus while in the classroom.

Short of addiction, different online platforms like YouTube, Facebook, Snapchat, and Instagram, among others, can be highly distractive (Bedassa, 2014). Due to the addictive nature of different SMNs, some students may not turn off the notifications in order to keep up to date on what is being posted. Nevertheless, in highly dynamic digital world, students may be bombarded with inbox messages often when online (Bedassa, 2014). This means that they will not fully concentrate on their academic works but rather focus on the virtual social interactions.

According to Rouis (2012), increased access to the Internet and the use of the different online platforms can culminate into increased stress levels among students. It should be noted that the minds of students are still in the growth phase and hence are not psychologically mature. With so much information being posted online, sometimes it may become too much too fast for students to absorb, process, and understand, eventually culminating into the build-up of depressive, loneliness, and social isolation feelings. Garcia et al. (2015) back up the above

findings by noting that improper use of different online platforms primarily the SMNs can contribute to increased stress levels among children, eventually inhibiting their sleeping patters. Similarly, stressed and depressed learners following an encounter with disturbing online images have disrupted and deprived sleeping behaviors. Apart from the disturbing images and depression, a study by Rouis (2012) determined that the lights emanating from the different electronic screens interfere with melatonin which is responsible for sleep. As such, the continued use of the devices is likely to gradually interfere with students' sleep-wake cycle in the long run. Lack of enough sleep has been associated with low school grades (Rouis, 2012).

The SAT as a Measure of Student Achievement

According to Wai, Brown, and Chabris (2018), there have been mixed findings regarding the utilization of standardized tests in assessing the academic achievements of students. For example, a study that was conducted by Hicks and Christmann (2019), which reviewed different empirical studies, determined that Scholastic Assessment Test (SAT) plays an essential role in assessing any relationship between a student's ability and their academic abilities. Further, according to Wiberg and Rolfsman (2019), different colleges strictly make use of the SAT and American College Test (ACT) as the two accredited standardized tests for student admissions rather than relying on the classroom grades. Most colleges suggest that ACT and SAT scores are more reliable since classroom grades can be skewed, which eventually means there will be no fair representation of learners. Additionally, SAT scores have been utilized in offering predictive abilities toward helping learners understand what to anticipate in college in regards academic performance (Wai et al., 2018).

However, Mathews (2003) noted that SAT scores do not have the ability to truly measure aptitude for the academic success of students. This is primarily because academic achievement

cannot be assessed using a single factor and standardized tests such as ACT and SAT are just but one component (Mathews, 2003). Hicks and Christmann (2019) support the above findings by underscoring the limitations of SAT scores in the sense that they do not give the student an opportunity to demonstrate his/her knowledge and competence with regard to advanced content as well as how smart they are as it is a one-time event. According to Wai, et al. (2018), the SAT scores fail to measure important student attributes such as critical thinking as well as creative skills. The above cited study further warns that SAT scores tend to reward superficial knowledge while discouraging analytical thinking. SAT scores have also been faulted due to the fact that they test only a relatively small sample of knowledge eventually hindering the opportunity to test the complete picture of student achievements.

Gaps in Research

Some of the previous studies, primarily the ones supporting the use of SAT scores in predicting college achievement, have argued that the utilization of these standardized tests can only be limited to some subjects (Kearns, 2011). As such, it follows that they cannot be used in the overall and broader assessment of all subjects undertaken by a particular student. For example, and according to the study undertaken by Hick and Christmann (2019), there is a lack of research studying the ways in which SAT scores predict college achievement in the examination of verbal and mathematics separately. Unfortunately, there have been limited studies that have been undertaken to empirically establish the above stated position. There is a need to conduct empirical studies in the future, each focusing on different subjects and the level of student achievement in each following predictions after undertaking a standardized tests, primarily ACT or SAT. This will help gain better understanding about the existing relationship between SAT scores and their influence on academic achievement for different subjects. This

can be essential in determining the specific subjects where standardized tests can be used.

With regard to academic achievement, it should be noted that diversities have also been established across different races and ethnicities. In other words, some studies have determined that race and ethnicity may have some influence on the level of student outcomes (Goza & Ryabov, 2009). It follows that other than Internet use, there is a relationship in other factors that will influence the level of academic achievements. As determined from the current research, a wide range of empirical studies have investigated the external factors such as teachers, neighborhood, and parents, which in combination with Internet use among students affect academic outcomes. However, little focus has been given to the essential factors that could be associated with aspects such as race and ethnicity in influencing academic achievements. It means that future studies that seek to investigate the correlation between Internet use and academic achievement must take into consideration all the personal, social, and environmental issues that influence academic achievement and especially when combined with Internet use patterns.

Considering the ever-changing dynamics in the tech sector, the findings obtained from the current research cannot be considered final. Recently, the level of Internet penetration has surged across different countries. In assessing Internet use among teens, some studies have failed to investigate the ever increasing number of homes that are connected to the Internet.

In assessing the relationship between standardized tests and academic achievements, most studies have ignored the frequent dynamics that may also influence SAT scores. As determined from the preceding section, one of the shortcomings associated with SAT scores is the fact that they are a one-time-event and may be highly subjective in the sense that they test a limited knowledge of the student, eventually ignoring and failing to give the wide and complete

picture of student abilities. With advancement in technology, it is also important to acknowledge that intellectual theft is considered rampant among students. Students have easier access to and better ways to manipulate information for their own good during exams. In other words, it should be noted that there is are several factors that may influence SAT scores, which further exacerbate their weakness towards providing the right picture in regards to what a student should anticipate in his/her college life.

Finally, it is important to underscore the fact that the current literature does not give a solid conclusion about the positive and negative implications of using SAT scores to predict student achievement. As evident from the current research, some researchers have supported the use of standardized tests to predict college scores for students. However, there are other researchers who argue that the SAT can be highly subjective and unreliable for predicting the academic achievements of students. Consequently, this means that further empirical studies are necessary in order to come up with more evidence-based conclusions as to whether SAT scores should be used or not used in measuring levels of student academic achievements.

Chapter Three

Research Design and Methodology

Introduction

In order to study the relationship between access and usage of the Internet and how those variables impact student achievement, a researcher-constructed survey (Appendix A) is used that utilizes the main components and structures of the Pew Research Center's topline questionnaire in their *Teens, Social Media & Technology Overview 2015* category (Lenhart, 2015). This survey was examined to determine the correct instrument to obtain the needed information in order to study the relationship between Internet usage and student achievement. The survey gathers information pertaining to Internet access types, computer ownership, cell phone/smartphone ownership, messaging habits, social media habits, and overall satisfaction from Internet use. The researcher added questions regarding demographics, Internet connection types, smartphone data information, and frequency of data overage.

Research Design and Approach

The purpose of this mixed methods research study is to analyze the relationship between access and usage of the Internet and the variables of gender, race, age, and SAT scores of students in their senior year at Blueville High School in Midwest Michigan. It was hypothesized that higher, unmonitored usage and access to the Internet at home will decrease the composite/component (overall score, math, and Evidence-based reading and writing) SAT scores and cumulative GPA's of students. The results of the study are published as a dissertation; however, the identities of participants are not revealed.

In this study of 12th grade students at Blueville High School, eight more specific questions have been analyzed. They are as follows:

1. Is there a relationship between usages of the Internet by gender?
2. Is there a difference or an interaction between gender and usage types of the Internet on composite/component SAT scores?
3. Is there a difference in composite/component SAT scores by socioeconomic status (free/reduced lunch status) and usage types of the Internet?
4. Are the proportions of male and female students' usage types of the Internet as expected?
5. Is Internet use for homework a predictor of composite/component SAT scores controlling for total hours of Internet use per week?
6. Is Internet use for social media a predictor of composite/component SAT scores controlling for total hours of Internet use per week?
7. Is Internet use for gaming a predictor of composite/component SAT scores controlling for total hours of Internet use per week?
8. Is Internet use for streaming a predictor of composite/component SAT scores controlling for total hours of Internet use per week?

The first four of these specific research questions are designed to give descriptive and frequency comparisons, while the remaining four research questions focus more on how the Internet is used (usage habits). These questions, when compared to composite/component SAT scores, show relationships between habits of Internet use and student achievement on a specific standardized assessment.

Additionally, there was a qualitative component of the study consisting of a post-survey interview with five randomly selected survey-takers (Appendix B). The researcher-developed questions are the following: (a) Tell me about your Internet usage habits. (b) Tell me how the

time you spend online (including social media, messaging, streaming, etc.) impacts your schoolwork. (c) Why do you think you spend the amount of time online that you do?

Participants

The proposed study took place at Blueville Public Schools, a rural district partially funded by Title V and Title VI federal dollars, located between Grand Rapids and Lansing, Michigan, where the researcher is employed. The district offers a traditional curriculum for grades K-12. In the 2018-2019 school year, Blueville Public Schools had a population of 3,237 students. Furthermore, 82.4% were White, 10.37% were Hispanic/Latino, 2.87% were two or more races, .87% were Asian, 3.2% were African American, and 0.29% were American Indian or Alaskan Indian. In addition, 60.28% were categorized as economically disadvantaged, while 39.72% were categorized as not economically disadvantaged, and 17.82% were categorized as students with disabilities.

Blueville High School consisted of approximately 855 students. The 2018-2019 twelfth grade class (targeted group of this study) consisted of 198 students, 38 of which were categorized as students with disabilities. In all, 51.2% were categorized as economically disadvantaged. Furthermore, 181 of the 198 students took the SAT in April of 2018.

All students are required to complete 22 credits during the course of their four years at Blueville High School. During their junior year, nearly all students at Blueville High School are required to take the SAT. The completed answer forms from the SAT tests are sent in to SAT to be scored. Weeks to months later, the results are returned to students and districts. Since 181 seniors at Blueville High School took the SAT the previous spring (even if they have transferred in from another district), the SAT is a good common measurement for student achievement for the purpose of this study. Students did not need to report their SAT scores on the survey as those

results were already collected by the researcher from Blueville Public Schools.

Data Collection and Instrumentation

Survey Tool.

Participants all took the survey using Google Forms, free of academic interruptions or controllable outside influences, in multiple computer labs throughout the building. A two-week window was established to ensure that all students who are under the age of 18 who return the parental consent form were able to complete the survey. Students who were at least 18 years old did not need to have a parental consent form. Individual composite/component SAT scores and free/reduced lunch statuses were aligned with student usernames in order to ensure accurate reporting of composite/component SAT scores and socioeconomic status. Additionally, cumulative GPAs were imported into the data set. This information was compiled by Blueville Public Schools and manually entered into the dataset, and aligned with student names. Usernames were removed after survey information was aligned in order to preserve anonymity upon reporting of results. Survey takers were given 20 minutes to complete the survey. Only after the removal of usernames was the researcher able to gain access to the survey results.

Internet access and usage was measured using yes/no response options and ranges of perceived time per week. If students did not have Internet access, the survey jumped to the opinion section to prevent inaccurate responses for frequency of Internet. Students were also asked how they access the Internet and were given the option to choose all that applied between no Internet access at all, to dial-up, broadband, and cell phone data. Usage habits of the Internet were measured by categories of usage types and range variables in order to gain a better understanding of usage.

No special training was required of either the survey administrators or students as Blueville High School uses Google Forms frequently to gather feedback in various categories throughout the school year. Google Forms controls for duplicate surveys by only allowing one submission per assigned email address. The survey was open for two weeks and the results were automatically compiled by Google Forms. Free/reduced lunch status and composite/component SAT scores was entered and aligned with student usernames. The results were then output to a Microsoft Excel file to then be imported into IBM® SPSS® Statistics for analysis.

A web-based, cross-sectional survey (some with multiple responses) using Google Forms was administered to students who are in their senior year at Blueville High School. The survey was a two-part survey; part one determined general access and access types to the Internet: dial-up, cell phone data, wired broadband, WI-FI, desktop computer, laptop, gaming console, or tablet. The second part determined usage types of the Internet: amount of time spent using various websites, social media platforms, gaming, streaming, etc., and for what purposes those usage habits follow (school related or non-school related). The first part of the survey simply asked for a yes or no response, while the second part of the survey was comprised of questions such as "How often do you use the Internet for English homework? Answers ranged from Almost Constantly to Never. The purpose of the survey is to examine the presence of the Internet and Internet usage habits and how those variables impact student achievement (composite/component SAT scores and GPA). Additionally, the variables of socioeconomic status (free/reduced lunch) were factored in but not included in the survey. The survey gathered the following information that is pertinent to this study:

1. User consent
2. Username

3. Age—16, 17, 18, or 19
4. Access to the Internet at home—yes or no
5. Access method—broadband, dial-up, cell phone data
6. Wi-Fi at home—yes or no
7. Device Access—smartphone, cell phone that is not a smartphone, desktop or laptop computer, gaming console, tablet/Slate
8. Frequency of device usage
9. Access methods
10. Frequency of internet usage
11. Gender
12. Internet usage habits (social media, messaging, gaming, etc.)
13. Internet usage habits (overall homework and by subject)
14. Multiple questions about opinions regarding the Internet and how it relates to school
15. Multiple questions regarding how using the Internet affects feelings of competency, autonomy, and relatedness.

While only 15 question subjects are mentioned above, several of the question subjects had multiple specific questions in their perspective categories. For example, Question Subject 12 inquires about usage habits. Individual questions regarding different types of social media usage will be asked (i.e., Facebook, Instagram, Snapchat).

The conceptualization for the survey is through the examination of previous research from The Pew Research Center's topline questionnaire in their *Teens, Social Media & Technology Overview 2015* category (Lenhart, 2015). Additionally, input was gained through a pilot study of groups of five students at three high schools in Blueville County,

MI, who would not be part of the study sample. The survey was distributed and collected using Google Forms. Since all students at Blueville High School have Google Gmail accounts, distribution of the survey and reliability of survey location was consistent and accurate.

The composite/component SAT score of students classified as seniors at Blueville High School is identified as the dependent variable, while the independent variables are the factors that may contribute to the composite/component SAT score itself: all variables previously listed.

In order to determine if there is a significant relationship between Internet use and student achievement (composite/component SAT scores), and between usage habits of the Internet and student achievement (composite/component SAT scores), the survey results were analyzed using descriptive statistics and structural equation modeling.

Data Analysis.

In order to better represent the data in a way that is more conducive to quantitative reporting, access types and hours of use for each variable were recoded. Frequency tables were generated with the data gathered for all quantitative variables to reflect the demographics of the population being studied. Descriptive statistics were generated for scaled variables used for the study to show means, standard deviations, and range. The following tests were performed using their corresponding null and alternate hypothesis.

Mann-Whitney U test. The Mann-Whitney U test is a nonparametric test, and is used to determine if an Independent t-test was used to determine whether two independent samples were selected from populations having the same distribution, and a statistical significance between genders, access levels, usage amounts, and student achievement (composite/component SAT

scores and GPA).

H0: There is no difference in Internet usage by gender

H1: There is a difference in Internet usage by gender

Two-way ANOVA. Two-way ANOVA tests were used to determine group differences and whether there was an interaction between genders and multiple variables regarding Internet access and usage habits on composite/component SAT scores:

AH0: $\mu A1 = \mu A2$

BH0: $\mu B1 = \mu B2 = \mu B3$

Ax B H0: The population differences among the levels of Factor A are the same at each level of Factor B (no interaction).

Ax B H1: The population difference among the levels of Factor A are not the same at each level of Factor B.

Chi square. Chi square tests were performed to test for independence:

Ho: The proportions are equal across groups (males and females). Ho: $P1=P2$

H1: The proportions are not equal across groups (males and females).

Ho: $P1 \neq P2$

Validity and Reliability.

The alpha coefficient for reliability on the Pew Research Center's Teens, Social Media & Technology Survey is .70 (Lenhart, 2015), which is generally considered acceptable (Kline, 2000, p. 13). Additionally, the Pew Research Center is considered an industry leader in Internet use research and reporting. Because the proposed study's research instrument was based on the Pew Research Center's Teens, Social Media & Technology Survey, validity and reliability have already been established.

Legal, Ethical, and Moral Issues

Empirical research requires the acknowledgement of certain legal, moral, and ethical issues. In order to ensure an appropriate, professional level of all three categories, the survey instrument and procedures were submitted to Eastern Michigan University's IRB and their approval will be kept on file and included in Appendix C of this dissertation. No surveys were distributed until the IRB approved the study.

In compliance with the Board of Education policy of Blueville Public Schools, a parental consent form must have been completed by the parent or guardian of all survey or focus group participants under the age of 18. These parental consent forms were distributed to all potential survey takers or focus group participants two weeks prior to the assigned survey window (see Appendices D and E). The consent forms outlined the purpose of the study, reaffirmed that no identifying information is be published, and indicated that participation in the survey and focus group was completely voluntary. Finally, the consent forms informed participants that they could have discontinued the survey or focus group participation at any time. These form indicated the BPS Board of Education does not require students over the age of 18 to obtain parental consent to participate in surveys or research projects.

All survey takers and focus groups participants completed the required assent form, which outlined the purpose of the study, procedures, collection of data, risks, benefits, confidentiality, and voluntary participation information (see Appendix F).

The Blueville Public Schools Board of Education and Eastern Michigan University require the researcher to gain permission to conduct the study. This letter indicating full permissions from the BPS superintendent is included in Appendix G.

All data, consent forms, survey instrument paper copies, and any files and forms

associated with this study are kept in a secure location. All digital information is kept in a password protect folder behind district security. Additionally, on May 10, 2014, the researcher completed the Collaborative Institutional Training Initiative (CITI) certification process.

Chapter Four

Research Findings and Results

Overview of the Study—Quantitative

This section of this chapter presents the quantitative results of this study on the relationship between access and usage types of the Internet and student achievement (composite/component SAT scores, and cumulative GPA from 9th to 11th grades). Responses on a survey that focused on access, speed of connectivity, usage types, usage frequency, and overall satisfaction were compared from the sample of 12th grade students at Blueville High School. The purpose of the study was to determine whether there was a significant relationship between Internet use and student achievement of Blueville High School seniors in Blueville, MI. Another question the study attempts to answer is whether the relationship between free/reduced lunch status and access to the Internet impacts student achievement. Eight individual questions were answered, but the two main research questions and null hypotheses are as follows:

R1: Is there a significant relationship between Internet use and composite/component SAT scores and cumulative GPA from 9th to 11th grades of seniors at Blueville High School?

Null Hypothesis: There will be no significant relationship between Internet use and composite/component SAT scores and cumulative GPA from 9th to 11th grades of seniors at Blueville High School.

R2: Is there a significant relationship between types of use of the Internet and composite/component SAT scores and cumulative GPA from 9th to 11th grades of seniors at Blueville High School?

Null Hypothesis: There will be no significant relationship between types of use of the Internet and composite/component SAT scores and cumulative

GPA from 9th to 11th grades of seniors at Blueville High School.

The results begin with descriptive statistics of students who completed the survey. Next, the results from the researcher constructed survey tool are presented organized by research question. This survey uses the main elements of The Pew Research Center's topline questionnaire in their *Teens, Social Media & Technology Overview 2015* category (Lenhart, 2015).

Descriptive Survey Results

A survey consisting of two parts was used to gather responses from participating seniors at Blueville High School who had taken the SAT the prior spring. As seen in the following descriptive statistics, 17-19 year olds were surveyed, and the average respondent age was 17.9. The average GPA among respondents was 3.09. Lunch status was used as a proxy for socioeconomic status, and in this sample, 55.4% of students paid for lunch in full, 40.2% received free lunch, and 4.3% paid a reduced rate for lunch. There were more males than females in the sample, 61% compared to 39%. See Tables 1-3.

Table 1

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	92	17	19	17.9	.33
Cumulative GPA	92	1.6	4.0	3.1	.63
Valid N (listwise)	92				

Table 2

Lunch Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Free	37	40.2	40.2	40.2
	Full Pay	51	55.4	55.4	95.7
	Reduced	4	4.3	4.3	100.0
	Total	92	100.0	100.0	

Table 3

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	56	60.9	60.9	60.9
	Female	36	39.1	39.1	100.0
	Total	92	100.0	100.0	

Over 90% of respondents indicated they have access to the Internet at home (see Table 4), and only one respondent did not have access to a smartphone (see Table 5). It makes logical sense that with the vast majority having access to a smartphone, only 15% indicated they have access to a phone that is not a smartphone (see Table 6). Nearly 9/10 respondents stated they had access to a desktop or laptop computer (see Table 7), and to a gaming console (see Table 8), while 2/3 reported access to a Tablet/iPad/Kindle/Slate (see Table 9). Despite the variety of devices available to them, 75% of respondents stated that their smartphone was the device they used most often (see Table 10). In terms of home Internet connection, broadband access was a recurring theme (see Figure 2). For those with one means of Internet access, Broadband was most common, followed by cell phone data. Broadband and cellphone data were the most common combination among those with multiple means of connectivity. A combination of

broadband and satellite is the least frequent combined means of accessing the Internet for students in this study.

Table 4

Do You Have the Internet at Home?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	8	8.7	8.7	8.7
	Yes	84	91.3	91.3	100.0
Total		92	100.0	100.0	

Table 5

Do You Have Access to a Smartphone?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1	1.1	1.1	1.1
	Yes	91	98.9	98.9	100.0
Total		92	100.0	100.0	

Table 6

Do You Have Access to a Cell Phone That Is Not a Smartphone?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	78	84.8	84.8	84.8
	Yes	14	15.2	15.2	100.0
Total		92	100.0	100.0	

Table 7

Do You Have Access to a Desktop of a Laptop Computer?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	10	10.9	10.9	10.9
	Yes	82	89.1	89.1	100.0
Total		92	100.0	100.0	

Table 8

Do You Have Access to a Gaming Console?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	12	13.0	13.0	13.0
	Yes	80	87.0	87.0	100.0
Total		92	100.0	100.0	

Table 9

Do You Have Access to a Tablet/iPad/Kindle/Slate?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	31	33.7	33.7	33.7
	Yes	61	66.3	66.3	100.0
Total		92	100.0	100.0	

Table 10

Which Device Do You Use Most often?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	A desktop or laptop computer	9	9.8	9.8	9.8
	A gaming console	13	14.1	14.1	23.9
	Smartphone	69	75.0	75.0	98.9
	Tablet/iPad/Kindle/Slate	1	1.1	1.1	100.0
	Total	92	100.0	100.0	

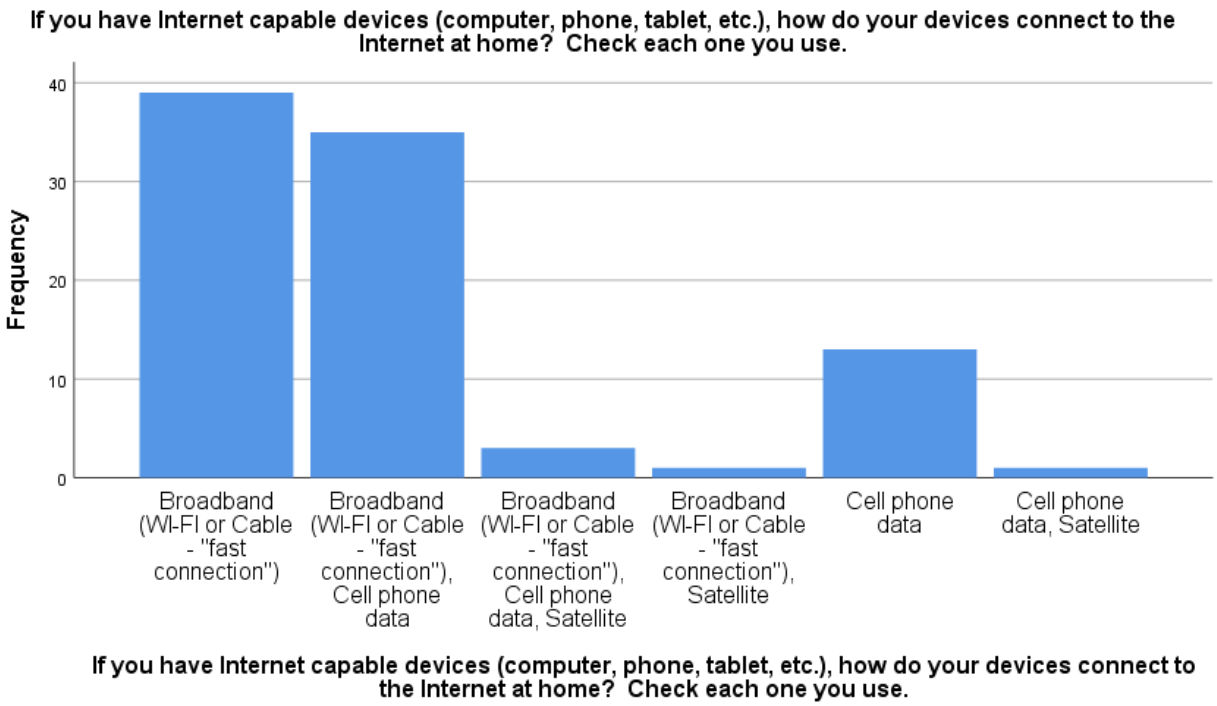

Figure 2. Device used to connect to the internet at home.

In addition to collecting information about students' access to the Internet, the survey tool also collected information about types and frequency of Internet use. As seen on the next page, over 90% of students report using the Internet, either on a cell phone or a computer, several times a day or almost constantly (see Table 11). Similarly, nearly 84% report using social media several times a day or almost constantly (see Table 12). When it comes to social media usage, this sample of Blueville High School seniors overwhelmingly favor YouTube (95.7%, see Table 13) and Snapchat (90.2%, see Table 14), followed by Facebook (81.5%, see Table 15) and Instagram (see 80.4%, Table 16). Less frequently used social media sites included Twitter (44.6%, see Table 17), Reddit (17.4%, see Table 18), and Tumblr (5.4%, see Table 19). Furthermore, 35.9% of students reported using a social media site that was not listed (see Table 20).

Table 11

How Often Do You Use the Internet, Either on a Computer or a Cellphone?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	About Once a Day	4	4.3	4.3	4.3
	Almost Constantly	51	55.4	55.4	59.8
	Less Often	1	1.1	1.1	60.9
	Several Times a Day	36	39.1	39.1	100.0
	Total	92	100.0	100.0	

Note: This would include activities like scrolling through social media, streaming music, or watching a movie, but this would not include texting.

Table 12

How Often Do You use Social Media (Facebook, Twitter, Snapchat, Tumblr, Instagram, etc.)?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	About Once a Day	9	9.8	9.8	9.8
	Almost Constantly	31	33.7	33.7	43.5
	Less Often	6	6.5	6.5	50.0
	Several Times a Day	46	50.0	50.0	100.0
	Total	92	100.0	100.0	

Table 13

Do You Ever Use YouTube?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	4	4.3	4.3	4.3
	Yes	88	95.7	95.7	100.0
	Total	92	100.0	100.0	

Table 14

Do You Ever Use Snapchat?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	9	9.8	9.8	9.8
	Yes	83	90.2	90.2	100.0
	Total	92	100.0	100.0	

Table 15

Do You Ever Use Facebook?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	17	18.5	18.5	18.5
	Yes	75	81.5	81.5	100.0
	Total	92	100.0	100.0	

Table 16

Do You Ever Use Instagram?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	18	19.6	19.6	19.6
	Yes	74	80.4	80.4	100.0
	Total	92	100.0	100.0	

Table 17

Do You Ever Use Twitter?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	51	55.4	55.4	55.4
	Yes	41	44.6	44.6	100.0
	Total	92	100.0	100.0	

Table 18

Do You Ever Use Reddit?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	76	82.6	82.6	82.6
	Yes	16	17.4	17.4	100.0
	Total	92	100.0	100.0	

Table 19

Do You Ever Use Tumblr?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	87	94.6	94.6	94.6
	Yes	5	5.4	5.4	100.0
	Total	92	100.0	100.0	

Table 20

Do You Ever Use a Social Media Site Not Listed?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	59	64.1	64.1	64.1
	Yes	33	35.9	35.9	100.0
	Total	92	100.0	100.0	

Students were asked their opinions about the Internet using the 16 questions (see Table 21). Responses were selected from a 5-point scale, with 1 being strongly disagree and 5 strongly agree. The questions with the highest mean ratings, over 4.5, addressed students' opinion that having the Internet makes it easier to complete schoolwork, and that they are capable of using the Internet themselves. Two other questions also had mean scores above 4 and were similar to the two highest scoring questions, again addressing helpfulness of the Internet as it relates to schoolwork, and skill at using the Internet. Mean scores only dipped below 3 on two items, Item

32: *Using the Internet to complete schoolwork distracts me (or would distract me) from getting my work done more than using a textbook,* and Item 36: *Many of my classmates know more about the Internet than I do.*

Table 21

Descriptive Statistics

	N	Mean	Std. Dev
Item 30: I think having the Internet makes schoolwork easier to complete.	92	4.53	.64
Item 31: I would prefer to use the Internet instead of a textbook to complete schoolwork.	92	3.57	1.37
Item 32: Using the Internet to complete schoolwork distracts me (or would distract me) from getting my work done more than using a textbook.	92	2.45	1.06
Item 33: Using the Internet for schoolwork makes school more interesting and fun.	92	3.65	.99
Item 34: Using the Internet helps (or would help) me understand my classes better.	92	3.78	1.01
Item 35: I learn more things (or would learn more things) using the Internet for schoolwork than I would using a textbook.	92	3.43	1.10
Item 36: Many of my classmates know more about the Internet than I do.	92	2.84	1.14
Item 37: I try to learn more about using the Internet whenever I can.	92	3.00	1.03
Item 38: Having access to the Internet is helpful in regards to schoolwork.	92	4.33	.83
Item 39: I think using the Internet helps (or would help) my GPA.	92	3.59	1.06
Item 40: I think using the Internet helped (or would have helped) my SAT score.	92	3.79	1.13
Item 41: Using the Internet makes me feel good.	92	3.72	1.04
Item 42: I feel like I am capable of using the Internet without anyone else's help.	92	4.57	.70
Item 43: I feel like I am good at using the Internet.	92	4.37	.78
Item 44: I feel like I can relate with the content I search or view on the Internet.	92	3.89	.90
Item 45: When I use the Internet, I feel like I am "in the zone"	92	3.43	1.06
Valid N (listwise)	92		

Research Question Results

This section will explore relationships between the variables of interest in this study. The primary dependent variables for analysis are types and frequency of internet usage, and composite and component SAT scores. Gender, free/reduced lunch status, frequency of use, and type of use of the internet are the key independent variables that were evaluated for statistical significance. Mann-Whitney U, ANOVA, and chi-squared tests were performed to find out whether there are significant differences or interactions between the aforementioned dependent and independent variables.

Is There a Difference Between Usages of the Internet by gender?

Nine usage factors were evaluated using a Mann-Whitney U test to determine whether there were any significant differences in types of use of the Internet by gender. Only two of the nine usage factors, gaming and video/movie streaming, had a significant difference based on gender. Males were significantly more likely to use the Internet to play video games ($p = .000$, see Tables 22 and 23). Males were also significantly more likely ($p < .01$) to use the Internet to watch videos/movies (see Tables 24 and 25).

Table 22

Mann-Whitney Test Gaming Ranks

	Gender	N	Mean Rank	Sum of Ranks
How often do you play video games (Fortnite, Call of Duty, etc.) on a computer, game console, or cellphone?	Male	56	60.25	3374.00
	Female	36	25.11	904.00
	Total	92		

Table 23

Mann-Whitney Gaming Test Statistics[a]

	How often do you play video games on a computer, game console, or cellphone?
Mann-Whitney U	238.00
Wilcoxon W	904.00
Z	-6.29
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: Gender

Table 24

Mann-Whitney Test Video Ranks

	Gender	N	Mean Rank	Sum of Ranks
How often do you watch videos/movies (YouTube, Amazon Movies, Netflix, etc.) on the Internet including on a computer, game console, or cellphone?	Male	56	52.09	2917.00
	Female	36	37.81	1361.00
	Total	92		

Table 25

Mann-Whitney U Test Statistics[a]

	How often do you watch videos/movies on the Internet including on a computer, game console, or cellphone?
Mann-Whitney U	695.00
Wilcoxon W	1361.00
Z	-2.64
Asymp. Sig. (2-tailed)	.008

a. Grouping Variable: Gender

Is There a Difference or an Interaction Between Gender and Frequency of Usage Types of the Internet on Composite and Component SAT Scores?

Nine two-way ANOVAs were performed. Gender (two-level nominal) and Internet Usage type (six-level ordinal) were the independent variables, and total SAT score (composite), Evidence-Based Reading and Writing (EBRW component), and math (component) SAT scores were the dependent variables. The Internet usage types included (a) use for English homework, (b) use for math homework, (c) use for social studies homework, (d) use for science homework, (e) use for emailing and messaging, (f) use for gaming, (g) use for streaming movies and videos, (h) use for streaming music, and (i) use for social media.

There were no significant effects found for gender and use of the Internet for math homework, social studies homework, email/messaging, gaming, streaming videos, or streaming music. There were two main effects and no interaction for gender and use of the Internet for English homework (see Table 26a for cell counts). There was a main effect for gender with males (M = 531.61) scoring significantly higher than females (M = 488.33) on the math portion of the SAT (F = 6.63, $p < .05$; see Table 26b). In addition, there was a main effect for frequency of using the Internet for English homework and the EBRW component of the SAT (F = 2.36, $p < .05$; see Table 26b). Post hoc analysis (Tukey) found students who reported using the Internet a few times a week for English homework (M = 570.87) scored significantly higher than those who report using the Internet for English homework once a week (M = 498.50, $p < .01$) or never using the Internet for English homework (M = 490.00, $p < .01$).

Table 26a

Between-Subject Factors for Gender and Use of Internet for English Homework

		Value Label	N
Which gender do you consider yourself?	1	Female	36
	2	Male	56
How often do you use the Internet for English, including time spent on the Internet using your cell phone?	1	Almost constantly	9
	2	Several Times a Day	8
	3	About Once a Day	14
	4	A few times a week	23
	5	Once a week	20
	6	Never	18

Table 26b

Between Subject Effects for Gender, Use of Internet for English Homework and Interactions

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Total SAT	477891.72[a]	11	43444.70	1.416	.182
	EBRW	123039.84[b]	11	11185.44	1.415	.182
	Math	149336.66[c]	11	13576.06	1.491	.151
Intercept	Total SAT	75034434.20	1	75034434.20	2446.471	.000
	EBRW	19450903.09	1	19450903.09	2460.860	.000
	Math	18078858.30	1	18078858.30	1985.178	.000
Gender	Total SAT	118557.27	1	118557.27	3.866	.053
	EBRW	9730.90	1	9730.90	1.231	.271
	Math	60356.77	1	60356.77	6.628	.012
English HW	Total SAT	306172.72	5	61234.54	1.997	.088
	EBRW	93257.29	5	18651.46	2.360	.047
	Math	65862.03	5	13172.41	1.446	.217
Gender *English HW	Total SAT	136731.02	5	27346.20	.892	.491
	EBRW	25107.17	5	5021.43	.635	.673
	Math	53664.79	5	10732.96	1.179	.327
Error	Total SAT	2453638.71	80	30670.48		
	EBRW	632328.64	80	7904.11		
	Math	728553.56	80	9106.92		
Total	Total SAT	102605200.00	92			
	EBRW	26228500.00	92			
	Math	25247700.00	92			
Corrected Total	Total SAT	2931530.44	91			
	EBRW	755368.48	91			
	Math	877890.22	91			

There were two main effects and a significant interaction for gender and use of the Internet for science homework (see Table 26c for cell counts). Males scored significantly higher (M = 531.61) than females (M = 488.33) on the math component portion of the SAT (F = 4.24,

$p < .05$; see Table 26d). Of students using the Internet for science homework, those who reported using the Internet a few times per day had the highest score ($M = 550.00$) and students using the Internet the most frequently had the lowest score ($M = 392.50$). Mean scores for this main effect follow a bell curve with moderate Internet usage having the highest math score on the SAT while more extreme high and low Internet usage results in lower math scores on the SAT ($F = 3.083$, $p < .05$). Post hoc analysis (Tukey) revealed that students using the Internet for science homework a few times per day ($M = 550.00$) or using the Internet once per week ($M = 543.53$) scored significantly higher on the math component of the SAT than students who report using the Internet almost constantly/several times per day for science homework ($M = 392.50$, $p < .05$ for both).

The interaction term was significant on total SAT score ($F = 3.219$, $p < .05$) and EBRW ($F = 3.696$, $p < .01$). For females ($M = 921.67$), using the Internet a few times per day results in a low total SAT score while males ($M = 1214.00$) score highest on the SAT at this Internet usage level. This effect is reversed at the once per week usage level with females having the highest score ($M = 1160.00$) while males have a lower score at this usage level ($M = 1056.67$, see Figure 3). Internet usage levels at once a week in science homework results in higher EBRW scores for females ($M = 606.00$), but low EBRW scores for males ($M = 517.50$). Almost constantly or several times a day of Internet usage for science homework results in the opposite pattern, with lower EBRW scores for females ($M = 405.00$) than males ($M = 525.00$). The same holds true for Internet usage a few times a day with lower scores for females ($M = 471.67$) compared to males ($M = 604.00$; see Figure 4).

Table 26c

Between Subjects Factors for Gender and Use of Internet for Science Homework

		Value Label	N
Which gender do you consider yourself?	1	Female	36
	2	Male	56
How often do you use the Internet for Science Homework	2	Almost constantly or several times a day	4
	3	About once a day	7
	4	A few times a day	16
	5	Once a week	17
	6	Never	48

Table 26d

Between Subjects Effects for Gender, and Use of Internet for Science Homework and Interactions

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Total Score	694158.53[a]	9	77128.73	2.827	.006
	EBRW	152495.12[b]	9	16943.90	2.305	.023
	Math	221621.78[c]	9	24624.64	3.077	.003
Intercept	Total Score	42919250.31	1	42919250.31	1572.997	.000
	EBRW	11346985.80	1	11346985.80	1543.364	.000
	Math	10129896.26	1	10129896.26	1265.719	.000
Gender	Total Score	89729.63	1	89729.63	3.289	.073
	EBRW	13328.20	1	13328.20	1.813	.182
	Math	33893.26	1	33893.26	4.235	.043
Internet Use for Science HW	Total Score	269872.12	4	67468.03	2.473	.051
	EBRW	44496.53	4	11124.13	1.513	.206
	Math	98697.95	4	24674.49	3.083	.020
Gender* Internet Use for Science HW	Total Score	351273.41	4	87818.35	3.219	.017
	EBRW	108706.60	4	27176.65	3.696	.008
	Math	73191.35	4	18297.84	2.286	.067
Error	Total Score	2237371.91	82	27285.02		
	EBRW	602873.36	82	7352.11		
	Math	656268.44	82	8003.27		
Total	Total Score	102605200.00	92			
	EBRW	26228500.00	92			
	Math	25247700.00	92			
Corrected Total	Total Score	2931530.44	91			
	EBRW	755368.48	91			
	Math	877890.21	91			

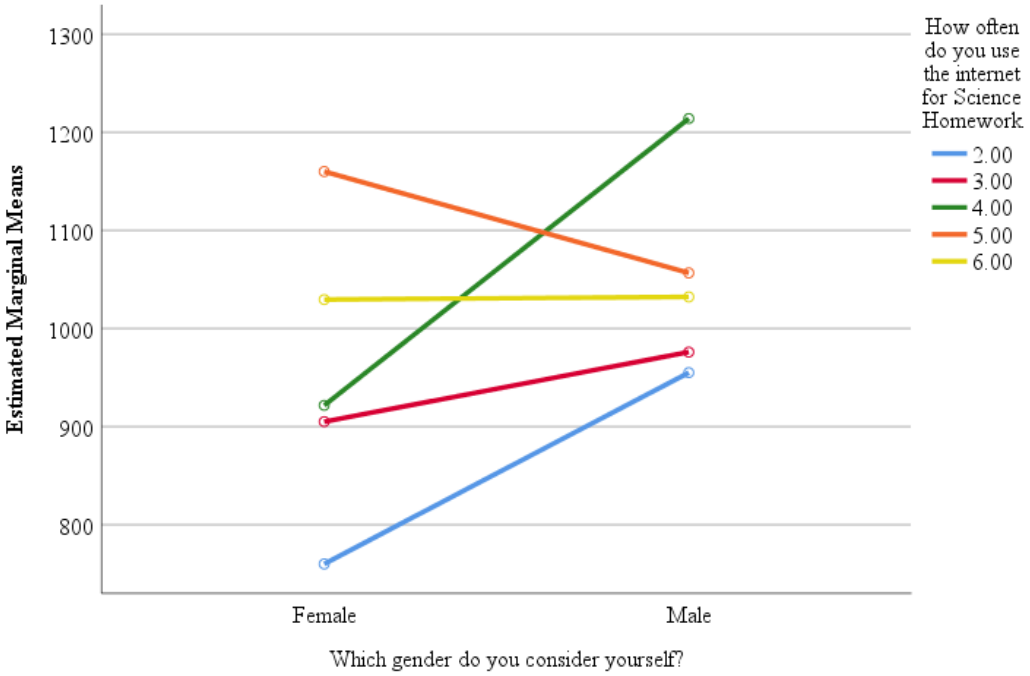

Figure 3. Estimated marginal means of total score (400-1600).

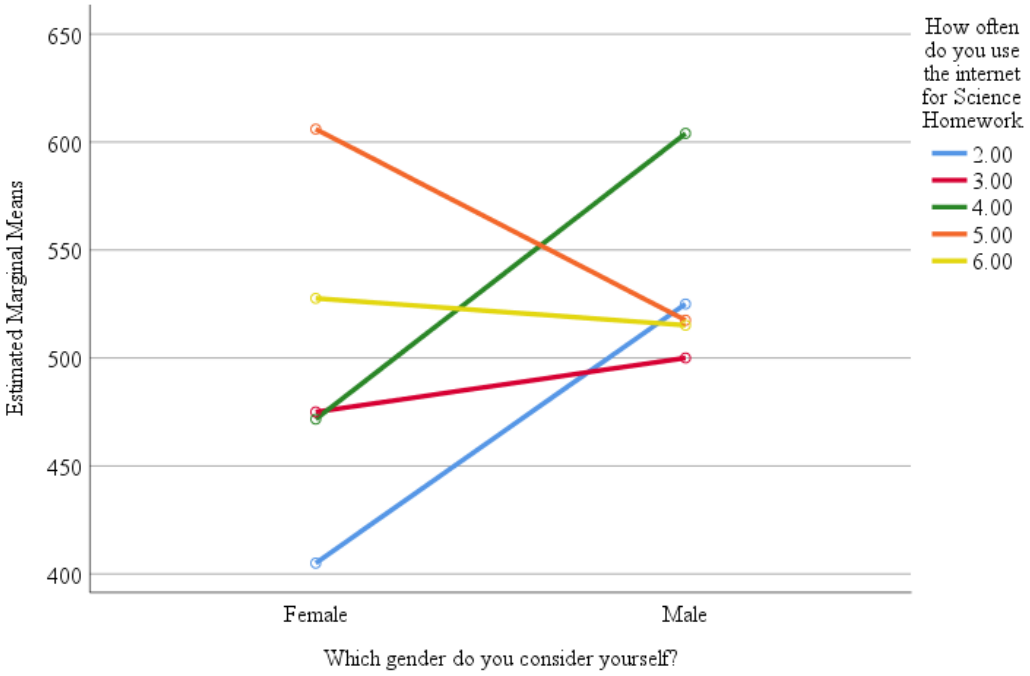

Figure 4. Estimated marginal means of evidence-based reading and writing.

There was one main effect and significant interactions for gender and use of the Internet for social media (see Table 26e for cell counts). Males scored significantly higher (M = 530.54) than females (M = 519.44) on the EBRW component portion of the SAT (F = 4.714, p < .05). There was a significant interaction between gender and Internet usage for social media on all three SAT measures (EBRW: F = 3.747, p < *.05;* Math: F = 4.308, p < .01; Total Score: F = 4.480, p < .01; see Table 26f).

Examination of mean plots revealed that on total SAT scores, Internet usage for social media at several times per week but less than once a day is associated with higher SAT scores for females (M = 1410.00) than males (M = 912.00), while a usage level of social media at almost constantly is associated with lower SAT scores for females (M = 948.57) than males (M = 1092.35, see Figure 5). While overall scores are different, the trends are the same for males and females on EBRW and math components of the SAT. Mean plot examination found that on the EBRW component, Internet usage for social media at several times per week but less than once a day is associated with higher SAT scores for females (M = 720.00) than males (M = 460.00), while a usage level of social media at almost constantly is associated with lower SAT scores for females (M = 498.57) than males (M = 542.94, see Figure 6). Mean plots for math scores showed Internet usage for social media at several times per week but less than once a day is associated with higher SAT scores for females (M = 690.00) than males (M = 452.00), while a usage level of social media at almost constantly is associated with lower SAT scores for females (M = 450.00) than males (M = 549.41, see Figure 7).

Table 26e

Between Subjects Factors for Gender and Use of Internet for Social Media

		Value Label	N
Which gender do you consider yourself?	1	Female	36
	2	Male	56
How often do you use Social Media?	1	Almost constantly	31
	2	Several Times a Day	46
	3	About Once a Day	9
	4	Several times a week but less than once a day	6

Table 26f

Between Subjects Effects for Gender, and Use of Internet for Social Media and Interactions

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Total Score	525975.24[a]	7	75139.32	2.624	.017
	EBRW	103937.57[b]	7	14848.22	1.915	.077
	Math	174490.14[c]	7	24927.16	2.977	.008
Intercept	Total Score	29481551.53	1	29481551.53	1029.471	.000
	EBRW	7580523.33	1	7580523.33	977.485	.000
	Math	7163206.04	1	7163206.04	855.430	.000
Gender	Total Score	96838.03	1	96838.03	3.382	.069
	EBRW	36555.67	1	36555.67	4.714	.033
	Math	14398.26	1	14398.26	1.719	.193
Social Media	Total Score	76483.64	3	25494.55	.890	.450
	EBRW	16526.88	3	5508.96	.710	.548
	Math	23011.97	3	7670.66	.916	.437
Gender * Social Media	Total Score	384883.12	3	128294.37	4.480	.006
	EBRW	87179.19	3	29059.73	3.747	.014
	Math	108218.55	3	36072.85	4.308	.007
Error	Total Score	2405555.19	84	28637.56		
	EBRW	651430.91	84	7755.13		
	Math	703400.08	84	8373.81		
Total	Total Score	102605200.00	92			
	EBRW	26228500.00	92			
	Math	25247700.00	92			
Corrected Total	Total Score	2931530.44	91			
	EBRW	755368.48	91			
	Math	877890.21	91			

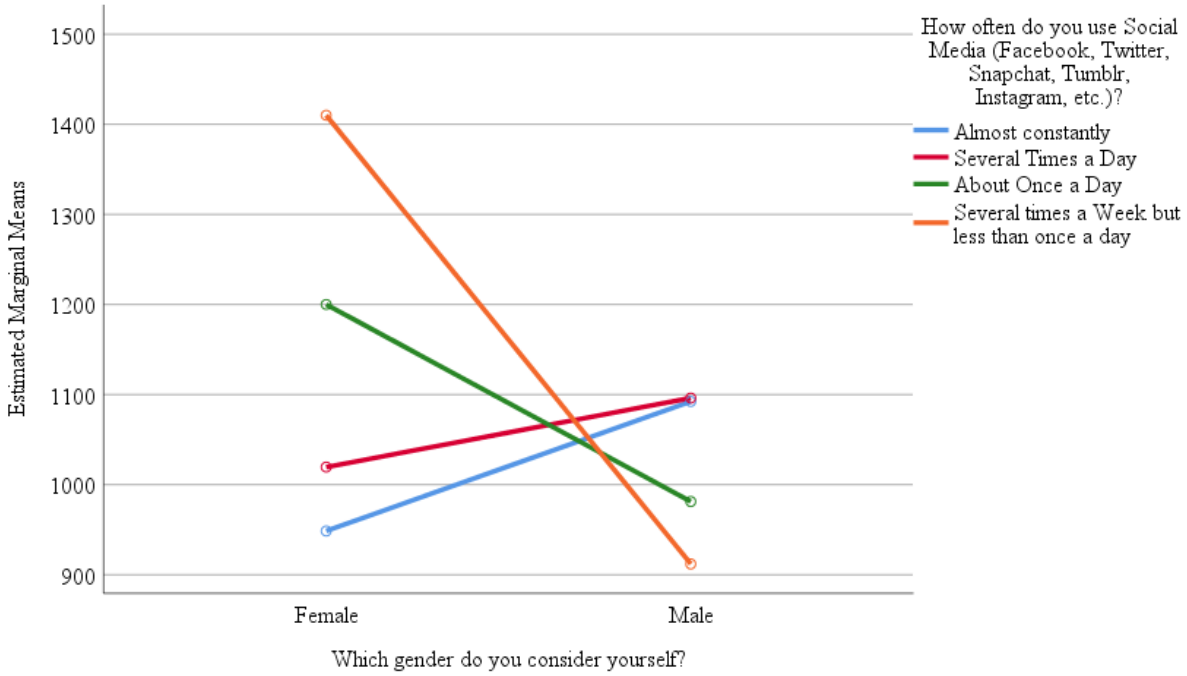

Figure 5. Estimated marginal means of total score.

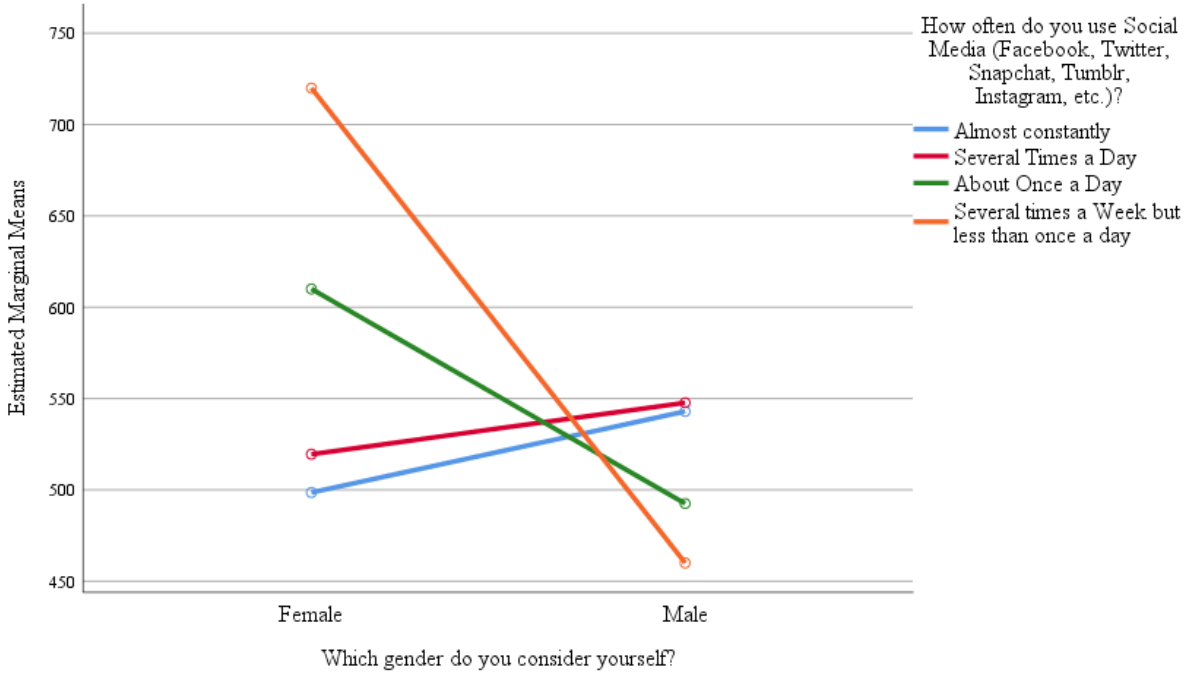

Figure 6. Estimated marginal means of evidence-based reading and writing.

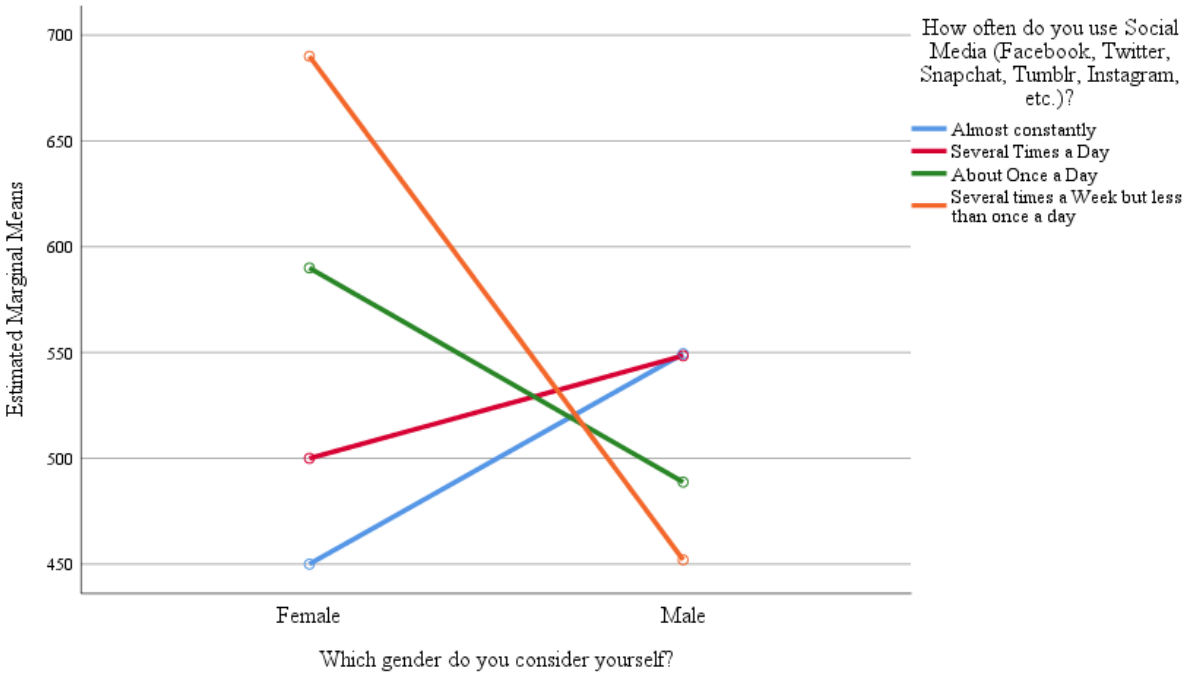

Figure 7. Estimated marginal means of math component score.

Is There a Difference in Composite/Component SAT Scores by Socioeconomic Status (Free/Reduced Lunch Status) and Usage Types of the Internet?

Nine two-way ANOVAs were performed. Lunch status (originally three levels, but collapsed into free/reduced and full pay due to small cell sizes) and Internet usage type/frequency (six-level ordinal) were the independent variables, and total SAT score (composite), Evidence-based Reading and Writing (EBRW), and Math (component) SAT scores were the dependent variables. The Internet usage types included (a) use for English homework, (b) use for math homework, (c) use for social studies homework, (d) use for science homework, (e) use for emailing and messaging, (f) use for gaming, (g) use for streaming movies and videos, (h) use for streaming music, and (i) use for social media.

There were no significant effects found for lunch status and use of the Internet for English homework, math homework, social studies homework, email/messaging, streaming videos, streaming music, or for social media (see Table 27a for cell counts). For science homework, there were very few who report using the internet almost constantly (n = 1) and several times a day (n = 3). Categories were collapsed for analysis. There was a main effect for frequency of using the internet for science homework on the total SAT score (F = 2.53, p < .05) and the math component of the SAT (F = 3.23, p < .05, see Table 27b.). Post hoc analysis (Tukey) revealed no significant subgroup results for the overall SAT scores and significant subgroup differences on the SAT Math component. Students who reported using the internet for science almost constantly or several times a day (M = 392.50) score significantly lower on the math component of the SAT than students who use the internet a few times a day (M = 566.25, p < .05) or once a week (M = 560.91, p < .05) for science homework.

Table 27a

Between-Subjects Factors for Lunch Status and Use of the Internet

		Value Label	N
Lunch Status Collapsed with 1 being free or reduced; 2 being full price	1.00	Free/Reduced	41
	2.00	Full	51
How often do you use the internet for Science Homework	2.00	Almost constantly or several times a day	4
	3.00	About once a day	7
	4.00	A few times a day	16
	5.00	Once a week	17
	6.00	Never	48

Table 27b

Tests of Between-Subjects Effects for Lunch Status and Use of the Internet

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Total Score	420358.54[a]	8	52544.82	1.737	.102
	EBRW	78762.29[b]	8	9845.29	1.208	.305
	Math	143203.02[c]	8	17900.38	2.022	.054
Intercept	Total Score	53067441.36	1	53067441.36	1754.001	.000
	EBRW	13815269.36	1	13815269.36	1694.734	.000
	Math	12729557.66	1	12729557.66	1438.099	.000
Lunch Combined	Total Score	19322.05	1	19322.05	.639	.426
	EBRW	4858.73	1	4858.73	.596	.442
	Math	4802.38	1	4802.38	.543	.463
Science Homework	Total Score	305546.96	4	76386.74	2.525	.047
	EBRW	45662.05	4	11415.51	1.400	.241
	Math	116589.61	4	29147.40	3.293	.015
Lunch Combined * Science Homework	Total Score	45927.71	3	15309.24	.506	.679
	EBRW	14506.69	3	4835.56	.593	.621
	Math	9996.36	3	3332.12	.376	.770
Error	Total Score	2511171.90	83	30255.08		
	EBRW	676606.19	83	8151.88		
	Math	734687.20	83	8851.65		
Total	Total Score	102605200.0	92			
	EBRW	26228500.00	92			
	Math	25247700.00	92			
Corrected Total	Total Score	2931530.44	91			
	EBRW	755368.48	91			
	Math	877890.22	91			

a. R Squared = .143 (Adjusted R Squared = .061)

b. R Squared = .104 (Adjusted R Squared = .018)

There was also a significant main effect for lunch status and use of internet for gaming with total SAT score (F=4.02, p=<.05, see Table 27d) and EBRW component of SAT (F=4.63,

$p<0.05$, see Table 27d.). Students who paid full price for lunch had higher overall SAT scores (M =1062.94) than students who received free/reduced priced lunch (M =1013.41). Similarly, EBRW scores were also significantly higher for students who paid full price (M = 538.43) than students who received free/reduced lunch (M = 510.98). See Table 27c for cell counts.

Table 27c

Between-Subjects Factors for Lunch Status and Use of the Internet

		Value Label	N
Lunch Status Collapsed with 1 being free or reduced; 3 being full price	1	Free	41
	3	Full	51
How often do you play video on a computer, game console, or cellphone?	0	Never	22
	1	Almost constantly	16
	2	Several Times a Day	16
	3	About Once a Week	8
	4	A few times a week	20
	5	Once a week	10

Table 27d

Tests of Between-Subjects Effects for Lunch Status and Use of the Internet

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Total Score	461575.91[a]	11	41961.45	1.359	.209
	EBRW	115780.62[b]	11	10525.51	1.317	.231
	Math	150921.88[c]	11	13720.17	1.510	.144
Intercept	Total Score	81896377.61	1	81896377.61	2652.563	.000
	EBRW	20772703.69	1	20772703.70	2598.261	.000
	Math	20177646.95	1	20177646.95	2220.471	.000
Lunch Combined	Total Score	124203.93	1	124203.93	4.023	.048
	EBRW	37040.88	1	37040.88	4.633	.034
	Math	25589.02	1	25589.02	2.816	.097
Internet Use for Gaming	Total Score	78404.00	5	15680.80	.508	.769
	EBRW	9838.30	5	1967.66	.246	.941
	Math	58687.82	5	11737.56	1.292	.276
Lunch Combined * Gaming	Total Score	330969.82	5	66193.96	2.144	.069
	EBRW	91654.09	5	18330.82	2.293	.053
	Math	78251.63	5	15650.33	1.722	.139
Error	Total Score	2469954.52	80	30874.43		
	EBRW	639587.86	80	7994.85		
	Math	726968.33	80	9087.10		
Total	Total Score	102605200.00	92			
	EBRW	26228500.00	92			
	Math	25247700.00	92			
Corrected Total	Total Score	2931530.44	91			
	EBRW	755368.48	91			
	Math	877890.22	91			

a. R Squared = .157 (Adjusted R Squared = .042)

b. R Squared = .153 (Adjusted R Squared = .037)

Are the Proportions of Male and Female Students' Usage Types of the Internet as Expected?

Cross-tabs/chi-squared tests were used to examine the proportions of gender (two-level nominal) and usage (two-level nominal, nine individual factors). Gender and Internet usage were not independent. Males were more likely to use the Internet for gaming and social studies work ($\chi^2_1 = 39.72$, $p < .001$; see Tables 28 and 29), while females were more likely to use the Internet for English work ($\chi^2_1 = 5.48$, $p < .05$; see Tables 30 and 31). About 95% of males use the Internet to play video games, compared to only 33.3% of girls. The majority of the video game players are males, not females, 81.5% and 18.5%, respectively. The Pearson chi-square value of 39.724 and p-value of .000 demonstrate that significantly more males than females use the internet for gaming. In regard to academics, 91.7% of females, compared to 71.4% of males, use the Internet for English work. Of students using the Internet for English work, the distribution of males and females is more even (54.8% and 45.2%, respectively). For social studies work, 35.7% of males use the Internet, as opposed to only 13.9% of females (see Table 32).

Table 28

*Gender * Do You Ever Play Video Games on the Internet Including on a Computer, Game Console, or Cellphone? Crosstabulation*

			Do you ever play video games on the Internet including on a computer, game console, or cellphone?		
			No	Yes	Total
Gender	Male	Count	3	53	56
		Expected Count	16.4	39.6	56.0
		% within Gender	5.4%	94.6%	100.0%
		% within Do you ever play video games on the Internet including on a computer, game console, or cellphone?	11.1%	81.5%	60.9%
	Female	Count	24	12	36
		Expected Count	10.6	25.4	36.0
		% within Gender	66.7%	33.3%	100.0%
		% within Do you ever play video games on the Internet including on a computer, game console, or cellphone?	88.9%	18.5%	39.1%
Total		Count	27	65	92
		Expected Count	27.0	65.0	92.0
		% within Gender	29.3%	70.7%	100.0%
		% within Do you ever play video games on the Internet including on a computer, game console, or cellphone?	100.0%	100.0%	100.0%

Table 29

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	39.724[a]	1	.000		
Continuity Correction[b]	36.823	1	.000		
Likelihood Ratio	42.138	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	39.293	1	.000		
N of Valid Cases	92				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 10.57.

b. Computed only for a 2x2 table

Table 30

*Gender * Do You Ever Use the Internet for English Work (Writing a Paper on Google Docs, Looking Up Answers to Questions From a Book You Had to Read, etc.), Including Time Spent on the internet Using Your Cell Phone? Crosstabulation*

			Do you ever use the Internet for English work including time spent on the internet using your cell phone?		
			No	Yes	Total
Gender	Male	Count	16	40	56
		Expected Count	11.6	44.4	56.0
		% within Gender	28.6%	71.4%	100.0%
		% within Do you ever use the Internet for English work including time spent on the internet using your cell phone?	84.2%	54.8%	60.9%
	Female	Count	3	33	36
		Expected Count	7.4	28.6	36.0
		% within Gender	8.3%	91.7%	100.0%
		% within Do you ever use the Internet for English work including time spent on the internet using your cell phone?	15.8%	45.2%	39.1%
Total		Count	19	73	92
		Expected Count	19.0	73.0	92.0
		% within Gender	20.7%	79.3%	100.0%
		% within Do you ever use the Internet for English work including time spent on the internet using your cell phone?	100.0%	100.0%	100.0%

Table 31

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.477[a]	1	.019		
Continuity Correction[b]	4.312	1	.038		
Likelihood Ratio	6.055	1	.014		
Fisher's Exact Test				.033	.016
Linear-by-Linear Association	5.417	1	.020		
N of Valid Cases	92				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.43.

b. Computed only for a 2x2 table

Table 32

*Gender * Do You Ever Use the Internet for Social Studies Work (Googling Information, Looking Up Answers, etc.), Including Time Spent on the Internet Using Your Cell Phone? Crosstabulation*

			Do you ever use the Internet for Social Studies work including time spent on the internet using your cell phone?		
			No	Yes	Total
Gender	Male	Count	36	20	56
		Expected Count	40.8	15.2	56.0
		% within Gender	64.3%	35.7%	100.0%
		% within Do you ever use the Internet for Social Studies work including time spent on the internet using your cell phone?	53.7%	80.0%	60.9%
	Female	Count	31	5	36
		Expected Count	26.2	9.8	36.0
		% within Gender	86.1%	13.9%	100.0%
		% within Do you ever use the Internet for Social Studies work including time spent on the internet using your cell phone?	46.3%	20.0%	39.1%
Total		Count	67	25	92
		Expected Count	67.0	25.0	92.0
		% within Gender	72.8%	27.2%	100.0%
		% within Do you ever use the Internet for Social Studies work including time spent on the internet using your cell phone?	100.0%	100.0%	100.0%

Less than half of students use the internet for Social Studies work (35.7% of males and 13.9% of females). Of the students using social studies for homework, 80% are males and 20% are females.

The Pearson chi-square value of 5.275 and p-value of .022 demonstrate a significant association between gender and Internet use for social studies. Males are significantly more likely to use the Internet for social studies work than females (see Table 33).

Table 33

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.275[a]	1	.022		
Continuity Correction[b]	4.229	1	.040		
Likelihood Ratio	5.628	1	.018		
Fisher's Exact Test				.030	.018
Linear-by-Linear Association	5.217	1	.022		
N of Valid Cases	92				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.78.
b. Computed only for a 2x2 table

Is Internet Use for Homework a Predictor of Composite and Component SAT Scores Controlling for Total Hours of Internet Use Per Week?

Four two-way ANOVAs were performed using Internet use per week (three-level ordinal) and each homework type (two-level nominal) as the independent variables, and EBRW, math, and Overall SAT scores as dependent variables. The homework types used included (a) use for English homework, (b) use for math homework, (c) use for social studies homework, (d) use for science homework.

There was a main effect and a significant interaction for Internet use for English homework (see Table 34a for cell counts). Students reporting Internet use for English homework (M = 535.48) scored significantly higher on the EBRW component of the SAT (F = 5.63, p < .05; see Table 34b) than students who did not use the Internet for English homework (M = 490.53). The interaction term was significant on total SAT score (F = 4.413, p <.05) and math (F = 5.22, p < .05; see Table 34b). For students who don't use the Internet for English, using the Internet almost constantly results in a higher total SAT score (M = 1077.27) than using the Internet several times a day (M = 915.00). The effect is reversed for students using the Internet for English, with almost constant Internet use resulting in a lower total SAT score (M = 1042.75) than usage several times a day (M = 1075.71, see Figure 8). Similarly, for students who don't use the Internet for English, using the Internet almost constantly results in a significantly higher math score (M = 557.27) than using the Internet several times a day (M = 465.00). The effect is reversed for students using the Internet for English, with almost constant Internet use resulting in a lower total SAT score (M = 506.75) than usage several times a day (M = 531.07, see Figure 9).

Table 34a

Between-Subjects Factors for English Homework

		Value Label	N
Do you ever use the Internet for English work, including time spent on the Internet using your cell phone?	0	No	19
	1	Yes	73
3-Level: How often do you use the Internet, either on a computer or a cellphone?	1	Almost constantly	51
	2	Several Times a Day	36
	3	About Once a Day or Less	5

Table 34b

Between Subjects Effects for Use of the Internet for English Homework and Time Spent Online

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	SAT Total	214949.04[a]	4	53737.26	1.721	.153
	EBRW	70912.05[b]	4	17728.01	2.253	.070
	Math	58846.68[c]	4	14711.67	1.563	.191
Intercept	SAT Total	39063400.82	1	39063400.82	1251.027	.000
	EBRW	9692491.25	1	9692491.25	1231.995	.000
	Math	9839485.73	1	9839485.73	1045.165	.000
Use for English	SAT Total	57566.75	1	57566.75	1.844	.178
HW	EBRW	44254.55	1	44254.55	5.625	.020
	Math	873.98	1	873.98	.093	.761
Time Spent Online	SAT Total	116435.76	2	58217.88	1.864	.161
	EBRW	31200.75	2	15600.38	1.983	.144
	Math	27505.90	2	13752.95	1.461	.238
English HW *	SAT Total	137795.63	1	137795.63	4.413	.039
Time Spent Online	EBRW	22357.83	1	22357.83	2.842	.095
	Math	49143.34	1	49143.34	5.220	.025
Error	SAT Total	2716581.40	87	31225.07		
	EBRW	684456.43	87	7867.32		
	Math	819043.54	87	9414.29		
Total	SAT Total	102605200.00	92			
	EBRW	26228500.00	92			
	Math	25247700.00	92			
Corrected Total	SAT Total	2931530.44	91			
	EBRW	755368.48	91			
	Math	877890.22	91			

a. R Squared = .073 (Adjusted R Squared = .031)

b. R Squared = .094 (Adjusted R Squared = .052)

c. R Squared = .067 (Adjusted R Squared = .024)

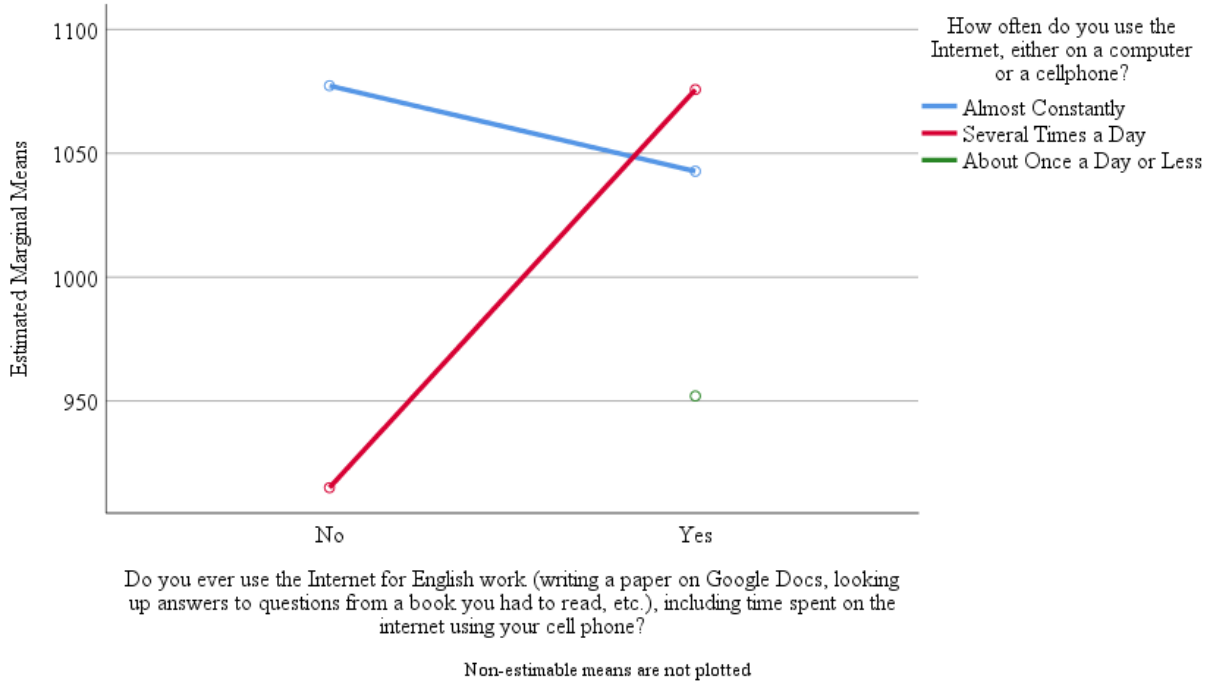

Figure 8. Estimated marginal means of total score (400-1600).

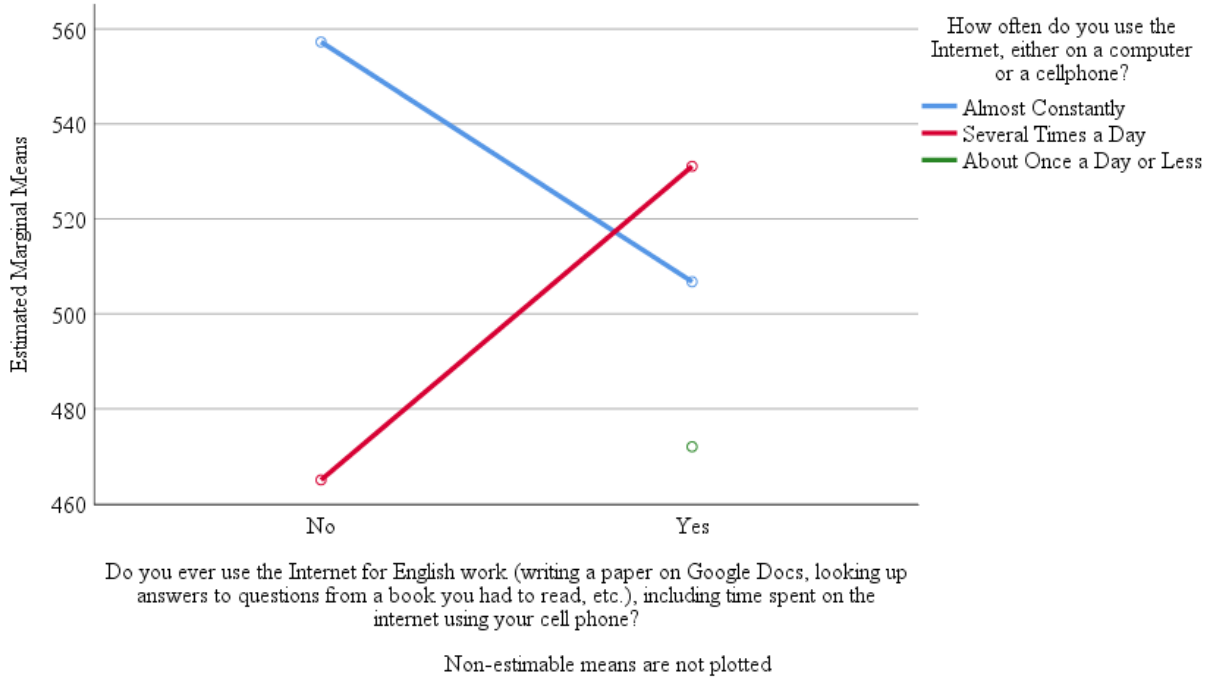

Figure 9. Estimated marginal means of math component scores.

There was also a main effect for Internet use for math homework on total SAT score (F = 4.74, $p < .05$) and EBRW (F = 6.93, $p < .05$; see Table 34d). The total SAT (M = 1065.69) and EBRW (M = 541.38) component scores for students using the Internet for math homework were significantly higher than the total SAT (M = 981.11) and EBRW (M = 489.63) scores for students who did not use the Internet for math. See table 34c for cell counts.

Table 34c

Between-Subjects Factors for Math Homework

	Value Label	N
Do you ever use the Internet for math work, including time spent on the Internet using your cell phone?	No	27
	Yes	65
3-Level: How often do you use the Internet, either on a computer or a cellphone?	Almost constantly	51
	Several Times a Day	36
	About Once a Day or Less	5

Table 34d

Between Subject Effects for Use of Internet for Math Homework and Time Spent Online

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected	SAT Total	215735.05[a]	4	53933.76	1.728	.151
Model	EBRW	76448.39[b]	4	19112.10	2.449	.052
	Math	36093.75[c]	4	9023.44	.933	.449
Intercept	SAT Total	43688411.36	1	43688411.36	1399.550	.000
	EBRW	11052921.57	1	11052921.57	1416.373	.000
	Math	10792062.89	1	10792062.90	1115.364	.000
Math HW	SAT Total	148069.48	1	148069.48	4.743	.032
	EBRW	54097.84	1	54097.84	6.932	.010
	Math	23167.44	1	23167.44	2.394	.125
Time Spent	SAT Total	70021.17	2	35010.59	1.122	.330
Online	EBRW	20985.39	2	10492.69	1.345	.266
	Math	14634.02	2	7317.01	.756	.472
Math HW *	SAT Total	4213.19	1	4213.19	.135	.714
Time Online	EBRW	1841.95	1	1841.95	.236	.628
	Math	483.61	1	483.61	.050	.824
Error	SAT Total	2715795.39	87	31216.04		
	EBRW	678920.09	87	7803.68		
	Math	841796.47	87	9675.82		
Total	SAT Total	102605200.00	92			
	EBRW	26228500.00	92			
	Math	25247700.00	92			
Corrected Total	SAT Total	2931530.44	91			
	EBRW	755368.48	91			
	Math	877890.22	91			

a. R Squared = .074 (Adjusted R Squared = .031)

b. R Squared = .101 (Adjusted R Squared = .060)

c. R Squared = .041 (Adjusted R Squared = -.003)

There were no significant effects found for Internet use for science or social studies homework when controlling for total hours of Internet use per week.

Is Internet Use for Social Media a Predictor of Composite and/or Component SAT Scores Controlling for Total Hours of Internet Use Per Week?

One two-way ANOVA was performed. Internet use for Social Media (four-level ordinal) and Internet Usage Frequency (three-level ordinal) were the independent variables, and total SAT score (composite), Evidence-Based Reading and Writing (EBRW component), and Math (component) SAT scores were the dependent variables. Social Media usage frequency levels included (a) almost constantly, (b) several times a day, (c) about once a day, and (d) several times a week but less than once a day. Internet usage frequency levels included (a) almost constantly, (b) several times a day, and (c) about once a day or less.

There were no significant main effects found for frequency of social media or overall internet use, but there was a significant interaction for EBRW score ($F = 2.446$, $p < .05$; see Table 35b). For social media usage almost constantly ($M = 522.90$), several times a day ($M = 535.43$) and about once a day ($M = 505.56$), EBRW scores drop as overall internet usage drops. With social media usage several times a week, but less than once a day ($M = 503.33$), EBRW scores are more variable. Almost constant internet use results in the lowest EBRW scores (M=420.00), while internet use several times a day results in the highest EBRW scores ($M = 720.00$), and once a day or less internet usage results in EBRW scores in the middle ($M = 520.00$; see Figure 10). See Table 35a for cell counts).

Table 35a

Between-Subjects Factors for Social Media Frequency

		Value Label	N
How often do you use Social Media?	1	Almost constantly	31
	2	Several Times a Day	46
	3	About Once a Day	9
	4	Several times a Week but less than once a day	6
How often do you use the Internet, either on a computer or a cellphone?	1	Almost constantly	51
	2	Several Times a Day	36
	3	About Once a Day or Less	5

Table 35b

Between-Subjects Effects for Internet Use for Social Studies and Time Spent Online

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	SAT Total	432074.17[a]	10	43207.42	1.400	.195
	EBRW	122716.70[b]	10	12271.67	1.571	.130
	Math	100277.92[c]	10	10027.79	1.045	.415
Intercept	SAT Total	25438228.15	1	25438228.15	824.378	.000
	EBRW	6544395.60	1	6544395.60	837.895	.000
	Math	6177366.27	1	6177366.27	643.465	.000
Social Media	SAT Total	88633.68	3	29544.56	.957	.417
Frequency	EBRW	18091.64	3	6030.55	.772	.513
	Math	29979.06	3	9993.02	1.041	.379
Time Spent	SAT Total	99366.38	2	49683.19	1.610	.206
Online	EBRW	29484.95	2	14742.47	1.888	.158
	Math	20803.34	2	10401.67	1.083	.343
Social Media *	SAT Total	321598.42	5	64319.68	2.084	.076
Time Spent	EBRW	95516.070	5	19103.21	2.446	.041
Online	Math	70995.15	5	14199.03	1.479	.206
Error	SAT Total	2499456.26	81	30857.49		
	EBRW	632651.78	81	7810.52		
	Math	777612.30	81	9600.15		
Total	SAT Total	102605200.00	92			
	EBRW	26228500.00	92			
	Math	25247700.00	92			
Corrected Total	SAT Total	2931530.44	91			
	EBRW	755368.48	91			
	Math	877890.22	91			

a. R Squared = .147 (Adjusted R Squared = .042)

b. R Squared = .162 (Adjusted R Squared = .059)

c. R Squared = .114 (Adjusted R Squared = .005)

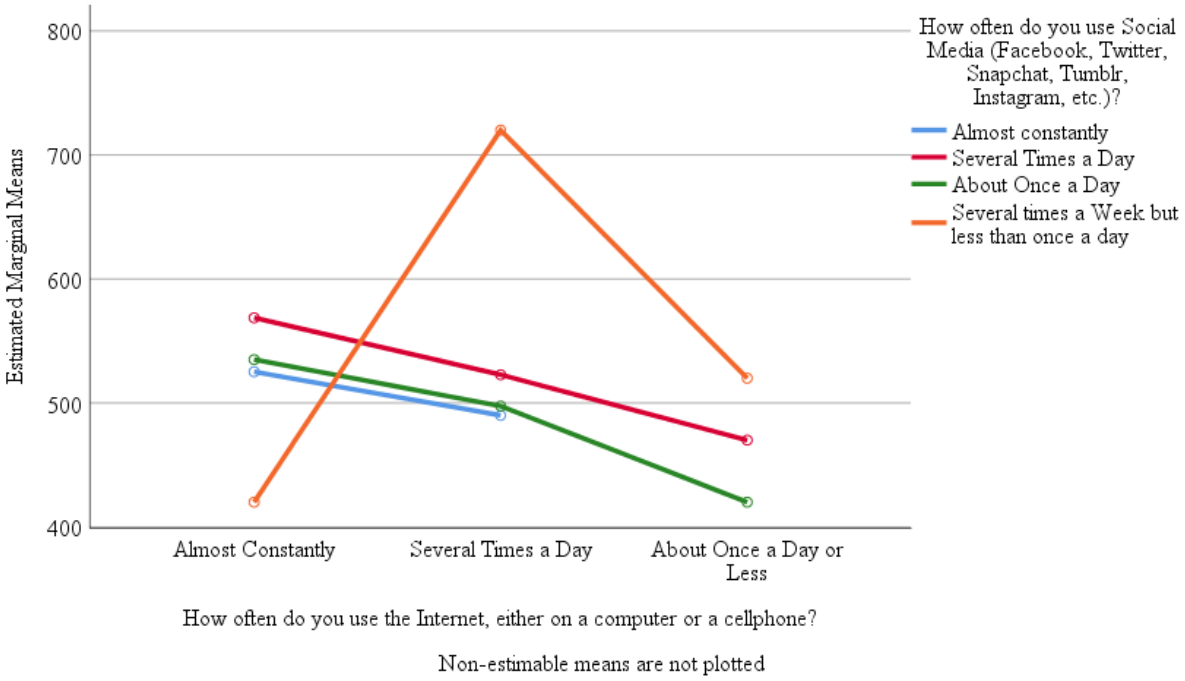

Figure 10. Estimated marginal means of evidence-based reading and writing.

Is Internet Use for Gaming a Predictor of Composite/Component SAT Scores Controlling for Total Hours of Internet Use Per Week?

A single two-way ANOVA was performed, using Internet use per week (five-level ordinal) and gaming (two-level nominal) as the independent variables, and EBRW, Math, and Overall SAT scores as dependent variables. Controlling for total hours of Internet use per week, Internet use for gaming was not a significant predictor of composite nor component SAT scores.

Is Internet Use for Streaming a Predictor of Composite/Component SAT Scores Controlling for Total Hours of Internet Use Per Week?

A single two-way ANOVA was performed, using Internet use per week (five-level ordinal) and streaming (two-level nominal) as the independent variables, and EBRW, Math and Overall SAT scores as dependent variables. Controlling for total hours of Internet use per week, Internet use for streaming was not a significant predictor of composite nor component SAT scores.

Overview of the Study—Qualitative

This section of this chapter presents the qualitative results of this study on the relationship between access and usage types of the Internet and student achievement (composite/component SAT scores, and cumulative GPA from 9th to 11th grades). Responses to a three question focus group session were summarized in relation to the two research questions. The two research questions are in regard to significant relationships between Internet usage habits and types of Internet usage compared to student achievement.

The three questions that were asked in the focus group were the following:

1. Tell me about your Internet usage habits.
2. Tell me how the time you spend online (including social media, streaming, etc.) impacts your schoolwork.
3. Why do you think you spend the amount of time online that you do?

The researcher chose the five focus groups participants randomly by initially numbering all possible participants. Next, the researcher asked the secretary of Blueville High School to choose five numbers from a list of 183. Students who matched the chosen numbers were then contacted and invited to participate in the survey. All five selected students accepted the invitation. All five

students were above the age of 18: three were male, and two were female. All five students had taken the SAT the previous year at Blueville High School, and all five students had previously completed the Internet Use Survey used in the quantitative section of this study. Two students, one male and one female, spoke more often than the other three participants. All five students gave input for each question, however.

A summary of individual responses are listed below:

1. *Tell me about your Internet usage habits*: All five students indicated that they are online every day, but three answered with "nearly all the time." This is consistent with the Pew Research Center's 2018 (Anderson & Jiang) study which reported that 45% of teens say they are online almost constantly. All five students said that they spend "a lot of time on social media" sites such as YouTube, Snapchat, Instagram, and Facebook. Facebook was the least popular of the social media sites mentioned, and three students agreed with each other saying that Facebook is more for adults and "Snapchat is for kids." All five students reported having very different Internet usage habits in regards to schoolwork. Two students indicated that they use the Internet for homework for "pretty much all subjects," while three students did not indicate a preference for using the Internet for schoolwork at all. Two students, both male, claimed to be online often late into the night playing interactive video games with friends from school. The same two students indicated that the use of the Internet has impacted the amount of sleep they get on average. Finally, when asked if their Internet usage habits change any when at school, three students said they "don't go anywhere without their phone so they are always using it," while two students said they cut back on their Internet usage while at school. All five

students agreed with each other that the Internet does not change the way they interact with friends.

2. *Tell me how the time you spend online (including social media, streaming, etc.) impacts your schoolwork*: Again, two students spoke more frequently than the other three saying that because they use the Internet for school often (both at school and at home), the Internet has a positive impact on their schoolwork. One student reported that without the Internet, he would not be able to pass his math class because "the teacher doesn't know how to teach." He further went on to say that sites such as YouTube and WebMath are "incredibly valuable" and that he uses them even in class to solve math work. Both of those students reported high scores on the math portion of the SAT and that they both use the Internet "often" for math help. All five students indicated using "a lot of data" for streaming music and videos and reported that YouTube and Spotify were the two platforms used most for streaming. Reaching data caps was reported as being a problem for all five students and their friends, and upon further discussion, all five students reported being throttled down" by their Internet or cellular service provider. All five students agreed that the Internet has greatly enhanced their ability to understand their schoolwork, but that they could understand how it could be a distraction for other students. Additionally, all five students believe the Internet will continue to "get better so that students won't have to rely on teachers for information."
3. *Why do you think you spend the amount of time online that you do?*: All five students had difficulty answering this question. This question was formed based on the eight elements of Csikszentmihalyi's flow theory and Deci and Ryan's self-determination theory because the question seeks a greater understanding of students' drive to be online nearly

all the time. In other words, something must make them want to be online that much. Upon clarification of the question by simply rephrasing it as "Why do you spend so much time online?" one student answered by saying that it makes it so he isn't bored. Another student agreed with that statement, but then explained further that it makes it so he isn't bored at school. The remaining three students simply stated that they don't know why they are online as much as they are other than "there really isn't anything else to do." Students' answers to the third question indicate a possible relationship to the working theories by showing that, for these five students, school does not fulfill the eight elements of flow theory, nor does it fit the model of self-determination theory.

Trends in Qualitative Results

Through the examination of results from the three qualitative study questions, the researcher arrived at the conclusion that the five students in the qualitative study did not believe there was much, if any, connection between Internet usage habits and their achievement. One student mentioned, "I'm not sure why your paper is important. I come to school everyday with my phone, and I'm on my phone pretty much all day. I don't even think about it and I don't think it impacts anything." Moreover, the study results show a trend in passivity toward overall Internet use in general, and that its impact on student life is minimal at best. The lack of response from the majority of the focus group is data in itself, indicating several possible scenarios. It is possible that the participants of the focus group were not inclined to answer the questions because they were not comfortable with the researcher himself. Participant response was minimal in length in regard to question prompts. Further, it is possible that the questions the researcher asked were not specific enough to encourage thorough answers from all participants. Even the two participants who were most involved in the discussion did not indicate a

heightened sense of attention to the subject, which may very well indicate that the subject is a non-issue for the majority of students in their peer group. One of the two most vocal respondents responded by saying, “I use my phone for all sorts of stuff including school stuff, but I don’t think it really impacts anything I do. I don’t ever think about it.” Even though the quantitative study results show some correlation in gender verses Internet usage habits, and in some areas of student achievement, the focus group results would indicate that the correlation is coincidental at best.

Chapter Five

Discussion

Purpose of the Study

The purpose of this study is to determine a relationship between Internet usage habits and student achievement (SAT scores and GPA) in order to inform policy regarding Internet use in schools. As the State of Michigan is consistently near the bottom in regards to SAT performance, it is important for schools to find out why. This study works to help establish Internet use policies in schools as a step in the direction of improving student performance.

Key Findings and Discussion

In this analysis of survey data collected from seniors at Blueville High School, several significant differences and associations were observed.

Gender.

While gender differences were not found for every pair of variables, this researcher did find that males are more likely to use the Internet for gaming, watching movies/videos, and for social studies homework, while females are more likely to use the Internet to stream music and for English homework. When using the Internet for English homework, males had statistically significantly higher composite/component SAT scores. Overall, males had higher math component SAT scores. It should be noted that both the 2015 and 2018 Pew Research Center's report on *Teens, Social Media, and Technology* (Lenhart, 2015; Anderson & Jiang, 2018) report similar finding in regards to males and Internet use for gaming.

When using the Internet for science homework, males scored higher on the math component of the SAT. Additionally, males scored higher on the EBRW component of the SAT when using the Internet for social media. It was determined that females more than males were

likely to use the Internet to complete their English homework. On the other hand, male respondents were highly likely to use the Internet in completing their math homework, gaming, and completing social studies homework. However, the research concluded that there was a statistically significant interaction between gender, Internet use, and SAT scores in that males using the Internet for English work had higher math and total SAT scores. Students who spent most of their time on the Internet also had better SAT scores in math. In other words, those students who used the Internet to complete their math work had higher average in the subject but the relationship was not statistically significant. Similar results were obtained in other subjects such as English, where more female students were using the Internet to complete their English homework. In addition, the research determined that the continued use of the Internet was a predictor factor to higher EBRW scores. Finally, males scored high on the EBRW component of the SAT when using the Internet more for social media. In general, interactions show that lower levels of Internet usage result in higher SAT scores for females. Conversely, males scored higher on the SAT with higher levels of Internet usage. As observed by Watkins (2018), Internet use for the completion of any assignment requires extensive readings, which eventually translates into enhanced reading and writing skills as well.

Usage Impacts on Achievement.

Usage of the Internet for English, math, gaming, and social media were associated with higher composite and/or component SAT scores. Interestingly, EBRW and overall SAT scores were higher for those who use the Internet for math homework. EBRW and total SAT scores were also higher for students using the Internet for English work. With EBRW scores being affected by multiple types of Internet usage, the researcher hypothesizes that Internet use for any homework subject requires reading, therefore any Internet use for any homework subject is likely

to result in higher EBRW scores. Neither gaming nor Internet use for streaming were found to be associated with higher or lower composite/component scores. Social media was positively correlated with composite/component SAT scores. Achievement was higher for students who used social media than for students who did not.

Overall Access.

Based on the current findings obtained from the current research, it is evident that Internet access and usage have rapidly grown recently. For example, based on the current research, more than 90% of the respondents have access to Internet services at home. Further, the number of people who have access to Internet-supported devices such as computers, laptops, and smart phones exceeds 90% of those people who participated in the research. Nevertheless, findings obtained from this research indicate that more than 67% of the respondents have access to a tablet, iPad, Slate, or Kindle. These research findings are consistent with the ones obtained from the 2013 survey by the US Census Bureau, which concluded that the United States has experienced rapid growth in Internet access and usage in recent years (U.S. Census Bureau, 2015).

The increased use of the Internet across different fields has ultimately attracted great interest, attention, and focus among researchers and policy makers. One area of research that has attracted such attention is the educational sector with the aim of investigating the relationship between Internet use and academic achievement of students. This is the basis of the current study that sought to investigate this relationship. As expected, it was determined that there does exist a relationship between Internet use among students and their SAT scores at Blueville High School. However, as observed by Vigdor, Ladd, and Martinez (2014), simply having Internet access at home and school does not guarantee improved student academic achievement implying that other

factors such as average usage time, nature of use, and level of control among others does influence overall student achievement.

With increased access to the Internet, the current study determined that a relatively large number of the respondents used the Internet several times a day while others reported as using it almost constantly. This is consistent with the research findings established by Lenhart (2015), indicating that teens who have Internet access are more likely to go online any time they want. The author further underscored the exponential growth of home Internet access coupled with the growing number of smartphones being readily available (Lenhart, 2015). Evidently, as per the findings obtained from the current research, this access was found to influence the level of their academic achievements with some stating that it helped them in effectively completing their school work, while others indicated that the disruptive nature of the Internet could interfere with their concentration toward completing assignments.

Positive and Negative Internet Use.

The above findings are supported in previous research conducted by Ndon (2014) who observed that rightful utilization of the Internet can help students in accessing a wide range of information necessary for school assignment completion. However, according to the facets of flow theory, interruptions interfere with optimal concentration and focus eventually inhibiting learning and performance (Santos et al., 2017). The sentiments are also supported by Bedassa (2014), whose research findings concluded that frequent notifications from different social media networks can interfere with student concentration thereby hindering performance and academic achievement. This is further backed up by Lenhart (2015), whose study concluded that most teens in this digital era are making use of the Internet to socialize through different social media platforms such as Snapchat, Instagram, and YouTube.

In the same context, it was determined that some of the respondents were using the Internet to message, email, and chat with peers and friends during their free time. Additionally, Internet access provided an avenue where students would engage in non-academic activities if proper control from their parents and teachers was not practiced. From the qualitative data, it was also evident that most students would spend a substantial amount of time online. Based on the research, 40% of the respondents noted that they would be online late into the night playing interactive videos with their friends. This is consistent with the research findings obtained by O'Reilly (2015), who acknowledges the aspect of video streaming and sharing being a common phenomenon in this digital era. Definitely, as observed by Ornstein, Levine, and Gutek (2011), increased Internet use of digital media, especially late into the night, interfered with sleeping patterns, negatively impacting the overall academic achievements of students.

Findings from the current research determined that the nature of Internet use also affected the status of academic achievements among students. For example, it was determined that those students who used the Internet for the completion of math work would eventually score higher on the SAT. Further, as explained by Ghavifekr and Rosdy (2015), online streaming is a predicting factor for higher math and SAT scores, but this is largely dependent on controlling the total number of hours used online.

In a research study published by Ndoye (2017), the way in which students use technology will largely influence their eventual performance in academics. The research warns that Internet use will have a huge impact on the behaviors of users, whereby through parental guidance, students can acquire relevant information on what websites to visit and how to apply the information and knowledge they acquire from the Internet (Ndoye, 2017). Unfortunately, considering that teens are still in their psychological development process, lack of guidance by

teachers and parents on how to use the Internet can have far reaching negative implications. An example is presented in a study that was conducted by Voogt and Knezek (2008), who concluded that improper use of Internet services without proper guidance could potentially expose teens to a wide range of inappropriate images and videos such as adult-themed and crime-based content.

Socioeconomic Connections to Student Achievement.

Upon testing the influence of socioeconomic status (free/reduced lunch), Internet use, and SAT scores, a significant relationship was found in this study. Students who paid full price for lunch had higher overall SAT scores and higher EBRW scores than students who were either partial pay or received free lunch. Regardless of the economic status, most students can now access Internet services almost constantly. This has eventually helped reduce the digital divide, whereby some students have better access to Internet services than others. Such scenarios have mostly been apparent within the geographical context, in which case individuals in the urban settings have better technological infrastructure at their disposal when compared to their counterparts in the rural areas (Muente-Kunigami & Navas-Sabater, 2010). It would follow that people in urban areas have better information access relative to their peers in more remote and rural settings. However, in the Blueville High School context, the current findings demonstrate that the digital divide gap is gradually being bridged and the implications of Internet use among students seems to be uniform regardless of their diverse socioeconomic backgrounds. Although autonomy is important toward improving student motivation, self-determination theory (SDT) warns that proper control should be ensured in order to prevent students from accessing inappropriate information from different online platforms, which may affect cognition and psychological functions in a negative manner.

Balance of Internet Use.

As expected, findings from the current study also determined that the amount of control on Internet use also had an impact on students' SAT scores. A strong balance is required between using the Internet and undertaking other activities such as completing school work. Flow theory states that a learner needs to ensure a strong balance between skills and underlying challenges that need to be addressed (Csikszentmihalyi & 3M Company, 2009). As such, besides concentration, students must ensure that they assign enough time for their schoolwork rather than solely focusing on Internet use. As determined by the current study, a large number of students who participated in the research have easy access to the Internet either from school or while at home. They reported as frequently accessing and using the Internet, which according to Yılmaz and Orhan (2010); Jethro, Grace, and Thomas (2012); and Arkorful and Abaidoo (2014) is beneficial in the sense that students can use the Internet to gain new insights and knowledge. According to the above cited authors, the Internet provides a platform through which students can access free online classes, self-assessment tests, and a wide range of information with just a simple search on different search engines such as Google (Yılmaz & Orhan, 2010; Jethro, Grace, & Thomas, 2012; Arkorful & Abaidoo, 2014). All the above are core to student academic achievement. Unfortunately, when good balance between Internet use and studying is not maintained, it may lead to addiction. The end result is poor academic scores and grades for learners (Rosen & Wittes, 2011).

Another thematic outcome established from the current research is that a relatively large number of students were using the Internet to conduct research on different school-related work such as science, mathematics, English, and social studies. Other students used the Internet for gaming, streaming music and videos, accessing different social media networks, all of which

were predictor factors to the SAT scores. As males used the Internet more for gaming, SAT scores increased; however, the researcher hypothesizes that this balance would tip at some point. As observed by Blumberg and James Hosmer Penniman Book Fund (2014), online gaming is one of the essential methods that can be used in helping learners develop their cognitive skills. Through gaming, students are able to develop their reasoning skills, focus, and perception. Nevertheless, documented research has also demonstrated that online gaming, which often requires critical thinking for one to win, helps improve the problem-solving skills of the particular gamer. As such, Blumberg and James Hosmer Penniman Book Fund (2014) agrees with the findings obtained from the current research that proper and well controlled gaming would be highly beneficial toward improving the cognitive abilities of a student. Also, according to Yılmaz and Orhan (2010), Internet use provides an opportunity where students can access a wide range of Youtube videos, including instructional ones that guide learners on how to solve different academically related problems. For instance, students can have easy access to mathematical formulas, which eventually help them achieve better grades in math. The current study's focus group interview produced the notion. This is partially one of the reasons as to why the current study drew a strong correlation between video streaming and high SAT scores in math. However, as warned by Bedassa (2014), excessive gaming and video streaming could negatively affect the academic achievements of students. Some students tend to use their time playing games and streaming videos, eventually leaving little or no time for schoolwork.

Implications for Schools and School Leaders

In regard to establishing policies in schools, school leadership would be advised to examine the overall usage habits of their students. It is interesting to note that qualitative results indicate that students do not believe that Internet usage habits have any impact on student

achievement, but quantitative results indicate that there is somewhat of a relationship between the two. Highly regulating Internet use is an important step in this process, as is indicating to students why this is important to their overall student achievement. There will be difficulty in convincing students of this connection based upon the results of the focus group. However, this does not solely require the input of teachers and school leaders, but also parents and other stakeholders. In other words, schools and school leaders should utilize the findings obtained from the current research in order to come up with a more integrated approach that brings on board all key stakeholders toward addressing the issue of negative Internet use and eventual decline in academic achievement. As evident from the current research findings, Internet access and use has some impact on student academic achievement. Collaborative efforts by school leaders and parents to build strong usage policies will ensure that students use the Internet in a way that is conducive to learning and academic growth.

Many schools, including the middle school of the researcher's employing district, have gone to a no-cell phone policy, including break times (recess and lunch). There is a lack of research indicating that these new policies have any true impact on student achievement. The opposite is actually true in several studies including a study by Promise (2018) who found that the perception of positive school culture decreased when schools banned cell phones. Because school policies should be well founded in research, policies such as this should be avoided as the current research shows that proper Internet use can lead to higher academic achievement. Since the current research, as well as the Pew Research Center's 2015 and 2018 studies (Lenhart, 2015; Anderson & Jiang, 2018), indicates that teens access the Internet most frequently on a smartphone, school leaders should be very cautious of removing that tool. Since one of the main goals of schools is to increase student achievement, schools should be examining the research to

establish policies of smartphone use that encourage appropriate usage that is conducive to academic gains instead of taking that tool away completely.

Many programs exist that help fund technology needs in schools and provide laptops to classrooms (or even individual students). Again, since the research shows that most students access the Internet by way of a smartphone, school leaders should be developing ways to get that tool into the hands of all students. Because the current research shows that the vast majority of students either own or have access to a smartphone, this would be a relatively easy endeavor and could even save hundreds of thousands of dollars in Title and General funds (making those funds available again to other programs).

Finally, the tall task of changing how standardized tests are administered should be addressed. Since research shows that the majority of teens have access to a smartphone, perhaps it is time to look into assessing students on standardized tests via smartphone. Of course, under the current structure of the SAT, this would bring a multitude of challenges such as the possibility of cheating by using a smartphone. However, if the assessment was changed so that students had to use the Internet to access information and process it in order to answer questions on the assessment, the shift could begin in the effectiveness of the test's ability to measure how students will perform in a problem-solving environment. Since one of our tasks as school leaders is to prepare students for life's next step, our current policies in regards to technology, smartphones, and the Internet are not currently designed to help. We need to examine what we have put in place and make the necessary adjustments to help students get to the next level, no matter how inconvenient it might seem for us.

Future Studies

Future studies should include parental surveys and focus groups that allow parents to indicate their opinion of their child's Internet usage habits and its impact on their student achievement. Additionally, focusing on how Internet use has influenced other facets of home life might be valuable. Internet addiction studies have been conducted, but Internet addiction in relation to student achievement is still relatively unexplored. Finally, Internet use habits in relation to sleep patterns and student achievement would be valuable to determine how much sleep is being lost due to Internet use.

Previous studies and findings obtained from the current research indicate that there is a strong link between technology use and student academic achievement (Wentworth & Middleton, 2014). However, there is a lack of research focused on determining the actual amount of Internet/technology use that would translate into improved student achievement. The findings obtained from the current research should also be utilized in conducting further research projects that determine the ability of students to maintain high grades in college or trade schools. Based on the findings obtained from the current research, Internet use may somewhat influence SAT scores, but further research needs to establish if students scoring high on the SAT are able to maintain similar levels of achievement in the workplace.

Findings from the current research also indicate a statistically significant difference in Internet use between males and females. For instance, males were found to use the Internet more often in completing their social studies homework, while female students used the Internet more often to complete their English homework. Evidently, this will have an impact in the final academic outcomes, partially forming a need for future studies to investigate the reasons behind this trend.

As determined from the current research, there are other factors besides access and usage of the Internet that influence different levels of student achievement. Some of these include the usage type *with* duration of Internet use. As such, it would be highly beneficial to conduct a study to extensively investigate how these factors relate and collaboratively influence overall student achievement. Additionally, the factor of *how* the Internet is being used should be examined. Coursework at school, with a home component, could be developed to help ensure students are knowledgeable about how the Internet can help or hurt student achievement. Being sure that students know the why as well as the what will be an important factor in regard to making and enforcing policy changes.

The digital divide was minimally found to be present in Blueville High School among those surveyed. Since nearly all students had access to the Internet in at least one form (90%), it would be difficult to say that access to the Internet in this area of Michigan is a major problem. There is, of course, the issue of speed of connectivity and how the definition of the digital divide affects official accessibility to what is now considered to be high-speed Internet connections; however, this study does not show that to be a problem at the high school level in this community. Future studies should be conducted in other areas of the country where access to the Internet and connectivity speed is considered a problem.

Finally, the current research was limited to Blueville High School in Blueville, Michigan. Although the findings obtained from the research are strongly supported by other findings from already existing literature, future research focusing on wider geographical contexts, incorporating more schools, and possibly including more academic levels would be appropriate as high levels of Internet use would most likely be found at the elementary level. It should be noted that technology is always on a transformational trend and its impact on different people is

gradually changing over time. This would lend itself to the incorporation of longitudinal studies over the educational course of a student cohort group. The study could start at the elementary level and continue through high school. Of course, students would come and go from that district, but students who start and graduate from the same district could be studied.

Final Thoughts

The relationship between Internet usage habits and student achievement is present in quantitative results, but is lacking in qualitative results. This inconsistency in outcomes presents a difficult scenario in regards to forming policies that will guide Internet use in schools. If students do not believe that Internet usage habits impact their student achievement at all, it will be difficult for them to buy into a policy that regulates usage. Even with quantitative correlations, student belief will most likely cause pushback on policy resulting in difficulties in policy enforcement. Additionally, with the satisfaction of the elements of self-D\determination theory and flow status being met through Internet use, students will find more satisfaction in Internet use than they would in school work (if school work is not found to be a motivator; Csikszentmihalyi & 3M Company, 2009; Ryan & Deci, 2018). Schools should work with students to find a healthy balance in Internet use to build a policy that lends to habits that increase student achievement rather than using blanket policies that are not founded in research.

Besides focusing on increased Internet access among students and schools, right policies need to be developed and implemented in regards to Internet usage skills. Younger students need to be trained on how to use the Internet and Internet-supported devices in order to help them better prepare for the next step in their educational careers. Those next steps typically will include the PSAT, which serves as a practice SAT test. This test can be taken in 8th, 9th, and 10th grades in Michigan and is meant to be a predictor in student achievement in regards to

standardized tests and overall student achievement. The results of this test should be given more attention at the individual student level as opposed to the composite score.

The role of the classroom teacher is very important in regards to making sure Internet usage is appropriate and productive during times of academic focus. With 45% of teens reporting being online nearly all the time, ensuring that the time spent online is age-appropriate will be important. Additionally, adjusting teaching styles in the classroom to incorporate Internet usage so that students develop a deeper understanding of curriculum might help bridge the gap between boredom and engagement. Technology paired with traditional instruction has been a focus for some time, but truly listening to students and how they would benefit from technology use in instruction should be our next steps as educational leaders. We must understand that face-to-face learning with small facets of technology will most likely not achieve the results we are looking for in regards to student achievement.

With the state of Michigan being in the bottom five in regard to overall SAT performance by students, the need is most certainly present to look at all factors that impact student achievement. Whether it be an adjustment in policy, the assurance of a smartphone or tablet for all students, or the development of coursework on appropriate usage of the Internet, schools in Michigan must find a way for technology to help improve student achievement.

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APPENDICES

Appendix A: Internet Use Survey

Internet Use Survey

Thank you for your consideration of this survey. By clicking the box below, you are agreeing that you have either gotten written permission from a parent/guardian if you are under 18 (permission form that went home and was returned signed by a parent/guardian), or that you are over 18 and you consent to taking this survey. Additionally, you are aware that this survey will collect basic Internet use habits, gender, age, and student ID. Please know that your user ID will be removed from all publications resulting from this survey. In no way will there be any identifying information published about you.

* Required

1. **Consent** *
   Mark only one oval.

   ◯ I have gotten permission to take this survey from a parent/guardian and have turned in the permission form. Additionally, I understand that any identifying information will be removed from my responses before data is published.

   ◯ I am at least 18 years old and I consent to taking this survey. Additionally, I understand that any identifying information will be removed from my responses before data is published.

   ◯ I do not consent to taking this survey, or I did not get permission to take this survey. *Stop filling out this form.*

Username

2. **Please type your Username (the one you use to login to computers here at school)** *

   _____

Age

3. **How old are you?** *
   Mark only one oval.

   ◯ 16
   ◯ 17
   ◯ 18
   ◯ 19

Technology Access

4. **Do you have the Internet at home?** *
   Mark only one oval.

   ◯ Yes
   ◯ No

5. **Do you have access to the following devices?** *
Mark only one oval per row.

	Yes	No
A smartphone	◯	◯
A cell phone that is not a smartphone	◯	◯
A desktop or laptop computer	◯	◯
A gaming console	◯	◯
Tablet/iPad/Kindle/Slate	◯	◯

6. **Which device do you use most often?** *
Mark only one oval.

- ◯ Smartphone
- ◯ Cell phone that is not a smartphone
- ◯ A desktop or laptop computer
- ◯ A gaming console
- ◯ Tablet/iPad/Kindle/Slate
- ◯ Other
- ◯ None

Access Method

7. **If you have Internet capable devices (computer, phone, tablet, etc.), how do your devices connect to the Internet at home? Check each one you use.** *
Check all that apply.

- ☐ Broadband (WI-FI or Cable - "fast connection")
- ☐ Dial-up
- ☐ Cell phone data
- ☐ Satellite
- ☐ I can't get online at home.
- ☐ I don't have Internet capable devices.

Amount of Time Online

8. **How often do you use the Internet, either on a computer or a cellphone? This would include activities like scrolling through social media, streaming music, or watching a movie, but this would not include texting.** *
Mark only one oval.

- ◯ Almost Constantly
- ◯ Several Times a Day
- ◯ About Once a Day
- ◯ Several Times a Week but LESS than Once a Day
- ◯ Less Often

Social Media

9. **How often do you use Social Media (Facebook, Twitter, Snapchat, Tumblr, Instagram, etc.)?** *
Mark only one oval.

- ◯ Almost Constantly
- ◯ Several Times a Day
- ◯ About Once a Day
- ◯ Several Times a Week but LESS than Once a Day
- ◯ Less Often

10. **Do you ever use any of the following social media sites?** *
Mark only one oval per row.

	Yes	No
Twitter	◯	◯
Instagram	◯	◯
Facebook	◯	◯
Snapchat	◯	◯
YouTube	◯	◯
Tumblr	◯	◯
Reddit	◯	◯
A social media site not listed	◯	◯

Emailing and Messaging

11. **Do you ever use the Internet for emailing and messaging others (school email, personal email, Twitter or Facebook Messenger, Snapchat, Whatsapp, etc.) including on a computer, game console, or cellphone?** *
Mark only one oval.

- ◯ Yes
- ◯ No

12. **How often do use the Internet for emailing and messaging others (school email, personal email, Twitter or Facebook Messenger, Snapchat, Whatsapp, etc.) including on a computer, game console, or cellphone?** *
Mark only one oval.

- ◯ Almost constantly
- ◯ Several times a day
- ◯ About once a day
- ◯ A few times a week
- ◯ Once a week
- ◯ Never

Gaming

13. **Do you ever play video games (Fortnite, Call of Duty, League of Legends, World of Warcraft, Counterstrike, Minecraft, etc.) on the Internet including on a computer, game console, or cellphone?** *
Mark only one oval.

- ◯ Yes
- ◯ No

14. **How often do you play video games (Fortnite, Call of Duty, League of Legends, World of Warcraft, Counterstrike, Minecraft, etc.) on a computer, game console, or cellphone?** *
Mark only one oval.

- ◯ Almost constantly
- ◯ Several times a day
- ◯ About once a week
- ◯ A few times a week
- ◯ Once a week
- ◯ Never

Gender

15. **Which gender do you consider yourself?** *
Mark only one oval.

- ◯ Male
- ◯ Female
- ◯ My gender is not listed here.

Movies and Videos

16. **Do you ever watch videos/movies (YouTube, Amazon Movies, Netflix, Hulu, DubSmash, etc.) on the Internet including on a computer, game console, or cellphone?** *
Mark only one oval.

- ◯ Yes
- ◯ No

17. **How often do you watch videos/movies (YouTube, Amazon Movies, Netflix, Hulu, DubSmash, etc.) on the Internet including on a computer, game console, or cellphone?** *
Mark only one oval.

- ◯ Almost constantly
- ◯ Several times a day
- ◯ About once a day
- ◯ A few times a week
- ◯ Once a week
- ◯ Never

Music

18. **Do you ever stream music (Pandora, Stitcher, Apple Music, Slacker, Spotify, etc.) on the Internet including on a computer, game console, or cellphone?** *
Mark only one oval.

- ◯ Yes
- ◯ No

19. **How often do you stream music (Pandora, Stitcher, Apple Music, Slacker, Spotify, etc.) on the Internet including on a computer, game console, or cellphone?** *
Mark only one oval.

- ◯ Almost constantly
- ◯ Several times a day
- ◯ About once a day
- ◯ A few times a week
- ◯ Once a week
- ◯ Never

Math Homework

20. **Do you ever use the Internet for math work (looking up equations, Googling answers, playing math games, etc.), including time spent on the internet using your cell phone?** *
Mark only one oval.

- ◯ Yes
- ◯ No

21. **How often do you use the Internet for math work (looking up equations, Googling answers, playing math games, etc.), including time spent on the internet using your cell phone?** *
Mark only one oval.

- ◯ Almost constantly
- ◯ Several times a day
- ◯ About once a day
- ◯ A few times a week
- ◯ Once a week
- ◯ Never

English Homework

22. **Do you ever use the Internet for English work (writing a paper on Google Docs, looking up answers to questions from a book you had to read, etc.), including time spent on the internet using your cell phone?** *
Mark only one oval.

- ◯ Yes
- ◯ No

23. **How often do you use the Internet for English work (writing a paper on Google Docs, looking up answers to questions from a Novel, etc.), including time spent on the internet using your cell phone?** *

Mark only one oval.

- ◯ Almost constantly
- ◯ Several times a day
- ◯ About once a day
- ◯ A few times a week
- ◯ Once a week
- ◯ Never

Science Homework

24. **Do you ever use the Internet for science work (looking up answers to questions, Googling science facts, etc.), including time spent on the internet using your cell phone?** *

Mark only one oval.

- ◯ Yes
- ◯ No

25. **How often do you use the Internet for science work (looking up answers to questions, Googling science facts, etc.), including time spent on the internet using your cell phone?** *

Mark only one oval.

- ◯ Almost constantly
- ◯ Several times a day
- ◯ About once a day
- ◯ A few times a week
- ◯ Once a week
- ◯ Never

Social Studies

26. **Do you ever use the Internet for Social Studies work (Googling information, looking up answers, etc.), including time spent on the internet using your cell phone?** *

Mark only one oval.

- ◯ Yes
- ◯ No

27. **How often do you use the Internet for Social Studies work (Googling information, looking up answers, etc.), including time spent on the internet using your cell phone?** *
Mark only one oval.

- ◯ Almost constantly
- ◯ Several times a day
- ◯ About once a day
- ◯ A few times a week
- ◯ Once a week
- ◯ Never

All Other Classes

28. **Do you use the Internet for work for all other classes (Googling information, looking up answers, building multimedia presentations, etc.), including time spent on the internet using your cell phone?** *
Mark only one oval.

- ◯ Yes
- ◯ No

29. **How often do you use the Internet for work for all other classes (Googling information, looking up answers, building multimedia presentations, etc.), including time spent on the internet using your cell phone?** *
Mark only one oval.

- ◯ Almost constantly
- ◯ Several times a day
- ◯ About once a day
- ◯ A few times a week
- ◯ Once a week
- ◯ Never

Your Opinions About the Internet

Please answer these even if you don't have access to the Internet.

30. **I think having the Internet makes schoolwork easier to complete.** *
1=Strongly Disagree, 2= Disagree, 3=Neither Agree or Disagree, 4=Agree, 5=Strongly Agree
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

31. **I would prefer to use the Internet instead of a textbook to complete schoolwork.** *
1=Strongly Disagree, 2= Disagree, 3=Neither Agree or Disagree, 4=Agree, 5=Strongly Agree
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

32. **Using the Internet to complete schoolwork distracts me (or would distract me) from getting my work done more than using a textbook.** *
1=Strongly Disagree, 2= Disagree, 3=Neither Agree or Disagree, 4=Agree, 5=Strongly Agree
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

33. **Using the Internet for schoolwork makes school more interesting and fun.** *
1=Strongly Disagree, 2= Disagree, 3=Neither Agree or Disagree, 4=Agree, 5=Strongly Agree
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

34. **Using the Internet helps (or would help) me understand my classes better.** *
1=Strongly Disagree, 2= Disagree, 3=Neither Agree or Disagree, 4=Agree, 5=Strongly Agree
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

35. **I learn more things (or would learn more things) using the Internet for schoolwork than I would using a textbook.** *
1=Strongly Disagree, 2= Disagree, 3=Neither Agree or Disagree, 4=Agree, 5=Strongly Agree
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

36. **Many of my classmates know more about the Internet than I do.** *
1=Strongly Disagree, 2= Disagree, 3=Neither Agree or Disagree, 4=Agree, 5=Strongly Agree
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

37. **I try to learn more about using the Internet whenever I can.** *
1=Strongly Disagree, 2= Disagree, 3=Neither Agree or Disagree, 4=Agree, 5=Strongly Agree
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

38. **Having access to the Internet is helpful in regards to schoolwork.** *
1=Strongly Disagree, 2= Disagree, 3=Neither Agree or Disagree, 4=Agree, 5=Strongly Agree
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

39. **I think using the Internet helps (or would help) my GPA.** *
1=Strongly Disagree, 2= Disagree, 3=Neither Agree or Disagree, 4=Agree, 5=Strongly Agree
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

40. **I think using the Internet helped (or would have helped) my SAT score.** *
1=Strongly Disagree, 2= Disagree, 3=Neither Agree or Disagree, 4=Agree, 5=Strongly Agree
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

41. **Using the Internet makes me feel good.** *
1=Strongly Disagree, 2= Disagree, 3=Neither Agree or Disagree, 4=Agree, 5=Strongly Agree
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

42. **I feel like I am capable of using the Internet without anyone else's help.** *
1=Strongly Disagree, 2= Disagree, 3=Neither Agree or Disagree, 4=Agree, 5=Strongly Agree
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

43. **I feel like I am good at using the Internet.** *
1=Strongly Disagree, 2= Disagree, 3=Neither Agree or Disagree, 4=Agree, 5=Strongly Agree
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

44. **I feel like I can relate with the content I search or view on the Internet.** *
1=Strongly Disagree, 2= Disagree, 3=Neither Agree or Disagree, 4=Agree, 5=Strongly Agree
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

45. **When I use the Internet, I feel like I am "in the zone" ("the zone" is described as a state of heightened focus where you feel autonomous, connected, and competent).** *
1=Strongly Disagree, 2= Disagree, 3=Neither Agree or Disagree, 4=Agree, 5=Strongly Agree
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

Open Response Questions

Please type your responses to the following questions

46. **How do you think your Internet usage habits impact your GPA or SAT scores?** *

47. **Please describe how using the Internet makes you feel about your academic success.** *

48. **What other information would be valuable for me to know in regards to how Internet use affects GPA and SAT scores at Ionia High School?** *

Powered by Google Forms

Appendix B: Qualitative Questionnaire Script

Qualitative Questionnaire Script

Thank you for participating in this post-survey interview. My name is Jonathan Duley and I am conducting research on Internet usage and access, and how that usage and access impacts student achievement of students here at Blueville High School. I will be asking you three open-ended questions. Please feel free to respond openly and honestly. Are you ready to begin?

1. **Tell me about your Internet usage habits.**

2. **Tell me how the time you spend online (including social media, messaging, streaming, etc.) impacts your schoolwork.**

3. **Why do you think you spend the amount of time online that you do?**

Appendix C: Human Subjects Approval Form

Date: 10-27-2019

IRB #: UHSRC-FY18-19-215
Title: A Study of the Relationship between Internet Usage and Student Achievement of Seniors at [redacted] School
Creation Date: 2-5-2019
End Date:
Status: Approved
Principal Investigator: Jonathan Duley
Review Board: University Human Subjects Review Committee
Sponsor:

Study History

Submission Type Initial	Review Type Expedited	Decision Approved

Key Study Contacts

Member Jonathan Duley	Role Principal Investigator	Contact jduley1@emich.edu
Member James Berry	Role Co-Principal Investigator	Contact jberry@emich.edu
Member Jonathan Duley	Role Primary Contact	Contact jduley1@emich.edu

Appendix D: Parental Consent Form

RESEARCH @ EMU

PLEASE RETURN THIS ENTIRE PACKET

Parental Consent Form for Survey Participants

The person in charge of this study is Jonathan Duley. Mr. Duley is a student at Eastern Michigan University and is the principal at [redacted] His faculty adviser is Dr. James Berry. Throughout this form, this person will be referred to as the "investigator."

Project Title: A Study of the Relationship between Internet Usage and Student Achievement at [redacted]
Principal Investigator: Jonathan Duley
Faculty Advisor: Dr. James Berry, Eastern Michigan University

Invitation to participate in research

Your child is invited to participate in a research study. In order to participate, your child must be a senior at [redacted] and must have taken the SAT in the spring of 2018. Participation in research is voluntary. Please ask any questions you have about participation in this study.

Important information about this study

- The purpose of the study is to identify any possible relationship between student achievement and Internet use habits.
- Participation in this part of the study involves taking an online survey that lasts less than 20 minutes.
- Risks of this study are very minimal and only include a very small chance of loss of confidentiality of survey answers.
- The investigator will protect your confidentiality by storing all data in a password protected file.
- Participation in this research is voluntary. Your child does not have to participate, and if you and your child decide to participate, you or your child can stop at any time.

What will happen if my child participates in this study?

Participation in this study involves
- Taking an online survey during school hours at Ionia High School
- The survey will take 20 minutes or less.

What types of data will be collected or accessed?

We will collect data about Internet use habits, age, gender, and overall opinions about the Internet.

What types of student records will be accessed?
We will access cumulative GPA from 9th to 11th grades, SAT composite and component scores, and free/reduced lunch eligibility. No identifiable information will be published. Student IDs will be removed from the dataset.

What are the anticipated risks for participation?

The primary risk of participation in this study is a potential loss of confidentiality, but that risk is very minimal.

Are there any benefits to participating?

You and your child will not directly benefit from participating in this research, however Ionia High School will benefit as it continues to strive to understand the benefits or harms of Internet usage habits in relation to student achievement.

How will my child's information be kept confidential?

We plan to publish the results of this study. We will not publish any information that can identify your child

We will keep your child's information confidential by assigning a random number to your child's information after student achievement and socioeconomic status are aligned. Your child's information will be stored in a password protected file on a password protected computer.

We will make every effort to keep your child's information confidential, however, we cannot guarantee confidentiality. The principal investigator and the research team will have access to the information you provide for research purposes only. Other groups may have access to your child's research information for quality control or safety purposes. These groups include the University Human Subjects Review Committee and the Office of Research Development at Eastern Michigan University.

If, during your child's participation in this study, we have reason to believe that elder abuse or child abuse is occurring, or if we have reason to believe that your child is at risk for being suicidal or otherwise harming themselves or anyone else, we must report this to authorities as required by law. We will make every effort to keep your child's research information confidential. However, it may be possible that we have to release your child's research information. If this were to occur, we would not be able to protect your child's confidentiality.

Storing study information for future use

We will not store your child's information to study in the future.

What are the alternatives to participation?

The alternative is not to participate.

Are there any costs to participation?

Participation will not cost you or your child anything.

Will my child be paid for participation?

Your child will not be paid to participate in this research study.

Study contact information

If you or your child has any questions about the research, you can contact the Principal Investigator, Jonathan Duley, at jduley@[redacted]or by phone at 616-527-8018. You can also contact Jonathan Duley's adviser, Dr. James Berry, at jberry@emich.edu or by phone at 734-487-0255.

For questions about your child's rights as a research subject, contact the Eastern Michigan University Human Subjects Review Committee at human.subjects@emich.edu or by phone at 734-487-3090.

Voluntary participation

Participation in this research study is your and your child's choice. Your child either will be asked independently for assent or his or her dissent will be respected. You and your child may refuse to participate at any time, even after signing this form, with no penalty or loss of benefits to which you and your child are otherwise entitled. You and your child may choose to leave the study at any time with no loss of benefits to which you and your child are otherwise entitled. If you and your child leave the study, the information your child provided will be kept confidential. You and your child may request, in writing, that your child's identifiable information be destroyed. However, we cannot destroy any information that has already been published.

Statement of Consent

I have read this form. I have had an opportunity to ask questions and am satisfied with the answers I received. I give my consent for my child to participate in this research study.

Signatures

_____
Name of Child

_____
Name of Parent

_____ _____
Signature of Parent Date

I have explained the research to the parent and answered all his/her questions. I will give a copy of the signed consent form to the parent.

Jonathan L. Duley
_____
Name of Person Obtaining Consent

3/12/2019
_____
Signature of Person Obtaining Consent Date

Appendix E: Focus Group Consent Form

RESEARCH @ EMU

PLEASE RETURN THIS ENTIRE PACKET

Parental Consent Form for Focus Group Participants

The person in charge of this study is Jonathan Duley. Mr. Duley is a student at Eastern Michigan University and is the principal at Emerson Elementary School. His faculty adviser is Dr. James Berry. Throughout this form, this person will be referred to as the "investigator."

Project Title: A Study of the Relationship between Internet Usage and Student Achievement of Seniors at [redacted]
Principal Investigator: Jonathan Duley, Graduate Student
Faculty Advisor: James Berry, Ph.D., Professor of Educational Leadership and Counseling

Invitation to participate in research

Your child is invited to participate in a research study. In order to participate, your child must be a senior at [redacted] and must have taken the SAT in the spring of 2018. Participation in research is voluntary. Please ask any questions you have about participation in this study.

Important information about this study

- The purpose of the study is to identify any possible relationship between student achievement and Internet use habits.
- Participation in this part of the study involves responding to three interview questions regarding Internet usage habits.
- Risks of this study are very minimal and only include a very small chance of loss of confidentiality of answers.
- The investigator will protect your child's confidentiality by storing all data in a password protected file.
- Participation in this research is voluntary. Your child does not have to participate, and if you and your child decide to participate, you or your child can stop at any time.

What is this study about?

This study examines the relationship between Internet usage habits and student achievement of student at Ionia High School.

What will happen if I participate in this study?

Participation in this study involves

- Participating in a focus group of three students who will be asked three questions about their Internet usage habits.
- The focus group session will last no longer than 30 minutes.

What are the expected risks for participation?

The primary risk of participation in this study is a potential loss of confidentiality, but that risk is very minimal.

Are there any benefits to participating?

You and your child will not directly benefit from participating in this research, however Ionia High School will benefit as it continues to strive to understand the benefits or harms of Internet usage habits in relation to student achievement.

How will my information be kept confidential?

We plan to publish the results of this study. We will not publish any information that can identify your child.

We will keep your child's information confidential by assigning a random number to your child's information after student achievement and socioeconomic status are aligned. Your child's information will be stored in a password protected file on a password protected computer.

We will make every effort to keep your child's information confidential, however, we cannot guarantee confidentiality. The principal investigator and the research team will have access to the information you provide for research purposes only. Other groups may have access to your child's research information for quality control or safety purposes. These groups include the University Human Subjects Review Committee and the Office of Research Development at Eastern Michigan University.

If, during your child's participation in this study, we have reason to believe that elder abuse or child abuse is occurring, or if we have reason to believe that your child is at risk for being suicidal or otherwise harming themselves or anyone else, we must report this to authorities as required by law. We will make every effort to keep your child's research information confidential. However, it may be possible that we have to release your child's research information. If this were to occur, we would not be able to protect your child's confidentiality.

The investigators may ask your child and other people in the group to use only first names during the focus group/interview session. The investigators will also ask your child not to tell anyone outside of the group, other than a

parent, about anything that was said during the group session. However, we cannot guarantee that everyone will keep the discussions private.

Storing study information for future use

We will not store your child's information to study in the future.

How will you collect the information in the interviews?

The interviews will be audio recorded and the audio file will be stored in a password protected digital folder.

What will happen with the audio recording of the interviews?

The audio recording of the interviews will be destroyed immediately after they have been transcribed.

Will my child be paid for participation?

Your child will not be paid to participate in this research study.

Study contact information

If you or your child has any questions about the research, you can contact the Principal Investigator, Jonathan Duley, at jduley@[redacted] by phone [redacted] You can also contact Jonathan Duley's adviser, Dr. James Berry, at jberry@emich.edu or by phone at 734-487-0255.

For questions about your child's rights as a research subject, contact the Eastern Michigan University Human Subjects Review Committee at human.subjects@emich.edu or by phone at 734-487-3090.

Voluntary participation

Participation in this research study is your and your child's choice. Your child either will be asked independently for assent or his or her dissent will be respected. You and your child may refuse to participate at any time, even after signing this form, with no penalty or loss of benefits to which you and your child are otherwise entitled. You and your child may choose to leave the study at any time with no loss of benefits to which you and your child are otherwise entitled. If you and your child leave the study, the information your child provided will be kept confidential. You and your child may request, in writing, that your child's identifiable information be destroyed. However, we cannot destroy any information that has already been published.

Statement of Consent

I have read this form. I have had an opportunity to ask questions and am satisfied with the answers I received. I give my consent for my child to participate in this research study. I also understand that the focus group interviews will be audio recorded.

Signatures

_____
Name of Child

_____
Name of Parent

_____ _____
Signature of Parent Date

I have explained the research to the parent and answered all his/her questions. I will give a copy of the signed consent form to the parent.

Jonathan L. Duley
_____
Name of Person Obtaining Consent

 3/12/2019
_____

_____ _____
Signature of Person Obtaining Consent Date

Appendix F: Assent Form

RESEARCH @ EMU

Assent Form

Introduction

- You are being asked to participate in a research study. Research studies are conducted by scientists or other researchers to answer questions and learn new things.
- The researcher conducting this study is Jonathan Duley, a doctoral student at Eastern Michigan University. His supervisor is Dr. James Berry. In this form Jonathan Duley will be referred to as the investigator.
- The purpose of this study is to determine a relationship between Internet usage and student achievement.
- Please read this form carefully and ask any questions you have before deciding to participate in this study.

Study Procedures

- If you agree to participate in this study, I will ask you to take a survey regarding your Internet usage habits.
- Your participation will last for only 1 survey session, with each session lasting about 20 minutes.
- You may also be asked to participate in a focus group after you take the online survey.

What types of data will be collected or accessed?

- We will collect data about Internet use habits, age, gender, and overall opinions about the Internet.

What types of student records will be accessed?

- We will access cumulative GPA from 9th to 11th grades, SAT composite and component scores, and free/reduced lunch eligibility. No identifiable information will be published.

Risks

- There is always a very minimal risk that people outside of the research study might find out some of your information. The investigator will do his absolute best to protect your information, but it is impossible to guarantee complete confidentiality.
- Your username will be used to align your survey answers to your GPA, free/reduced lunch status, and with your SAT score. All identifiable information will be completely removed before the report is published.

Benefits

- You will not benefit from participating in this study, however future high school students might benefit from this study as we learn more about how Internet usage habits impact student achievement.

Confidentiality

- The investigator will do everything he can to protect your information. However, the investigator cannot guarantee complete confidentiality.

- Your username will be replaced with a random number that will completely remove any identifiable information from your survey.
- All data will be stored in a password protected digital file.
- Because Jonathan Duley is a mandated reporter, he is required to report any information you provide that would indicate a minor is being abused or neglected.

Payments

- There is no compensation for your participation in this study.

Voluntary Participation

- The decision to participate is up to you. You can refuse to participate in this study now or at any time. You can choose to participate and then, at any time during the study, choose to stop participating.
- Your parents will also be asked to give permission for you to participate if you are under 18. Even if your parents let you participate, you can still refuse to participate.
- If you choose to participate and change your mind, you can ask the investigator to destroy all of your information collected. Please be aware that any published information cannot be destroyed.

Contact Information

- If you have questions about this study at any time, you can contact the investigator, Jonathan Duley at [redacted] or jduley1@emich.edu. You can also contact Jonathan Duley's advisor, Dr. James Berry, at 734-487-0255 or jberry@emich.edy with any questions.
- If you have questions about your rights as a research participant, you can contact the Eastern Michigan University Human Subjects Review Committee (UHSRC) at 734-487-3090 or human.subjects@emich.edu. The UHSRC reviews and monitors research studies to make sure that participants' rights are respected.

Assent Statement

- By signing below, you indicate that you have read this form, that all of your questions have been answered to your satisfaction, and that you agree to participate in this research study.

Signatures

Name of Participant (print): _____

Signature of Participant: _____Date: _____

Signature of Researcher(s): Jonathan L. Duley Date: 3-12-2019

Appendix G: Permission to Conduct Study

November 28, 2018

Mr. Ron Wilson, Superintendent

[redacted]

REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT [redacted]

[redacted],

I am writing to request permission to conduct a research project as part of the requirements for the Ph.D. in Educational Leadership at Eastern Michigan University. The research I wish to conduct for the Ph.D. involves a study of the relationship between Internet access and usage habits and student achievement of the class of 2019. The purpose of this study is to determine if there is a statistically significant relationship between access and usage of the Internet and student achievement. This study will be conducted under the supervision of Dr. James Berry of Eastern Michigan University's Leadership and Counselling Department.

I am seeking your consent to conduct a survey of all current [redacted] seniors in order to determine their Internet access and usage habits. This information will then be compared to the SAT scores and cumulative GPAs of those students by statistical analysis using the statistical analysis software SPSS.

I have provided you with a description of the information that will be gathered from the survey instrument. The survey instrument, which has been produced using Google Forms, will be distributed, with your permission, to current [redacted] seniors in the second semester of the current school year via student e-mail accounts.

Upon completion of the study, I will provide [redacted] with a bound copy of the full research report. If you require any further information, please do not hesitate to contact me.

Sincerely,

Jonathan L. Duley, Ed.S.

Instrumentation

A web-based, cross-sectional survey (some with multiple responses) using Google Forms will be administered to students who are in their senior year at [redacted]. The proposed survey will be a two-part survey; part one will determine general access and access types to the Internet: dial-up, cell phone data, wired broadband, WI-FI, desktop computer, laptop, gaming console, or tablet. The second part will determine usage types of the Internet: amount of time spent using various websites, social media platforms, gaming, streaming, etc., and for what purposes those usage habits follow (school related or non-school related). The first part of the survey simply asks for a "yes" or "no" response, while the second part of the survey is comprised of questions such as "How often do you use the Internet for English homework? Answers range from Almost Constantly to Never. The purpose of the survey is to examine the presence of the Internet and Internet usage habits and how those variables impact student achievement (composite/component SAT scores and GPA). Additionally, the variables of socioeconomic status (free/reduced lunch) will be factored in but not included in the survey.

The survey will gather the following information that is pertinent to this study:

User Consent
Username
Age – 16, 17, 18, or 19
Access to the Internet at home – yes or no
Access method – broadband, dial-up, cell phone data
Wi-Fi at home – yes or no
Device Access – smartphone, cell phone that is not a smartphone, desktop or laptop Computer, Gaming Console, Tablet/Slate
Frequency of Device Usage
Access Methods
Frequency of Internet usage
Gender
Internet usage habits (social media, messaging, gaming, etc.)
Internet usage habits (overall homework and by subject)
Multiple questions about opinions regarding the Internet and how it relates to school
Multiple questions regarding how using the Internet affects feelings of competency, autonomy, and relatedness.

While only 15 question subjects are mentioned above, several of the question subjects will have multiple specific questions in their perspective categories. For example, question subject number eleven inquires about usage habits. Individual questions regarding different types of social media usage will be asked (i.e. Facebook, Instagram, Snapchat, etc.).

The conceptualization for the survey is through the examination of previous research from The Pew Research Center's 2015 Topline Questionnaire in their Teens, Social Media & Technology Overview 2015 category (Lenhart, 2015). Additionally, input was gained through a pilot study of groups of 5 students at 3 high schools in [redacted] The survey will be distributed and collected using Google Forms. Since all students at Ionia High School have Google Gmail accounts, distribution of the survey and reliability of survey location will be consistent and accurate.

The composite/component SAT score of students classified as seniors at [redacted] is identified as the dependent variable, while the independent variables are the factors that may contribute to the composite/component SAT score itself: all variables previously listed.

In order to determine if there is a significant relationship between Internet use and student achievement (composite/component SAT scores), and between usage habits of the Internet and student achievement (composite/component SAT scores), the survey results will be analyzed using descriptive statistics and structural equation modeling.

PERMISSION TO CONDUCT RESEARCH AT [redacted] HIGH SCHOOL

Dear Mr. Duley,

I formally grant you permission to conduct a survey of current [redacted] seniors for the purpose of research to be included in your dissertation. Additionally, you may access and use the non-publicly available datasets for your study. This includes grade point average, SAT scores, and socio-economic status. We understand that all identifying information will be removed from datasets prior to publishing the final report/dissertation.

Per [redacted] Board of Education policy, you will need to get parental consent of all minor (under 18) survey-takers before conducting your research.

If you have any questions, please feel free to contact me.

Sincerely,

Ron Wilson
[redacted]