Abstract

The purpose of this study was to explore if there were correlations between parental education, gender and race with U.S. teenagers' high-risk behaviors, positive behaviors and self-efficacy when it comes to digital literacy.

The analysis found a statistically significant effect of gender, race, and parental education on high-risk behaviors, positive behaviors and self-efficacy. Notably, it was found that high-risk behaviors among Black/African American students whose parents have low and high education varied the most. Self-efficacy was higher among all race categories when parental education was high. Positive behaviors increased the most between Native American students with low verse high parental education. The data also suggests that females have lower high-risk behaviors, greater self-efficacy and more positive behaviors as compared to males.

This study contributes to a more recent body of literature around teenage digital literacy behaviors and digital self-efficacy, particularly with its implication for policy and education efforts. It also expands the application of knowledge gap theory.

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Chapter 1: Introduction

From smart phones, to social media, we are surrounded by technology at home, at school and at work. Given the ubiquity of digital technology in today's world, understanding our attitudes and behaviors toward technology are significant. This is especially true for middle and high school students who have grown up with the Internet, social media and all things digital. Technology is pervasive in the lives of today's digital learners (Pew Internet, 2013). The Pew Internet Research's 2015 report found that 92% of U.S. teens report going online daily. Nearly 75% of teens have or have access to a smart phone (Lenhart, 2015). In addition, another 24% of U.S. teens report going online "nearly constantly" (Lenhart, 2015). This substantiates the need to identify not only how well students know how to use these technologies, but what their attitudes and behaviors are when it comes to being prepared to safely use such technology. Students today are nicknamed "digital natives", but how digitally comfortable they are, is precisely what this study seeks to understand (Palfrey & Gasser, 2008; Prenksy, 2001, 2010). According to Prensky (2001), "Digital natives naturally immerse themselves in digital technologies such as computers, cell phones, MP3 players, and videogames" (2001). Tapscott (2009) has referred to students of this generation as "Net Gen-ers," since they are the first generation to have grown up in a digital environment.

The purpose of this study is to measure the digital literacy behaviors and self-efficacy of the Net Gen-er generation based on gender and race and the potential correlation to parents' level of education. Studying these demographic factors is crucial since previous studies have shown that access to the Internet and technology is stratified based on race, and that recently the gender gap in teen online behavior has grown (Lenhart, 2015). Thus, knowledge gap theory is the underpinning theory used to understand the gaps in digital

literacy among various groups of students. While a handful of studies have examined digital literacy skills (Gui & Argentin, 2011; Hargiatti, 2002; Kennedy et al., 2008; Li & Ranieri, 2010; Liff & Shepherd, 2004; Park, 2014; Shelley et al., 2002) this would be the first study of its kind to measure a significantly large sample of teens' self-reported efficacy and behaviors related to digital technology use.

The world of online media and students' abilities to successfully navigate the virtual landscape will be an issue facing American teens both today and tomorrow. Literature on the Internet and online media began with a focus on the issues of access to the actual technology. This has been called the "digital divide." The 'digital divide' describes the gaps between groups that have access to the Internet or to computers, and those who do not. The 'second level digital divide' is a more recent term used to describe the varying competence levels when it comes to skills related to Internet use or Information Communication Technology (ICT). As the following literature review demonstrates, there seems to be a gap between students' comfort level with and ability to successfully leverage technology to its full capacity. The second-level digital divide, or the gap in competence levels when it comes to using the Internet, is the focus of the present study. As the U.S. population becomes even more reliant on the cyber world for jobs and everyday activities, it is crucial to ensure students feel well prepared to complete tasks that require digital competence. As noted above, today's students have tremendous access to technology as they have grown up with it, making them unique from previous generations. But that doesn't necessarily mean they know how to use it well or feel comfortable with all aspects of digital literacy (Gui & Argentin, 2011; Hargiatti, 2002; Kennedy et al., 2008; Li & Ranieri, 2010; Liff & Shepherd, 2004; Park, 2014; Shelley et al., 2002). By studying students' self-reported preparedness to

complete tasks such as managing cell phone usage or establishing privacy settings on social media, we will have a better understanding of the gaps that need to be addressed when it comes to educating this generation of digital natives on real-world digital skills. Not only will this study illuminate where the gaps are in the second level digital divide, it will explore how those gaps vary based on gender, race and parental education.

As a public school educator, the researcher in this study saw first hand how students of different genders, races and educational backgrounds, had noticeably different attitudes and behaviors around technology. As an educator, there were surprisingly few requirements to explicitly teach such skills and attitudes. That, in fact, was the impetus to embark on this study. It was with the hope to capture quantitatively what the researcher experienced qualitatively and then be able to make suggestions for practical applications.

The two research questions that will guide this study are:

Research Question 1: What is the relationship between teenage online behaviors and self-efficacy and their parents' level of education?

Research Questions 2: Do gender and race affect teenage online behavior and/or digital self-efficacy?

Chapter 2: Literature Review

Knowledge Gap Theory

Since this study examines how digitally literate digital natives really are, knowledge gap theory is an appropriate theory with which to understand how digital literacy attitudes and behaviors vary among different groups of students. The knowledge gap hypothesis maintains that when information is introduced into a community, people of high socioeconomic statues will acquire the information more quickly than people of low socioeconomic status, which leads to an increasing gap in knowledge between the two (Shoemaker, Tankard, Lasorsa, 2004, p. 160). This hypothesis originated from achievement gap and economic gap research of the 1960s and 1970s (Shoemaker, Tankard, Lasorsa, 2004, p. 160). As Shoemaker et al. state, "the idea of a gap that needs closing probably helped provide some motivation for researchers to investigate the topic of people acquiring information at different rates" (2004, p. 161). As Gaziano and Gaziano (2010) noted, it is not problematic that people have specialized knowledge based on class. What is problematic is when particular types of knowledge (in the case of this study, digital literacy) that should have universal value do not. The result is a knowledge gap of societal level significance.

In the 1990s and early 2000s, several works tied knowledge gap to gender (Delli Carpini, & Keeter, 1996, 2000; Frazer & Macdonald, 2003; Hayes, 2001; Kenski & Jamieson, 2000; Mondak & Anderson, 2004; Verba et al., 1997). These researchers all confirmed the existence of a significant knowledge disparity between men and women when it came to political knowledge: Men's knowledge of politics is considerably higher. Mondak and Anderson (2004) attribute the gaps to women more frequently answering, "don't know"

where men tend to guess more. The other researchers attribute the gap to political socialization and political learning.

Other researchers have studied factors that reinforce knowledge gaps. Ettema and Kline (1977) found contingent conditions for understanding how knowledge gaps are widened and narrowed (pg. 179-202). These include ceiling effects. Tichenor et al. (1970) described five factors that reinforce knowledge inequalities, one of which was retention of information (which is often correlated with education). The other factors include communication skills, stored information, relevant social contact and the mode of delivery (e.g. print media). Pearson (1993) has studied knowledge gaps on particular subsets of the population in Alaska where rural, small urban and large urban demographics were considered relative to media access and knowledge gaps. Bonafadelli (2005) has also researched knowledge gaps between populations in European countries, but not American adolescents. He found knowledge levels of biotechnology varied strongly between northern European countries like Sweden and Finland who had higher levels of education as compared to southern countries like Italy and Greece. At the micro level, Bonafadelli also found that young, educated, non-religious men had more positive attitudes toward modern technologies and were better informed (p. 50).

A recent study by Eastin, Cicchirillo, & Mabry (2015) applied knowledge gap theory to media expectancies. Their findings confirmed that media expectancies varied across ethnic subgroups and were attributed to the disparities that the knowledge gap hypothesis suggests. Their work, for instance, found that the Hispanic subgroup reported using local and national newspapers more than Caucasians. As their findings relate to the present study its particularly salient that they note "incorporating ethnicity as a key variable rather than controlling for it

allows us to analyze what has commonly been assumed as non-direct or non-purposeful effects within the existent research." The three ethnic subgroups they studied are Caucasian, Hispanic and African American—three groups that this study also examined.

The present study is relevant in that it addresses a major shortcoming in communication research relative to knowledge gap theory—adolescents. Austin (2003) suggests that there is a lack of research on children and adolescents in areas relating to knowledge gap. This study would add to the body of research so that this segment is no longer a neglected audience.

Tichenor, Donohue, & Olien (1970) do cite that the original knowledge gap hypothesis attributed variation in information acquisition to the Socio-Economic Status, or SES, of population segments. Education, along with income and occupation, are used to determine SES status (Brogan, 2009). This study's consideration of parental education levels could be considered an SES variable**.** This would make the variable of this study consistent with studies from other areas of communication that found education to be a significant variable impacting knowledge gap (Brantgarde, 1983; Tichenor, Donohue & Olien, 1970; Wanta & Elliott, 1995).

Digital Literacy Gaps

Literature on digital literacy first began with a focus on access to technology, or what has been coined the "digital divide." The 'digital divide' describes the gap between groups that have Internet access and those who do not. The 'second level digital divide' is a term used to describe the varying competence levels when it comes to skills related to Internet use and ICT. Hargiatti (2002) has researched the second level digital divide and along with other researchers has examined computer literacy and online fluency to assess information seeking

skills. This research is closest in content to this study, which examined students' level of preparedness to engage with different aspects of digital media. Harigatti (2002) confirms that there is a wide range of abilities to locate content online. More recently however, research has pivoted to examine digital literacy skills of various sub groups of the population. These gaps are often tied to demographic factors such as race, age, income and even parental level of education. The literature indicates that there are gaps in what students know about technology and young people's skills performing online tasks.

Parental Education

The concept of parental level of education affecting student achievement is not new. Studies by Bakker et al. (2007), Schlechter & Milevsky (2010), and Spera (2006) all support the positive correlation between parental level of education and academic achievement in children. These studies, however, expand upon past research that demonstrated that the positive correlation is conveyed as much through adolescents' and teachers' perceptions of the importance parents place on their children's education, as it is through direct modeling of behaviors associated with a high value of education. What this study seeks to determine is if there is a correlation between digital literacy behaviors and self-efficacy and parental level of education.

Along similar lines as the knowledge gap hypothesis, other research has coined the term "Sesame Street effect" for television use (Cook et al., 1975). Children from more privileged backgrounds were found to be more likely viewers of educational programming. In terms of Internet and computer use, this could suggest that young people who are already advantaged gain more from the new technology and thus increase the gap between educated families and less educated families. Thus, even when access to home computers is equal,

children who come from a higher SES background experience greater educational gains than do children from lower SES backgrounds (Attewell & Battle, 1999; Livingstone & Helsper, 2007). Although some work has explored this relationship for young children, little related research has focused on young adults or teenagers. The "Sesame Street" idea has not been translated to digital literacy skills. This study will similarly explore how a primary caregiver or parent's educational background correlates to their students' digital literacy.

Park (2014) also gathered data on parental education. His findings indicated a minimal effect of parental background on mobile communication skills. Gui (2007) found that, when age is kept constant, education level and parental education show a relevant impact on the ability to solve complex research tasks on the web. What separates Gui's work from this study is the notion of self-perceived digital literacy skills versus tested digital skill levels. Taken in totality, these studies underpinned the hypotheses around the impact of parental education levels on digital literacy.

Gui and Argentin (2011) confirmed the impact of parental education on disparities in digital skills. Their sample, however, was northern Italian high school students, not U.S. teens (Gui & Argentin, 2011, p. 967). Their methods also varied from this study in that they administered a test to gauge actual operational skills (Gui & Argentin, 2011, pp. 967-968). The present study does not actually test students' digital skills rather it asks teens to self-report whether or not they engage in certain digital tasks. Their work does provide a basis for this study's hypothesis that parental education will be a significant predictor of student's digital literacy. They considered gender and family education 'ascriptive characteristics' that were tested against students' scores on a digital test. Specifically, their results highlighted gaps in digital knowledge between males with highly educated parents and females with

lower secondary or less educated parents. Males from more educated families scored better than the females from less educated families. In fact, controlling for the upper secondary school type, they observed "the gap in digital skills between males from low and high education families falls from 0.39 to 0.13 standard deviations" (Gui & Argentin, 2011, p. 976). The authors attributed part of these results to the type of secondary school the students attended (Gui & Argentin, 2011, p. 976). Male students from lower educated parents attended vocational schools more often than females whose parents also had a lower level of education. Females were found to have attended more traditional four-year schools.

Other articles have looked at how digital citizenship and digital skills should be taught, but haven't quantified the gaps. For example, Orth and Chen (2013) published an article making suggestions for how digital citizenship should be taught with a focus on parent engagement. They believe schools need to build partnerships with parents since digital citizenship is an ongoing practice, with access to technology both in and outside of school.

Gender Gap

Harigatti and Hinnant (2008) linked self-reported Web-use skill to people's online activities. Their sample, however, included males and females ages 18 to 26. They did find that gender was a significant variable in that women are "more likely to report lower levels of understanding about Internet–related terms" than men (p. 613). The authors suggest this could be due in part to the level of education of the male and female respondents. For instance, they also found that respondents with less education (those with less than a high school education, only a high school education or some college education) were significantly less knowledgeable about the Internet than the respondents who had a college degree. It is important to note that the study was conducted via phone survey to 270 households. While it

is nationally representative of the United States, the authors caution about generalizing the results since the sample was small. Other studies related to online skills (Boyd & Hargittai, 2010) reported no gender difference in online activities such as privacy skill sets, while women and older users still tended to fall behind with regard to digital literacy and content-related skill sets (Hargittai, 2010).

The use of digital media on the whole tends to be skewed by gender. Many studies have shown women to use more new technology than men and for different gratifications (Boneva, Kraut, & Frohlich, 2001; Sheldon, 2008). Common Sense Media (2012) found girls more likely than boys to be on Twitter (p. 19). Given that, it could be expected that girls are more digitally literate than boys due to their higher levels of usage. While this study does not seek to understand the reasons for use, there could be a connection in digital literacy skills and frequency of use, which we know varies by gender.

However, there have been conflicting results when it comes to understanding the digital literacy knowledge gap and the role gender plays. In a separate study, Hargittai and Schafer (2006) found that while women self-report lower web-use skills, actual abilities differ from men (pp. 432-448). It is difficult to ascertain if this trend is also true amongst younger women as well, but is important to consider in the context of this study. And still, other studies have shown gender to have a significant impact on the level of self-perceived skills and knowledge of web-related terms (Liff & Shepherd, 2004; Gui, 2007; Hargittai & Hinnant, 2008). Other findings such as Wesier's (2004) indicate that the gender gap in Internet use is diminishing. The development of the exploratory hypotheses seeks to validate whether differences in gender exist among the large sample of teens surveyed in this study.

It should also be noted that Harigatti's first study as well as Livingstone's, were conducted over a decade ago. Their findings, while significant, are quite dated, given how quickly technology and our use of it changes. In Livingstone's 2003 article, she cites several studies that pose gender as a source of inequality when it comes to Internet use. While it is difficult to make direct comparisons with such disparate findings, this study does not want to neglect them.

Racial Gap

The seminal findings from the most recent Pew Internet Research Report in 2015 indicated that access to technology varied by race (Lenhart, 2015). This study sought to confirm that if access to technology varies by race, than so must self perceived efficacy and behaviors when it comes using that technology.

Teenagers' use of mobile communication can be considered another component of the second level digital divide. Yong Jin Park's 2014 study demonstrated that female and non-white teens were better equipped in digital skills and use when it came to mobile-based communication (pg. 1). The teens that participated in this study were very similar in age to those this study seeks to investigate (ages 12-17).

Shelley et al. (2004) conducted a study with a random sample of 167 adults in the Midwest United States. While they were researching attitudes toward technology, they found direct correlations between race and education. They utilized a path model and found that results varied by Non-Whites and Whites. While the context of Shelley et al.'s study encompassed different survey questions and target audience than this study, it is significant in that it compared race and education levels, which this study does seek to investigate. They could not determine the cause for the correlation. Common Sense Media (2012) reported

from their study of over 1,000 teens "the biggest demographic differences in regard to Twitter are ethnic—with African American youths using it more than Hispanic or White teens (p. 19). The reasoning behind this remains to be found. Furlong et al. (2000) found ethnicity-based inequalities in the nature of ICT use. Specifically that it may actually increase rather than decrease inequalities in class, gender and ethnicity precisely because of inequalities in the nature of ICT use (Furlong et al., 2000).

Age

To establish the premise that American teens must be studied and that digital media is an area that should be studied, a review of the current literature on technology knowledge gaps of other age groups was conducted. Common Sense Media (2012) is a popular, independent nonprofit that works with parents and educators to positively impact kids' lives in the world of media and technology. They found that "our nation's children spend more time with media and digital activities than they do with their families or in school, which profoundly impacts their social, emotional, and physical development" (2012, p. 2). Similar to what this study aims to achieve, Common Sense Media has also surveyed students to empirically measure digital literacy levels. Their findings are consistent with other research that students exhibit significant gaps in understanding.

Other organizations have collected empirical data related to digital literacy skills of students at the collegiate level. *The Educating the Net Generation Project* was a published research report aimed at collecting empirical evidence of information and communication technologies (ICT) skills and experiences of Australian university students (Kennedy et al., 2008). The data obtained from 2,588 students showed that more than 80% of students had no experience with podcasting or wiki creation (Kennedy et al., 2008). Additionally, some

students had never heard of podcasting, blogs and social bookmarking (Kennedy et al., 2008). Other research has examined anecdotal accounts of ICT skills (Bennett, Maton & Kervin, 2008). Kumar (2009, 2010) studied higher education students and aggregated data to illustrate how these students use digital technologies. But again, this population is not identical to that which this study seeks to understand. It is helpful to compare that digital literacy has been quantified amongst college students but illuminates the lack for high school aged students and a measurement of attitudes and behaviors. Li and Ranieri (2010) tested the digital competence of Chinese ninth graders and made recommendations for teaching such competencies in China's school system. Teens are important to study because they are the first generation that has grown up with the Internet, smart phones and social media. This study is interested in examining this population for that reason. "Children may be developing greater digital literacy than siblings who are just a few years older" (Oblinger, et al. 2005).

Harigatti (2002) found that young people in their late teens and twenties can navigate online better than people in their thirties or seventies. She urges that policy decisions not just aim to reduce inequalities to access, but invest in the training and support needed to successfully utilize technology so that its useful (Harigatti, 2002). This informed the current study in several ways. First, it offered evidence that indeed younger people use the Internet more and their online efficacy should be studied further. However, it also raises the question, of the possibility of there being differences even among people of the same generation.

Attitudes & Behaviors

The data the present study utilized sought to measure how healthy U.S. teens self-report high-risk behaviors, positive behaviors and their beliefs in their own self-efficacy of

digital skills. Therefore, a review of other studies around digital literacy attitudes and behaviors was conducted.

Currently, there are two related studies to teen attitudes and behaviors around digital literacy (Peluchette & Karl, 2008; Youn, 2008). In 2008, Peluchette & Karl studied college-aged students' attitudes (and uses) toward social networking sites such as Facebook, and also examined gender differences in students' self-reported ratings. This study in particular is relevant to the present study in that it examined attitudes and gender differences. However, as indicated from the other research, the target audience was college students not teenagers. The authors did not state if they used a Likert scale to measure preparedness but rather a survey "developed by the authors, including perceived information appropriateness and accessibility of information" (Peluchette & Karl, 2008, p. 96).

Another study from 2008 by Seounmi Youn, explored teens' attitudes toward online privacy protection and the influence parents had on that attitude. Youn's study found that "teens high in concept-oriented family communication tend to engage in discussion mediation, which, in turn, affects their level of privacy concern. In contrast, teens high in socio-oriented communication tend to have more family rules and surf the Internet with parents. Rulemaking mediation is not directly related to teens' level of privacy concern, while co-surfing mediation is related to their level of concern" (p.362). Once again, while attitudes were a focus, they were specific to online privacy not preparedness to complete various digital activities such as this study examined. What is significant is that parents' mediation style played an active role in affecting the students' attitudes.

Chapter 3: Hypotheses

The above literature review led to the formation of several hypotheses, which predict

a relationship between digital literacy behaviors, self-efficacy and parental education. These

are exploratory hypotheses garnered from the literature, which so far indicate that there is

some correlation between gender, race, parental education and digital literacy. Thus, the

following exploratory hypotheses were developed:

H1a: Students' level of parental education will be correlated with students' high-risk digital behaviors
H1b: Students' level of parental education will be correlated with students' positive digital behaviors
H1c: Students' level of parental education will be correlated with students' digital self-efficacy

H2a: Students' gender will be correlated with students' digital high-risk digital behaviors
H2b: Students' gender will be correlated with students' positive digital behaviors
H2c: Students' gender will be correlated with students' digital self-efficacy

H3a: Students' race will be correlated with students' high-risk digital behaviors
H3b: Students' race will be correlated with students' positive digital behaviors
H3c: Students' race will be correlated with students' self-digital efficacy

H4a: The interaction between students' level of parental education and race will be correlated with students' high-risk digital behaviors
H4b: The interaction between students' level of parental education and race will be correlated with students' positive digital behaviors
H4c: The interaction between students' level of parental education and race will be correlated with students' digital self-efficacy

Chapter 4: Methodology

This study is a secondary data analysis of student survey data collected by EverFi from the 2014-2015 academic year. EverFi is a privately held, education technology company that provides online programming to schools. The program that was used in this study was called "*Ignition-Digital Literacy & Responsibility*" and is available at no cost to public schools across the United States of America. *Ignition* teaches students how to be good digital citizens, understand digital security, recognize cyber-bullying, and manage time online, among many other digital literacy topics. Before students engage with the course content, they must register and verify that they are over 13 years of age so that they may be surveyed. Upon registration, students are prompted to answer questions in a pre-survey. EverFi researchers use survey responses to measure the effectiveness of the course in impacting students' attitudes and digital preparedness. All survey and content modules were developed by EverFi and hosted on its website, www.everfi.com. Special permission was granted to the researcher who is employed by EverFi to use the pre-survey data only for the purpose of this study.

Sampling

Each survey represented a single, unique student taking the online course. The initial data set included 215,029 valid surveys completed by middle and high school-aged students from across the United States of America. All surveys were completed anonymously. Students were defined as the individuals in 9th-12th grade, who have taken the *Ignition Pre-Survey*. Students must be over the age of 13 in order to have completed the *Ignition Pre-Survey*. They self-selected the grade they are in and their age. While the majority of students

will be in 9th-12th grade, the option "middle school/junior high" is also available. Parents were defined in the survey as " primary caregiver (mother, father, guardian)."

Dependent Variables

The initial survey included 26 different survey questions aimed at assessing self-reported digital literacy attitudes and behaviors that were posed to students using a Likert scale of 1-7. A factor analysis indicated three primary groupings of dependent variables, with 20 questions correlating strongest (see Table B in the Appendix).

Based on the primary loadings for each item, the factors were labeled: *High Risk Behaviors, Digital Self-Efficacy, and Positive Behaviors*. Composite scores were created for each of the three factors, based on the summation of the items that had their primary loadings on each factor. Descriptive statistics are provided in Table 1 in the next chapter. The full factor loadings are listed in Table B in the appendix.

1. High-Risk Behaviors

The seven questions that had the highest internal consistency (a =.798) pertained to high-risk behaviors that students engage in online. Higher scores indicated greater levels of agreement with high-risk behaviors. The seven questions were:

3a. Post a picture of myself doing something I probably shouldn't
3o. Write something online or in a text that could hurt someone else's feelings
3e. Open an email attachment sent by someone I don't know
3l. Send a sexually explicit text message or photo to someone I don't know
3d. Post my full name, home address, and date of birth online
3b. Accept a "friend request" from someone I don't know
3c. Meet someone face-to-face after meeting online

These kinds of behaviors are considered high-risk because they can lead to dangerous or unsafe outcomes for students.

2. *Digital Self-Efficacy*

The second variable the data displayed was digital self-efficacy (α =.738). These questions asked students to assess their own efficacy, or effectiveness, in completing digital tasks. Students were asked the following questions to assess their comfort in completing the following:

5e. Create a multimedia blog post or presentation
5c. Set up my privacy settings on a social network
5d. Pick a credible web site to use for research for a school project
5b. Manage my cell phone usage to stay within my plan
5a. Compare computer offers and decide which best meets my goals
5f. Respond if someone posts something hurtful online

These questions are most closely related to ICT skills, only they are self-reported not tested for. The higher the scores indicated that students felt very prepared to completed such tasks such as picking a credible web site, creating a blog post or setting up privacy settings on a social network.

3. *Positive Behaviors*

The third variable the data displayed was positive digital behaviors (α =.681). Unlike the first factor, these behaviors are healthy behaviors that students should be encouraged to display. The higher scores indicated greater levels of agreement with the positive behaviors. The questions that assessed these behaviors were:

3p. Check my phone bill to make sure I am not using too many minutes
3h. Tell an adult if something happens online that makes me uncomfortable
3g. Spend less time online
3j. Frequently change my passwords
3i. Stop an online conversation if someone asks questions that are too personal
2l. I always read online privacy statements of sites that request personal information
2d. I would never post or tag a photo of friends without their permission

Moderating Variables

In addition to the survey questions that were asked, demographic information for gender, race, age and the highest level of education attained by the respondents' primary caregiver were also collected.

1. Gender

Gender was operationally defined as either male or female. Students were asked "what is your sex" and given the option to select "male," "female," "other" with a fillable blank, and "prefer not to say."

2. Race

Race was operationally defined by the seven options students can self-select from. These include Black/African American, White/Caucasian, Hispanic/Latino, Asia/Pacific Islander, Native American Indian/Native Alaskan, Other and Prefer Not To Say. EverFi did not separate race and ethnicity as two categories when surveying students. During the analysis, Race was recoded to exclude "other" and "prefer not to say."

Independent Variable

The independent variable in each hypothesis was parental education level. Low parental education was defined as those who have completed junior high, some high school, high school graduate, technical school graduate and some college. These four options are what students selected from when describing the highest level of education attained by their primary caregiver. High parental education is defined as those that are college graduates or attended graduate school. This was how "high" and "low" parental education levels were determined. Due to the fact that this study is a secondary data analysis, additional SES

information was not collected. Students were only asked to report the highest level of

education reached by any of their primary caregivers.

Chapter 5: Analysis

The final data set from the surveys included 169,922 responses for high-risk behaviors, Initially, the data for this variable was skewed, so a log-transformation was conducted to decrease the variability of the data and make the data conform to the normal distribution. After adjusting for skewness, the minimum score was 0 and maximum score of .85. The mean score for high-risk behaviors was .3070 with a standard deviation of .20609 after adjusting for skewness. For digital self-efficacy, the total responses analyzed were 169,516 with a minimum score of 1.0 and maximum score of 7.00. The mean score was 4.9306 with a standard deviation of 1.18699. For positive behaviors, there were 172,662 responses, with a minimum score of 1.00 and maximum score of 7.00. The mean score for positive behaviors was 4.1140 with a standard deviation of 1.25523.

For parental level of education, there were 164,850 responses. Responses were coded as 1.00 for minimum and 2.00 for maximum (or low and high education levels as described in the previous section). The mean score was 1.148 with a standard deviation of .50. For gender, 174,594 responses were analyzed. The minimum score was 1.00 and maximum score was 4.00. The average score for gender was 1.63 with a standard deviation of 1.63 as well.

Race included 171,704 responses with a minimum score of 1 and maximum score of 5 based on the recode of race categories described previously. The mean score was 2.70 with a standard deviation of 1.690. Age was analyzed using 172,929 responses, where 1.00 was the minimum and 9.00 was the maximum. The mean score was 3.26 with a standard deviation of 1.4783.

Table A.

Descriptive statistics for all variables

Factor	N	Min	Max	Mean	Standard Deviation
High-Risk Behaviors	169,922	0.00	.85	.3070	.20609
Digital Self-Efficacy	169,516	1.00	7.00	4.9306	1.18699
Positive Behaviors	172,662	1.00	7.00	4.1140	1.25523
Parental Level of Education	164,850	1	2	1.48	.50
Gender	174,594	1	4	1.63	1.63
Race	171,704	1	5	2.70	1.690
Age	172,929	1	9	3.26	1.4783

To determine the relationships in the exploratory hypotheses, multiple two-way ANOVA tests were conducted to compare the effect of parental education, gender, and race, on each of the three dependent variables (high-risk behaviors, positive behaviors and digital self-efficacy). An additional interaction between race and parental education was included in the model.

To test hypotheses H1a, H2a, H3a and H4a, a two-way ANOVA was conducted to compare the effect of gender, race, parental education and the interaction of race with parental education on high-risk behaviors.

There was a significant effect of gender on high-risk behaviors [$F(3) = 904.638$, $p = 0.00$] (see Table 1). As Table 1.2 shows, males scored higher (*M = 2.431)* when it came to high-risk behaviors than females (*M = 2.117)*. That means males engage in more risky behaviors online than do females.

There was a significant effect of race on high risk behaviors [$F(4) = 283.655$, $p = 0.00$]. As Table 1.2 shows, Black/African American (*M = 2.632)* and Native American students (*M =* 2.376*)* had the highest mean scores, or riskiest online behaviors. Asian/Pacific

Islander students had the lowest score for high-risk behaviors ($M = 2.318$), followed by White/Caucasian students ($M = 2.632$) indicating that these race categories engaged in high-risk behaviors less than the other race categories.

There was a significant effect of parental education on high-risk behaviors [$F(1) = 168.299$, $p = 0.00$]. Students whose parents had low education had higher high-risk behaviors ($M = 2.535$) than students whose parents had high education ($M = 2.383$). This data suggests that students from more educated households report engaging in less risky behavior online.

The interaction of race and parental education on high-risk behaviors was also significant [$F(4) = .550$, $p = 0.00$]. Post hoc comparisons using the Bonferroni test indicated that the mean score for high risk behaviors among Black/African American students whose parents had low education ($M =. 38$) were significantly higher than Black/African American students whose parents have a high level of education ($M = .35$). This relationship is represented in Figure 1. Similarly, post hoc comparisons using the Bonferroni test indicated a similar trend among Native American teens, where high risk behaviors were greater ($M =. 37$) when parental education was low, and high risk behavior decreased with more highly educated parents ($M =. 35$). Post hoc comparisons using the Bonferroni test indicated that White/Caucasian students whose parents had low education ($M = .33$) fell to $M =. 29$ when parents' education was high. Asian/Pacific Islander students with low parental education had a mean score of $M =.33$ and $M =.29$ with high parental education. Hispanic/Latino students who parents had low education ($M = .34$) scored very close to the same as Hispanic/Latino students whose parents had high education ($M = .33$).

Table 1.

ANOVA between subject-effects for high-risk behaviors

	df	*Mean Square*	*F*	*Sig.*
Gender	3	35.902	904.638	0.000
Race	4	11.257	283.655	0.000
Parental Education	1	6.679	168.299	0.000
Race & Parental Education	4	.550	13.854	0.000

Table 1.2

Estimated marginal mean scores for high-risk behaviors

	Mean	*Std. Error*
Gender: Male	2.431	.005
Gender: Female	2.117	.006
Gender: Other	3.009	.024
Gender: Prefer Not to Answer	2.280	.016
Race: Black/African American	2.632	.010
Race: White/Caucasian	2.376	.008
Race: Hispanic/Latino	2.448	.010
Race: Asian/Pacific Islander	2.318	.016
Race: Native American	2.622	.022
Parental Education: Low	2.535	.009
Parental Education: High	2.383	.009

Figure 1.
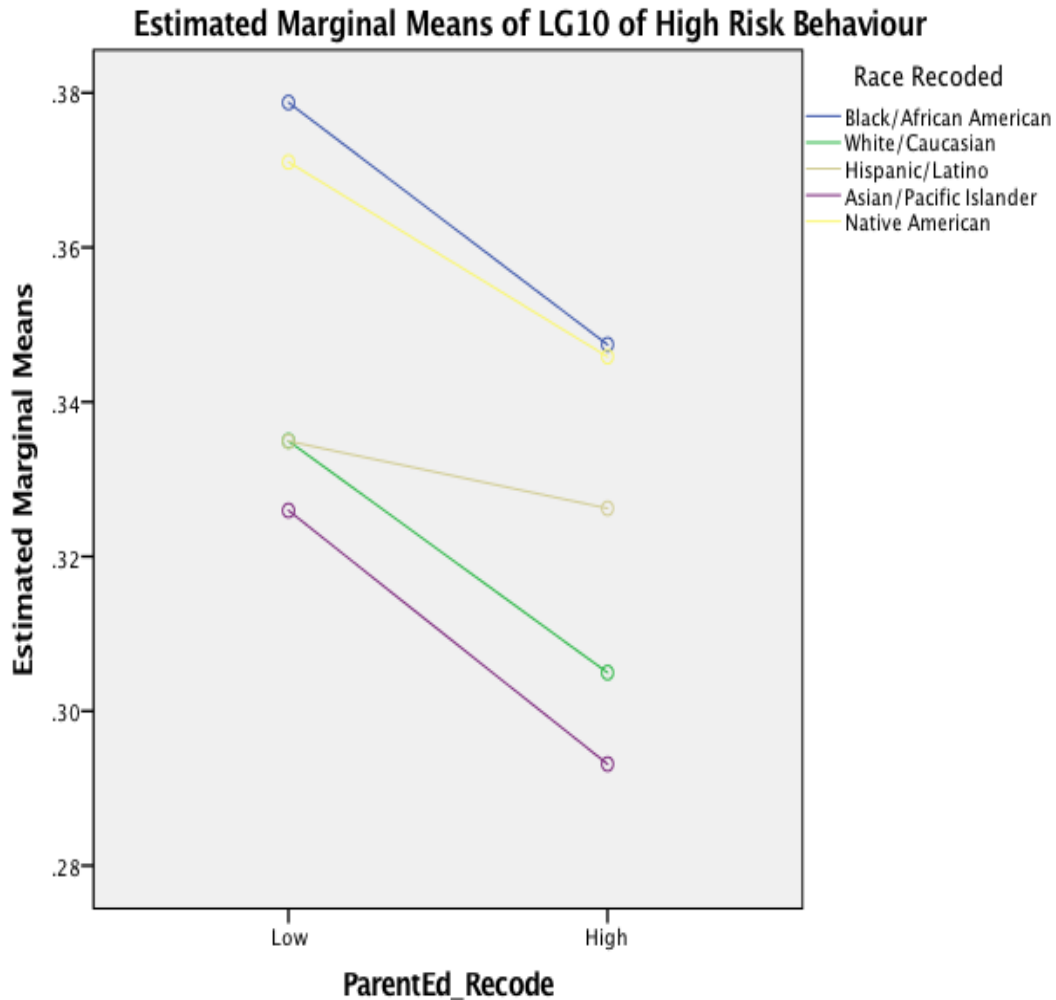
To test hypotheses H1b, H2b, H3b and H4b a two-way ANOVA was conducted to compare the effect of gender, race, parental education and the interaction of race and parental education on positive behaviors. There was a significant effect of gender [$F(3)$ =7 59.886, p = 0.000], race [$F(4)$ =193.500, p = 0.000], and parental education [$F(1)$ =12.425, p = 0.000] on positive behaviors. The effect of the interaction of race and parental education on positive behavior was not statistically significant [$F(4)$ = .751, p = .557).

The data suggests that females (M = 4.247) have more positive behaviors than males

($M = 4.078$). The data also suggests that Native American students ($M = 4.080$) followed by

Asian/Pacific Islander students ($M = 4.078$) had the most positive behaviors of all the race

categories. White/Caucasian students had the lowest scores for positive behaviors of all the

race categories ($M = 3.947$). Students whose parents had low education had lower positive

behavior scores ($M = 4.030$) as compared to students whose parents had high education ($M = 4.069$). This suggests that more highly educated parents have students who report more

positive online behavior.

Table 2.

ANOVA between subject effects for positive behaviors

	df	Mean Square	F	Sig.
Gender	3	759.886	531.780	0.000
Race	4	193.500	135.415	0.000
Parental Education	1	12.425	8.695	0.000
Race & Parental Education	4	1.074	.751	.557

Table 2.1.

Estimated marginal mean scores for positive behaviors

	Mean	Std. Error
Gender: Male	4.078	.006
Gender: Female	4.247	.006
Gender: Other	3.689	.027
Gender: Prefer Not to Answer	4.188	.017
Race: Black/African American	4.067	.010
Race: White/Caucasian	3.947	.009
Race: Hispanic/Latino	4.001	.011
Race: Asian/Pacific Islander	4.078	.017
Race: Native American	4.080	.024

Parental Education: Low	4.029	.010
Parental Education: High	4.072	.010

To test hypotheses H1c, H2c, H3c and H4c, a two-way ANOVA was conducted to compare the effect of gender, race, parental education and the interaction of race and parental education on digital self-efficacy. There was a significant effect of gender [$F(3) = 23.893$, $p = 0.000$], race [$F(4) = 172.782$, $p = 0.00$], parental education [$F(4) = 337.706$, $p = 0.000$] and the interaction of race and parental education [$F(4) = 10.874$, $p = 0.000$]. The data suggests that females have slightly higher self-efficacy ($M = 4.976$) than males ($M = 4.906$). In other words, females self report greater comfort conducting tasks online than do males.

Among the various race categories, self-efficacy was highest among Asian/Pacific Islanders ($M = 5.154$). Hispanic/Latino and Native American students tied for the lowest self-efficacy ($M = 4.878$, $M = 4.878$) meaning they report feeling less comfortable completing certain online tasks than the other race categories reported.

For parental education, students of parents who had low levels of education, had lower self-efficacy ($M = 4.845$). Students of parents who had high levels of education had greater self-efficacy ($M = 5.075$). Again, this data suggests a correlation between parental level of education and self-efficacy, and how well students think they perform when asked about certain digital capabilities.

Post hoc comparisons using the Bonferroni test indicated that self-efficacy for Asian/Pacific Islander students whose parents had low education ($M = 4.83$) increased significantly when compared to Asian/Pacific Islander students whose parental education was high ($M = 5.12$). For White/Caucasian students, those with parents who had low education,

self-efficacy was lower ($M = 4.78$) but increased when parental education was high ($M = 4.97$). Post hoc comparisons using the Bonferroni test indicated Native American students whose parents had low education ($M = 4.65$) increased when parental education was high ($M = 4.83$). Black/African American students with low parental education ($M = 4.66$) increased to $M = 4.75$ with high education, similar to Hispanic/Latino students, whose low self-efficacy means were low when parental education was low ($M = 4.63$) and increased when parental education was high ($M = 4.75$). These comparisons are represented in Figure 3.

Table 3.

ANOVA between subject-effects for self-efficacy

	df	Mean Square	F	Sig.
Gender	3	31.343	23.893	0.000
Race	4	226.658	172.782	0.000
Parental Education	1	443.008	337.706	0.000
Race & Parental Education	4	14.265	10.874	0.000

Table 3.1.

Estimated marginal mean scores for self-efficacy

	Mean	Std. Error
Gender: Male	4.905	.010
Gender: Female	4.973	.006
Gender: Other	5.007	.025
Gender: Prefer Not to Answer	4.964	.0016
Race: Black/African American	4.885	.010
Race: White/Caucasian	5.039	.009

Race: Hispanic/Latino	4.881	.011
Race: Asian/Pacific Islander	5.158	.016
Race: Native American	4.879	.023
Parental Education: Low	4.851	.009
Parental Education: High	5.074	.009

Figure 3.

Estimated Marginal Means of SelfEfficacy
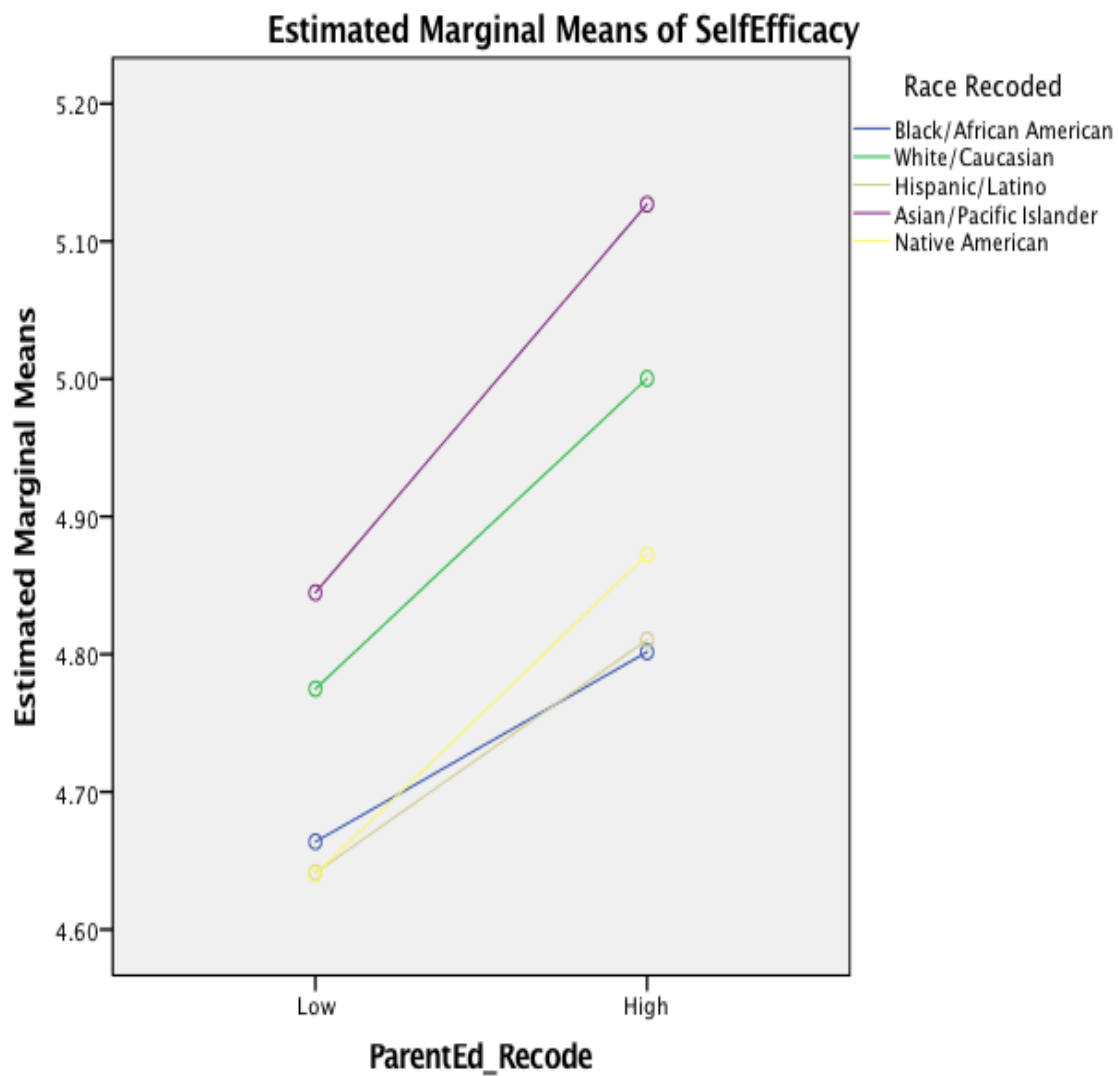
Chapter 6: Discussion

When considering the results as a whole and the application of the knowledge gap hypothesis, there are some interesting points to consider. As the analysis demonstrated, there were significant effects between the interactions of race and parental level of education on high-risk behaviors and self-efficacy of American teens on digital literacy. Since education level is an aspect of socio-economic status, the knowledge gap hypothesis supports this study's findings that more highly educated parents have a positive effect on their children. The data did confirm the previous findings by Attewell & Battle, 1999 and Livingstone & Helsper, 2007, that students from more educated families perform better. This was true across all race categories when it came to self-efficacy and high-risk behaviors. Of particular interest is why certain race categories had more dramatic shifts based on parental education level. Similar to how the Pew Research Center found that access varies by race (Lenhart, 2015), so does positive behavior, high-risk behavior and self-efficacy.

For Black/African American and Native American students, their high-risk behavior was reported as the highest when their parental education was low. Self-reported high-risk behavior dropped significantly when their parental education was high. Are these more highly educated parents talking more often with their children about the dangers of high-risk behavior or safe on-line behavior? Do these students attend schools with explicit digital literacy instruction? Why were the high-risk behaviors of Hispanic/Latino students virtually the same regardless of parental education level? It would appear that parental education level has less affect on this race category's high-risk behavior. These would be questions future research could explore using these preliminary findings.

White/Caucasian and Asian/Pacific Islander students also had greater high-risk behaviors reported for low educated parents, but compared to Black/African American and Native American students, their high-risk behaviors weren't nearly as high. This could be that these students are receiving more information about the dangers of high-risk online behavior regardless of parental education level. Since the data does show a gap, particularly among high risk behaviors and the interaction of education and race, this indicates that an intervention is necessary. The students from low educated families, particularly Black/African American and Native American, report engaging in high-risk behaviors at a rate much greater than their peers from other race categories who are from low educated families. This has potentially dangerous outcomes that could affect these students far into the future. For instance, meeting someone face-to-face or posting personal information online are two high-risk behaviors that could have dire consequences.

While the effect of gender was significant for all three outcomes, it showed that males had a higher high-risk behavior score as compared to females and it was statistically significant. Females, however, had a higher mean score when compared to males for positive behaviors. The data does suggest that females perform better overall; from more positive behaviors, to higher self-efficacy to lower high-risk behaviors. These results provide a valuable and more updated statistic to the conflicting findings from the literature review, which suggested that females lagged behind males in ICT skills. For instance, these findings directly contradict Hargittai and Schafer (2006) who found that women self-report lower web-use skills (pp. 432-448). Given the pace of technology, the findings from this study are more reflective of the current state than what was found in 2006.

The findings around self-efficacy tell us that students think or feel that they are equipped to complete digital tasks. It is of particular interest that for all race categories self-efficacy is relatively low when parental education is low. Asian/Pacific Islander students had the highest self-efficacy for both low and high parental education levels. These statistics can serve as a starting point to explore the "why" behind that trend. Is it a cultural reflection? The fact that self-efficacy is lowest amongst the minority race categories indicates that a gap exists between these students and those who report that they have higher self-efficacy (Whites/Caucasians and Asian/Pacific Islanders). This supports the knowledge gap hypothesis that these students from more educated families have acquired knowledge at a greater rate.

Practical Implications

This study has tremendous implications for future policy decisions and social actions. As both federal and local departments of education decide where to fund technology education, the results of this study provide evidence to support targeting certain segments of the school-aged population. For instance, to address the fact that males engage in more high-risk behaviors than females, a campaign to teach males about the dangers of risky online behaviors could be initiated. In a similar vein, to educate the race categories that reported lower positive behaviors public service announcements or required public school curriculum, could be developed.

The findings of this study counter some of the trends that might determine where funding is currently distributed. It also illustrates that areas that might be upper income or more highly educated are actually in more need of education tools to make students more competent around technology. Given the high performance of females around positive

behaviors, that's one area that the data shows does not need to be improved upon currently, but maintained.

As the literature review illustrated, there is no current research available that has studied parental level of education as a moderating variable on teenage students' digital literacy be it digital self-efficacy, high-risk behaviors or positive behaviors. Therefore, this study also has theoretical implications for contributing to the current body of research that applies knowledge gap hypothesis in modern media and technology. Knowledge gap theory has been applied to uncover differences in media use expectancies as they vary across ethnic subgroups (Eastin, Cicchirillo & Mabry, 2015). As stated earlier by Eastin et al (2015) "the knowledge gap hypothesis goes hand-in-hand with second-level digital divide research as it suggests that simply measuring access and/or exposure to information does not adequately represent the social inequities that may be found within particular individuals or communities" (p. 419). The data from the present study confirms the second-level digital divide and how the intersections of race and parental education have clear disparities in student self-efficacy and high-risk behaviors.

In effect, this study can consider a self-reported assessment of teens' attitudes and behaviors or skills as an outcome of the knowledge gap hypothesis in today's digital era. This is particularly true because of the subgroups by which the data are stratified in the same way as knowledge gap theory.

Limitations

Perhaps the greatest limitation this study faced was that the data had already been collected using a measuring instrument not designed by the researcher. Additional SES variables could have been collected as well as different questions asked. For example,

students could have reported their race and ethnicity separately instead of together. In addition, the main SES variable missing was income. It would be extremely beneficial to collect data around that variable in the future, though also a challenge since many students aren't aware of their parents' income level. Coding the education variable as high and low, grouped those who were moderately educated (some college or technical school for instance) as low education. It could be argued that a third level be coded for, but for the sake of data interpretation binary groups of high and low were used instead.

Self-reporting digital efficacy, high-risk behaviors and positive behaviors could also be considered a limitation. In the future, these factors could be tested for empirically to garner the most accurate scores.

Future Research

Future studies could also include access to the internet and time spent online as two variables to explore further since that data was also collected but did not pertain to the purview of the present study. Additional interactions could also be conducted in addition to the ones this studied focused on (race and parental education).

Perhaps this will lead to other bodies of research that will look at parental levels of digital literacy in relation to their children's. As parents, educators and policymakers work together to determine how digital literacy should be taught, what can be done to address gaps and gain insights about teens in the digital world, this study will inform their decisions. This study can be seen as the first step in starting the discourse on the effects parental education levels have on the digital self-efficacy, high-risk behaviors and positive behaviors of U.S. adolescents.

In conclusion, while there is still a dearth of research on self-reported digital literacy behaviors and the links to parental education, this study provides compelling evidence of the relationships between race and parental education that can serve as a statically significant starting point. With the mounting attention to teen Internet use and how digital literacy is taught and measured both in the education and communications fields, this study will help inform educators, policy makers, and parents alike.

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Appendix A-copy of complete measuring instrument

EverFi's Ignition Pre-Survey Questions
   1.   **Are you 13 years old or older?**

2. How prepared to you feel to complete the following tasks?

	Not at all prepared 1	2	3	4	5	6	Very prepared 7
Compare computer offers and decide which best meets my needs							
Manage my phone usage to stay within my plan							
Set up my privacy settings on a social network							
Pick a credible web site to use for research for a school project							
Create a multimedia blogpost of presentation							
Respond if someone posts something hurtful online							

3. How much do you _agree_ or _disagree_ with each statement below? Click the answer that best matches how you feel.

	I Strongly DISAGREE 1	2	3	4	5	6	I Strongly AGREE 7
I would never post or tag a photo of friends without their permission.							
When I delete a photo no one will ever see it in the future							
When I apply for a job, they will check me out on the Internet.							
Sending sexually explicit texts or photos could put me in jail.							
People cannot become addicted to texting or using the Internet.							
It is my responsibility to protect my privacy when online.							
It is the responsibility of the social network							

	provider to protect my privacy when I'm online social networking.						
I always read the online privacy statements of sites that request personal information.							

4. I*n the next year*, how <u>likely</u> or <u>unlikely</u> is it that you will do the following things? Click on the answer that best matches what you think

	Very LIKELY 1	2	3	4	5	6	Very UNLIKELY 7
Accept a "friend request" from someone I don't know							
Post a picture of myself doing something I probably shouldn't							
Post my full name, home address, and date of birth online							
Open an email attachment sent by someone I don't know							
Spend less time online							
Tell an adult if something happens online that makes me uncomfortable.							
Use a reliable source online to help with my homework							
Write something online or in a text that could hurt someone else's feelings							
Check my phone bill to make sure I am not using too many minutes							
Stop an online conversation if someone asks questions that are too personal							
Frequently change my passwords							
Send a sexually explicit text message or photo to someone I don't know							

5. What is your sex?
   O   Male
   O   Female
   O   Other _____
   O   Prefer not to say

6. Choose one answer that best describes your race/ethnicity.
   O   Black/African-American (non-Hispanic)
   O   Caucasian/White (non-Hispanic)
   O   Hispanic/Latino
   O   Asian/Pacific Islander

- O Native American Indian/Native Alaskan
- O Other _____
- O Prefer not to say

7. What year of school are you in?
- O Middle School/Junior High
- O Freshman in High School (9th Grade)
- O Sophomore in High School (10th Grade)
- O Junior in High School (11th Grade)
- O Senior in High School (12th Grade)

8. How old are you?
__years

9. Describe the highest level of education reached by ANY of your primary caregivers (mother, father, guardian)
- O Not applicable
- O Junior high (middle school)
- O Some high school
- O High school graduate/GED
- O Technical school graduate
- O Some college
- O College graduate
- O Graduate school

Appendix B: Table B. Factor loadings based on a principal components analysis with varimax rotation (sorted by size) for 20 items

	Extracted Factor			
Question	**1**	**2**	**3**	
3a.Post a picture of myself doing something I probably shouldn't	.753			
3o. Write something online or in a text that could hurt someone else's feelings	.688			
3e.Open an email attachment sent by someone I don't know	.684			
3l. Send a sexually explicit text message or photo to someone I don't know	.680			
3d. Post my full name, home address, and date of birth online	.671			
3b. Accept a "friend request" from someone I don't know	.639			
3c. Meet someone face-to-face after meeting online	.620			
5e. Create a multimedia blog post or presentation		.702		
5c. Set up my privacy settings on a social network		.692		
5d. Pick a credible web site to use for research for a school project		.674		

5b. Manage my cell phone usage to stay within my plan		.643	
5a. Compare computer offers and decide which best meets my goals		.635	
5f. Respond if someone posts something hurtful online		.539	
3p. Check my phone bill to make sure I am not using too many minutes			.633
3h. Tell an adult if something happens online that makes me uncomfortable			.626
3g. Spend less time online			.615
3j. Frequently change my passwords			.570
3i. Stop an online conversation if someone asks questions that are too personal			.488
2l. I always read online privacy statements of sites that request personal information			.478
2d. I would never post or tag a photo of friends without their permission			.416