Secondary Student Information Literacy Self-efficacy vs. Performance

Jen Spisak
Longwood University

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SECONDARY STUDENT INFORMATION LITERACY SELF-EFFICACY VS. PERFORMANCE

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

by

Jenifer Ramler Spisak
Master of Arts, Virginia Polytechnic Institute and State University, 1996
Bachelor of Arts, Virginia Polytechnic Institute and State University, 1995

Director: Dr. James H. McMillan
Professor, School of Education
Virginia Commonwealth University

Virginia Commonwealth University
Richmond, Virginia
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Acknowledgment Page

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Abstract

SECONDARY STUDENT INFORMATION LITERACY SELF-EFFICACY VS. PERFORMANCE

By Jenifer R. Spisak, Ph.D.

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

Virginia Commonwealth University, 2018

Major Director: Dr. James H. McMillan, Ph.D.
Professor, Foundations of Education
School of Education

The amount of information in the world has grown exponentially in the last generation. Students often believe that growing up as digital natives means they have advanced information literacy skills. However, school librarians are not seeing evidence of this in their schools. The purpose of this study was to determine if secondary students overestimate their information literacy (IL) abilities, if relationships exist between IL self-efficacy and performance, and if grade level or self-efficacy level changes those relationships. To accomplish this, data were collected from two middle schools and three high schools from a total of 397 students in grades 6, 9, and 12. Students completed the Information Literacy Self-efficacy Scale (ILSES) and the Tool for Real-time Assessment of Information Literacy Skills (TRAILS) to measure their IL self-efficacy and performance. The data were examined as a whole, by grade level, by self-efficacy level, and by a breakdown of combined self-efficacy level and grade level. Analyses involved t-tests, bivariate correlations, and hierarchical linear regression. Results showed that all groups overestimated their IL abilities and that the overestimation increased as self-efficacy level increased. In
addition, correlations provided evidence of a relationship between IL self-efficacy and performance for each grade level and for each self-efficacy level. Another finding was that in all grade levels, higher self-efficacy equated to higher performance, however, for a large percent of students, high self-efficacy equated with lower scores. Grade level did have an effect on the relationship between IL self-efficacy and performance. This effect showed statistical and practical significance when grade level was used as a covariate but only practical significance when used as a moderating variable. Overall, ninth graders showed a dip in performance when compared to sixth and twelfth grades.
Chapter 1: Introduction

Background and Context

According to the American Library Association (ALA), “Information literacy is a set of abilities requiring individuals to ‘recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information’” (American Library Association, 1989, para. 3). Although the Association of College and Research Libraries (ACRL) division of ALA updated its working definition of information literacy in 2016 (ACRL, 2016), the K-12 division of ALA, the American Association of School Librarians (AASL), still uses the original version of the definition for its school populations.

School librarians have taught information literacy (IL) skills in some form since the 1940s. In 1945, a set of standards for school libraries was published by ALA, School Libraries of Today and Tomorrow, Functions and Standards (Douglas & AASL, 1945). One point in these standards focused on the expectations for students to be taught how to be skillful users of libraries and information (Barnett, 2015). This was the first set of standards to place importance on the instruction of information skills by the school librarian. In the 1990s, digitization and the Internet began infiltrating school libraries, and the use of them exploded in the 2000s. In addition, this was a time when social media began its ascent in popular culture (Lamb, 2016). Due to the ease of use of the Internet and the ability to access information in numerous ways, amounts of information have expanded exponentially, and information evaluation has become crucial.

In an age where information and the modes of sharing information are ubiquitous and increasing, citizens require these abilities to make informed decisions. Misinformation and disinformation are commonly found and are often difficult to distinguish from accurate, unbiased
Fake news. During the 2016 presidential election cycle, the term “fake news” increased in use (“Fake News: Search Term,” 2017). As a term, “fake news” has become a part of the world’s political, professional, and social zeitgeist. School librarians have been able to use it as a way to reinforce the need for IL instruction. They understand that there are many different ways people talk about fake news and each is an important element of why IL instruction is important. One way that people use the term “fake news” is to describe news stories put out by the media as factual stories that are not factual. A second way it is used is to describe stories that snowball and are spread through social media as if they are factual causing people to believe them. Cycles of “fake news” have been cited as having had influences on voters. Pew Research Center in December of 2016 published a study that showed even adults often believed and shared these stories through social media (Barthel et al., 2016). These data indicate that IL skills are still lacking as people age.

Self-efficacy. The theory of self-efficacy was introduced by Albert Bandura (1997) and refers to a person’s confidence or belief in their own abilities to perform tasks or accomplish goals. Self-Efficacy Theory (SET) is studied in psychology, education, and many other domains. Bandura found that it is closely related to how much effort a person is willing to put into overcoming a challenge (Bandura, 1997). If a person believes he/she can overcome a challenge, he/she is more likely to work hard to do so. The level of one’s self-efficacy can be a benefit or a hindrance (e.g. when someone overestimates their ability).
**Dunning-Kruger Effect.** Overestimating ability has been studied as The Dunning-Kruger Effect. The Dunning-Kruger Effect, a competency theory coined from the work of Justin Kruger and David Dunning (1999), is a term for the self-inherent bias of a person who believes he/she is more competent at a task or skill than they actually are. This effect has been studied across disciplines and just briefly in studies involving student information literacy. In studies of information literacy in undergraduate students, it has been found that students who score “not proficient” on information literacy measures, often have very high levels of self-efficacy when asked about their perceptions of their information literacy competence (Gross, 2005; Gross & Latham, 2007, 2009, 2011a, 2011b, 2012; Latham & Gross, 2008). When this occurs, students are less likely to try to learn these skills because they already believe they have them. This is a problem in trying to raise a more information literate, democratic society that can navigate the proliferation of information available. The concept of the Dunning-Kruger Effect occurring or not for secondary students, rather than undergraduate students, is underexplored in the research literature.

**Problem Statement**

Not having information literacy skills is a problem in our society from the very young to the very old, and a lack of these skills can impede democracy. In a democratic society, citizens need to be able to make informed decisions in choosing who to vote for and what to support (Delli Carpini & Keeter, 1996; Hochschild & Einstein, 2015). People cannot do this if they aren’t able to evaluate the accuracy or examine the bias in where information comes from. In order to have a more informed society, students need to be taught how to locate, evaluate, and use information so that they can apply these skills as adults. They need to know how to recognize the difference between valuable information and misinformation. Citizens must have IL skills in
order to navigate through the vast amount of information available today. Children need to become adults who can contribute to a strong, knowledgeable democracy and functional society. But, first, students’ lack of IL skills needs to be acknowledged. Students need to be aware that it is essential to be careful with information, and teachers need to realize there is an information literacy deficit in their students.

A recent study published by Stanford University showed that secondary students’ information evaluation skills were weak (Wineburg, et al., 2016). Without IL skills to evaluate and reject false information and use good information, people will have a difficult time navigating this new landscape. Although student self-efficacy was not measured as a part of the study, it established empirical evidence that students did not have strong information literacy skills. In order to avoid making choices based on misinformation, citizens need to begin learning sound research methods and evaluation techniques while they are in K-12 schools. This is not likely to occur if students and teachers mistakenly believe their existing research and evaluation skills are strong. Their high self-efficacy could be limiting the effectiveness and accuracy of their research, and they would not even be aware that they needed improvement. Therefore, more research needs to be conducted to determine if discrepancies do, in fact, exist between students’ belief in their ability to locate, evaluate, and use information and their performance on an instrument designed to measure ability.

People need to have the skills to locate, evaluate, and use information effectively. These skills are more important now because in the Internet and information age, there is not only ubiquitous availability of information but also considerable misinformation and disinformation. Unfortunately, because our current K-12 student body has been raised with technology, and are called “digital natives,” there is an assumption that they also have information literacy skills. In
fact, a study conducted by the European commission found that the more access students had to computers, the more computer and information literate they believed themselves to be (European Commission, 2013). This is especially important as more school systems move to 1:1 computer initiatives thereby increasing student computer use. Technology skills, however, are not the same as information skills; technological proficiency is not the same as being information literate. Being able to use a computer does not mean a student can locate, evaluate, and use accurate and unbiased information.

It is a problem if K-12 students, especially secondary students, believe they have information literacy skills when they do not. If students are unaware that there is a difference between biased and unbiased sources, accurate and inaccurate information, and professional and hoax websites, they will not seek out help in learning how to effectively locate, evaluate, and use information. In fact, they are likely to avoid trying to solve information problems on their own (Kurbanoglu, Akkoyunlu & Umay, 2006). Dunning (2011) elaborates on this idea claiming that a lack of metacognition is part of the reason incompetent people incorrectly perceive their own competence because “the skills or knowledge they need to produce a correct response are often the very same ones they need to judge the quality of that response” (p. 152). These are important reasons to analyze the difference between secondary student information literacy self-efficacy and information literacy performance.

As the Internet age has advanced and the complexity of the issue of bias in both news media and social media has increased, students do not appear to know the difference between information and misinformation, even when their self-efficacy is perceived as high (Gross, 2005; Gross & Latham, 2005, 2007, 2009, 2011a, 2011b, 2012; Latham & Gross, 2008). Consequently, because their self-efficacy is high when performance may be low, students are researching
without information literacy skills. Instead they may be using misinformation, which affects learning and growth.

**Purpose**

The purpose of this study is to provide empirical evidence of relationships between students’ self-perceptions of their IL skills and how they perform on an IL measure. It is also designed to examine grade level as a moderating variable to see if it contributes to the strength of the relationships between secondary student IL self-efficacy and performance. Reasons for using this variable will be outlined in the Rationale section.

**Rationale**

This is important research for numerous reasons. First, it can elucidate whether in fact there are discrepancies between secondary students IL self-efficacy and their IL performance and if the Dunning-Kruger Effect is taking place. The Dunning-Kruger Effect stems from Competency Theory from the field of psychology. Competency Theory states that there is a mismatch between a person’s competency and their self-perception of competency. The Dunning-Kruger Effect, specifically, refers to one direction of the mismatch between competency and self-perception of competency, and that is when a person who is incompetent believes him/herself to be highly competent (Kruger & Dunning, 1999). Library science researchers are interested in examining if Competency Theory and the Dunning-Kruger Effect applies to the domain of information literacy (Clark, 2017; Gross, 2005; Gross & Latham, 2007, 2009, 2011a, 2011b, 2012; Latham & Gross, 2008; Mahmood, 2017). This research is important because students who overestimate their IL skills are unlikely to change or seek to improve their
search habits (Aesaert, Voogt, Kuiper, & van Braak, 2017; Cleary, 2009); therefore, the decisions they make will be made based on misinformation and disinformation.

A second reason this is important research is because people believe being able to navigate and use a computer means that strategies for searching, evaluating and using information are also strong. People need to be aware that although students think they can research and find good information, it does not mean they can. More instruction in the area of information literacy rather than technological skills is needed.

A third reason is because when students research without having IL instruction, they solidify searching and evaluating dispositions that are rooted in ineffectual methods that lead to curating and sharing misinformation. The results of this study could be used to advocate for stronger IL instruction in schools, which will, in turn, increase the knowledge of the populace as those students become adults. The dispositions attained from IL instruction are applicable in school as well as outside of school. IL skills are life skills that people use to make informed decisions and shape their beliefs on policies, politics, and the world as a whole.

Understanding the current state of IL and the discrepancy between student self-perceptions and measured abilities is a first step to advocate for more IL instruction in our schools. More IL instruction can lead to a more informed citizenry, as people learn to make decisions based on accurate, unbiased information. This research study can provide data on what secondary students’ IL skills are versus what they think they are so that their existing skills can be improved and the attainment of real knowledge can occur. When positive IL dispositions are cultivated and established, the growth of a more informed democracy can be facilitated.
Research is needed on the relationships between secondary student IL self-efficacy and their IL capabilities. Currently, research in the area of student IL self-efficacy and performance has been conducted with undergraduate and graduate students. Notable studies in this area have been published by Gross & Latham (2005, 2007, 2008, 2009, 2011a, 2011b, 2012). In addition, Melissa Clark (2017) published a literature review titled “Imposed-inquiry Information-seeking Self-efficacy and Performance of College Student: A Review of Literature” and Khalid Mahmood (2017) published a systematic review of empirical studies covering student overestimation of their information literacy skills. Of these studies, only one involved students in K-12 education, but its purpose was to explore the impact of feedback on information-seeking behavior and student performance, which is not being explored in this study (Timmers, Walraven, & Veldkamp, 2015). For the remaining studies, the population sampled was undergraduate and graduate level students. This shows a need for more research on IL self-efficacy versus performance in the secondary school environment.

This study can add to existing literature on IL skills by measuring the self-efficacy and performance of students in K-12 environments. It can add to the knowledge base on information literacy and secondary students by bringing an awareness of discrepancies between how information literate students think they are versus how they perform. It can be used as a basis for future studies conducted on the effect of IL instruction on students’ ability to locate, evaluate, and use information effectively, and it can impact policy and practice providing evidence for the need for more information literacy instruction and skill development at the secondary level.

**Methodology**

This study uses a nonexperimental, quantitative design with sixth, ninth, and twelfth grade students from two middle schools and three high schools. Data collection involved the use
of surveys to gather self-reported demographics and levels of information literacy self-efficacy. An IL achievement measure was used to gather performance data. The IL self-efficacy measure used was the Information Literacy Self-Efficacy Scale (ILSES), and the performance measure used was the Tool for Real-time Assessment of Information Literacy Skills (TRAILS) for grades six, nine, and twelve. Each grade level has its own version of the TRAILS measure that was developed specifically for that grade level.

Levels of low, medium, and high were assigned to student self-efficacy scores. A comparison of means using a t-test was used to determine whether students overestimate their information literacy skill abilities, and bivariate correlations were used to display the relationships between the levels of self-efficacy and performance (Field, 2013). Regression analyses were also used to examine relationships between the variables. Regression allows for an analysis of the data to look for relationships between the self-efficacy and performance scores (Field, 2013). For the regression, the categorical levels of low, medium, and high were used for self-efficacy, and the continuous variable of the TRAILS performance measure score was used.

In addition to assessing the differences between student IL self-efficacy and performance, regression was also used to examine the effect of grade level as a moderating variable on the IL self-efficacy/performance relationship (Acock, 2016; Hancock & Mueller, 2010). This was to account for the assumption that technology savvy “digital natives” become more information literate as they age, advance through grade levels, and acquire more computer experience. Grade level, rather than age, was examined because the research is cross-sectional, not longitudinal.

**Research Questions**

1. Do students overestimate their information literacy skill abilities?
2. Are there relationships between students’ information literacy self-efficacy and their performance on an information literacy measure?

3. Do the relationships between students’ information literacy self-efficacy and their performance on an information literacy measure differ depending on the level of self-efficacy?

4. Does student information literacy efficacy and/or performance change with grade level? Does grade level moderate the relationship between IL self-efficacy and performance?

**Definition of Terms**

- **1:1 school** – school programs that provide all students in a school, district, or state with their own laptop, netbook, tablet computer, or other mobile computing device. One-to-one refers to one computer for every student ("One-to-One Definition," 2013)

- **Disinformation** – false information deliberately and often covertly spread (as by the planting of rumors) in order to influence public opinion or obscure the truth ("Definition of disinformation," 2018)

- **Fake news** – false stories that appear to be news, spread on the Internet or using other media, usually created to influence political views or as a joke ("Fake news definition", 2018)

- **Information literacy** – a collection of abilities where individuals are able “to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information” (ALA, 1989)

- **Misinformation** – incorrect or misleading information ("Definition of misinformation", 2018)
● Self-efficacy – a person’s confidence or belief in their own abilities to perform tasks or accomplish goals (Bandura, 1997)
Chapter 2: Literature Review

This review of literature will present studies that show the issues surrounding student search techniques and the way they evaluate information. These search techniques are worrisome due to the proliferation of the internet with mass amounts of information, misinformation, and the phenomenon that has become “fake news.” Therefore, studies surrounding this phenomenon will be reviewed as well. The literature review will also include studies that examine the differences between students’ information literacy self-efficacy and performance. In addition to student self-perceptions, the perceptions of students’ information literacy skills by others (i.e. teachers, librarians, professors, etc.) will be included. The literature review will conclude by examining students’ bias and their personal over/underestimation of their IL skills.

Literature Search Strategy

Searches of information for this literature review included using Virginia Commonwealth University (VCU) Libraries’ general holdings search as well as those of numerous databases (EBSCO, ERIC, ProQuest, PsycINFO, etc.), Google Scholar, print resources from VCU Libraries and through inter-library loan, dissertation searches through ProQuest and Scholar’s Compass, and physical searches of the library collections of Virginia Commonwealth University and Longwood University. Keywords included information literacy, evidence-based practice, self-perceptions, secondary, student perceptions, overconfidence, overestimation, underestimation, self-efficacy, fake news, librar*, civic reasoning, web evaluation, information evaluation, competency theory, Dunning-Kruger Effect, measurement, skill assessment, and digital native. In conducting these searches, very little quantitative research was found on K-12 students’ IL self-efficacy versus performance on an IL measure. Some studies were found that
were similar in scope but focused on different areas of research or used undergraduate and graduate students for their samples rather than K-12 students.

**Information Literacy Defined**

Researcher Heidi Julien (2016) notes that one of the difficulties of information literacy is defining it. She notes that people are confused by the term and that there are a number of alternative terms people in the profession use to mean the same thing as information literacy (i.e. media literacy, metaliteracy, transliteracy, etc.). She also notes that many institutions have their own unique versions of defining the term, which can lead to confusion. Due to these issues, it is important to be clear about what is meant by the term “information literacy” in this research study. According to the American Library Association (ALA), information literacy is a set of abilities requiring individuals to “recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information” (ALA, 1989, p. 3). In 2016, the Association of College & Research Libraries (ACRL) updated their working definition of information literacy to the following, “Information literacy is the set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning” (ACRL, 2016, p. 3). However, the American Association of School Librarians (AASL) has not adopted this definition. In addition, the existing instruments that measure secondary student information literacy (IL) were created based on the previously noted definition adopted by the ALA. Therefore, the ALA definition will be used for information literacy for this study. In addition to the definition of IL that the ALA uses, Michael Eisenberg, author of the article “Information Literacy: Essential Skills for the Information Age,” states that “IL is the set of skills and knowledge that not only allows us to find, evaluate, and use
the information we need, but perhaps more importantly, allows us to filter out the information we don’t need” (Eisenberg, 2008, p. 40). This acknowledgement of the need to filter out useless information is just as important a piece of the definition as locating, evaluating, and using information.

Information literacy is a core tenant of school librarianship. In the past, the term literacy simply meant the ability to read and write. Now, in the digital age, with information being shared at previously unfathomable rates, the world has a need for more than traditional literacy; it now has a need for transliteracy (or multiple literacies) (Tyner, 2009). Instilling multiple literacies, especially information literacy, is a core tenant of school librarianship. School librarians have been teaching students information literacy skills for decades, but the importance of these skills has become even greater as the Internet age has advanced and the complexity of the issue of bias in media—both news media and social media—has increased. The methods used to teach these information literacy skills, however, have progressed as information itself has changed.

Kathleen Tyner (1998) writes about the numerous literacies that are present in the world, and she calls for a new definition of the word literacy. It is no longer just alphabetic literacy (reading and writing print text) that exists, but multiple literacies that need to be considered when referring to literacy. As the world of information grows, the idea of literacy is bound to change over the course of time. Some examples of different types of literacies that exist are cultural, numerical, visual, computer, network, technological, media, and information (Tyner, 2009). Due to the plethora of literacies, a more all-encompassing definition of literacy needs to exist. The definition should include multiliteracies where each literacy has a different purpose. Tyner (2009) also suggests that the process of developing literacy is important and that people who
consume information always need to be learning and using new tools to find and send information.

**Importance of and Need for Information Literacy**

**Fake news and the need for information literacy.** During the last few years, the term “fake news” has been used extensively. As “fake news” as a term has become a part of the world’s political, professional, and social zeitgeist, school librarians have been able to use it as a way to reinforce the need for information literacy instruction. They understand that there are many different ways people talk about fake news and each is an important element of why information literacy instruction is important. One way people use the term “fake news” is to describe news stories put out by the media as factual stories that are not factual. A second way it is used is to describe stories that snowball and are spread through social media as if they are factual causing people to believe them. Cycles of “fake news” have been cited as having had influences on voters. Pew Research Center in December of 2016 published a study that showed adults often believed and shared these inaccurate and false stories (Barthel et al., 2016). Without information literacy skills to evaluate and reject false information and use good information, people will have a difficult time navigating this new landscape. As Eisenberg succinctly states, “IL skills are the necessary tools that help us successfully navigate the present and future landscape of information” (Eisenberg, 2008, p. 40).

The term “fake news” has spiked in popularity this decade. Google Trends analyzes the number of Google search queries that are completed for search terms. According to the data, in 2004, the term “fake news” was searched at only 4% of what it was in the beginning of 2017 (“Fake News,” 2017). In fact, according to Google Trends, the frequency of Google searches for the keyword “fake news” increased 97% between the period of June 2008 and February 2017.
and 50% between the shorter period of November 2016 to February 2017 (Google, 2017). This tells us, at the very least, that the awareness of “fake news” has been growing as has people’s curiosity about it.

The term “fake news” covers a variety of forms of misinformation and disinformation found online and in the media. Because of this awareness, it is an excellent time for school librarians to collaborate and work with content teachers to strengthen students’ IL and information evaluation skills in order to prepare them to contribute to an informed society. Although IL encompasses much more than just “fake news,” the heightened awareness of it can open the door for school librarians to address not just information evaluation and fake news, but also the broader range of IL skills.

A recent study published by Stanford University showed that students’ information evaluation skills are weak (Wineburg, McGrew, Breakstone, & Ortega, 2016). Some findings showed that although middle school students could recognize a traditional advertisement and deem it not credible as a news source, they could not do the same with an advertisement written to look like a news story, even if it was labeled “sponsored content.” In the same study, high school students showed they were unfamiliar with social media markings that verified a credible account, such as a blue checkmark on Twitter. Furthermore, it was found that college students were not able to determine the difference between Google results that were from authoritative sources and those that were not (Wineburg et al., 2016).

The Pew Research Center released similar findings (Barthel et al., 2016). This study focused on adults and their awareness of “fake news.” Across party lines, 64% of Americans believe that fake news is causing great confusion in the United States, and another 24% believe it is causing some confusion. Only 39% of American adults feel very confident they could spot a
fake news story online. This seems to refute previous findings that reported IL skill development improves with age (Metzger et al., 2015) and adds to the reasoning for using grade level as a moderating variable in this study. This interaction could help to examine if the Dunning-Kruger Effect improves or changes as students advance in grade level. Beliefs aside, 23% of Americans admitted to sharing a fake news story through social media whether they knew at the time whether it was fake or not (Barthel, Mitchell, & Holcomb, 2016). This shows how easily misinformation and disinformation is shared and spread so quickly. It shows an importance for students understanding when they need assistance in determining the validity of the information they find, which is difficult to attain if they already think they have the skills to do this.

Experts in the field of school librarianship have recently published articles on how lack of IL is a problem, especially that of information evaluation (Gardner, 2016; Jacobson, 2017; Valenza, 2016). They have also suggested that it’s not a simple problem and that many methods should be used to build IL skills in students in order to combat the susceptibility problem they have when it comes to the information found on the Internet.

**Student search techniques and lack of skills.** Today, many resources for research are found using some form of electronic device. Students can find information on computers and devices using databases, websites, eBooks, online journals, online encyclopedias, etc. However, research has shown that students are weak in searching for information and also have difficulty evaluating the information they do find.

In a qualitative study titled “How High-School Students Find and Evaluate Scientific Information: A Basis for Information Literacy Skills Development,” by Julien and Barker (2009), research was conducted on the development of IL skills in high school students. The researchers conducted interviews with students from three different biology classes within one
high school in Alberta, Canada in order to determine their existing level of information literacy. The mandated curriculum for this school system requires an inquiry focus to teaching and learning and to have students learn to evaluate information, ideas, and bias among other information literacy skills. The curriculum also recognizes and states the need for developing Information and Communication Technology (ICT) skills within its students. The population sampled for this study was 11th and 12th grade biology students, and the study gathered data in two ways. The first was to analyze an in-class assignment that centered on students’ process of information seeking, and the second was to conduct student interviews.

Students were asked to perform a research task. The research task outlined a series of metacognitive questions students knew ahead of time they would have to answer such as, “How did you decide which information to use?” Knowing these questions ahead of time could have influenced the way students conducted their research, which would influence the responses. The study may have better measured student practices had the follow up questions not been known ahead of time. However, the data do appear to reflect common student searching attitudes and practices. The research task process was also followed up with semi-structured interviews, which allowed for more elaboration on students’ thoughts, practices, and search strategies. These thoughts and practices are important to consider for the current study because it was also conducted with secondary students. The search techniques and strategies of secondary students help explain the strength of students’ existing levels of information literacy.

The results of this study showed the most commonly used source for students to find information was the Internet. Google was the most commonly used search tool, followed by specific websites such as Wikipedia. Students cited the Internet as being the best way to get research done because it is faster and the information is readily available. Researchers stated that
based on the interviews, student “understanding of critical evaluation criteria such as authority, accuracy, objectivity, currency, and coverage were not evident” (Julien & Barker, 2009, p.15). The study concludes by noting that these skills should be taught in schools before students reach post-secondary schooling in order to “participate fully in 21st century life, in workplaces, or in their personal life context” (Julien & Barker, 2009, p.12).

Findings in another study also indicate that adolescents are turning to the Internet more than ever to find sources of information (Metzger et al., 2015). In order to assess what the researchers call “shortcomings in young people’s information consumption behavior” (Metzger et al, 2015, p. 325), they set out to research student awareness of the issues of credibility associated with online information, their use of web evaluation for these sources, and their accuracy in selecting credible sources. The sample for this study included 2,747 adolescents, ranging in age from 11 to 18, selected randomly from across the United States. Parental permission was obtained as well as demographic data. Based on the number of participants from a demographic area, responses were weighted to correct discrepancies between the U.S. population and the sample. Participants came from different races, genders, areas of the U.S., and socioeconomic levels.

Students were asked to evaluate two hoax websites to determine their believability. The results of this study show that the generational effect of age indicated an increase in student evaluative skills and ability to identify hoax websites. This indicates that age has an effect on students’ ability to evaluate information and that teaching these skills should be done through grade levels with a developmental approach according to age. In order to do this, scaffolding IL instruction should occur throughout school grades (Metzger et al., 2015).
A survey was developed to assess the components of the study. Each question was answered by the participants using 5-point scales with various answers such as ranges from “never” to “very often” and “not at all important” to “very important.” Students were also asked to evaluate two hoax websites to determine their believability. The results of this study show that older students show increased evaluative skills and ability to identify hoax websites over younger students. This indicates that age has an effect on students’ ability to evaluate information and that teaching these skills should be done with a developmental approach according to age. Other researchers also note the importance of teaching information literacy skills and information evaluation beginning at a young age (Asselin & Lee, 2002; Tower, 2000) and continuing through adulthood (Kuhlthau, 2004). This is an important implication for the current study because it indicates that age of secondary students may be a moderating factor in the relationship between secondary student self-efficacy and performance. However, the Metzger study relies on student self-perceptions in determining competence instead of an actual competence measure, and experts have challenged the notion that student self-perceptions are accurate indicators of information literacy competence (Rosman et al., 2015).

In 1997, a study found that research strategies and information literacy instruction need to be integrated into content and curriculum (Warmkessel & McCade, 1997). Another study determined that preservice teachers in college preparation programs reported not receiving information literacy instruction until college (Asselin & Lee, 2002), and yet another study, in 2015, found that students and teachers needed more adequate training in information literacy instruction (Pinto & Sales, 2015).

**Others’ beliefs about student information literacy.** Because younger generations have grown up as digital natives with technology always present in their lives, a common belief is that
these students are more digitally and cognitively competent with technology and have a greater ability to find more information than previous generations because more of it is available through electronic means (AASL, 2014). But technological proficiency is completely different from information literacy, and experts refute this belief stating, “the sheer abundance of information will not in itself create a more informed citizenry” (ALA, n.d., para. 1).

In library science, a major focus of instruction is information literacy. An information literate person is one who can recognize when information is needed and knows how to find, evaluate, and use that information effectively and ethically. With the massive of amounts of information that people are exposed to today, it is more important than ever that students undergo information literacy instruction in order to be able to best find, use, and apply information. The purpose of this study is not to design or explore types of information literacy instruction that are available but instead to show current student information literacy abilities in this area as compared to their perceptions. If there is a mismatch, then more instruction is needed.

Information today is ubiquitous in a way it wasn’t 20 years ago. It can be found in libraries, as it once was, but also in people’s homes through the use of computers, devices, and the Internet. Students of today have grown up as digital natives never knowing of a world where they could only get research information from a library. However, as stated previously, growing up as a digital native does not mean growing up digitally or information literate. Students need to learn to navigate through the plethora of information to select that which is valid, reputable, and worthwhile.

In 2011 Calvani, Fini, Ranieri, and Picci designed a study to explore digital competency and cognitive abilities of adolescents to investigate these theories. The study was conducted in
secondary schools from different regions of Italy. The research sample was comprised of 1056 students in ninth and tenth grade. Of these schools represented in the sample, 58% were from technical institutes, and 42% were from schools aimed at preparing students for academic study.

Calvani, Fini, Ranieri, and Picci employed the use of a questionnaire of 87 questions. Over the course of two years this questionnaire was tested on students from across three high schools as well as being evaluated by a panel of experts. The final questionnaire that resulted from this test period was narrowed to 35 questions that concentrated on three main categories: information and communications technology (ICT) knowledge, high-order cognitive skills, and ethical knowledge. These 35 questions were used in the study.

In the category of ICT, students performed well in the visual literacy and troubleshooting subsets with correct score percentages of 88% and 79% respectively. But when the more cognitive subset of understanding technological concepts was assessed, only 54% of student answers were correct. In the category of high-order cognitive skills, student percentages of correct responses continued to drop. Students responded with 68% correct answers in the subset of organizing and connecting textual and visual data, 61% for information research, and only 43% in the subset of organized structured data. These lower percentages continued in the third category: ethical knowledge. The correct answer percentages for this category were as follows, 61% for staying safe online, 67% for respect on the net, and 44% for understanding social and technological inequality.

The results of this study show that digital native adolescents perform well with the practical and technical aspects of using a computer and the Internet, but their competency level drops significantly when higher cognition and complex tasks are required. The study “shows that even the spectrum of adolescents’ skills in ICT does not include high-level technological and
cognitive skills” (Calvani et al., p. 805). This refutes the commonly held belief that students who know how to work computers also know how to locate, evaluate, and use information.

Information literacy skills are needed in order to make sense of the massive amounts of information, misinformation, and disinformation available. Heidi Julien and Susan Barker (2009) concluded that most students are weak in their ability to seek valuable information and evaluate sources critically. They conducted a study to determine if there were differences between students’ actual information literacy skills, and what people assume they are. The results showed that even when there is a written mandate to teach information literacy skills, students lack them. They showed that teachers often ignore teaching them because there is more pressure placed upon them to teach to the test instead, so they concentrate on teaching facts instead of information literacy skills. The researchers argue that teaching these skills should not be left for college and that technology proficiency does not indicate information literacy. In this day of mass communication and information, teaching information seeking skills is just as important as teaching reading and writing (Julien & Barker, 2009) and more emphasis should be placed there.

In her paper, “Integrating Information Literacy Using Problem-based Learning,” Alexius Smith Macklin (2001) argues that technology proficiency and information literacy are not the same things. Often students and faculty do not see the importance of library instruction because of the assumption that students are already information literate because they grew up using technology (Macklin, 2001). However, knowing how to use a computer does not mean a student knows how to determine what information is needed, locate valuable and reliable information, evaluate it for authenticity, authority, currency, relevance, and purpose, and use it effectively and ethically. These skills are often hard to teach for the simple reason that students already think they have them, so the lesson feels irrelevant to them.
This is also supported by the previously mentioned study, “How High-School Students Find and Evaluate Scientific Information: A Basis for Information Literacy Skills Development,” by Julien and Barker (2009). In this study on information literacy skill development in high-school students, they contend that students should be taught reading, writing, and information literacy skills all through K-12 schooling because of its practical significance in the real world. They believe that if students are taught these skills, they will be better able to research effectively as well as navigate through the world in the information age (Julien & Barker, 2009). In questioning and doubting the idea many faculty and students have that technology proficiency also implies information literacy, they conducted their study to test that theory. They concluded at the end of the study that students did not, in fact, have information literacy skills and that waiting until college to teach them is impractical. Their practical conclusion was that students should be directly taught information literacy skills through all levels of school (Julien & Barker, 2009).

In summary, the amount of information available through a multitude of technological means has changed the way information is consumed. Secondary students currently use search strategies they are familiar with, such as Google, without understanding the weaknesses of these searches or how to look for authority, currency, authenticity, purpose, and relevance in an information source. Because these students have grown up with technology, teachers and parents often believe they are more capable in conducting research; however, being technologically proficient is not the same as being able to successfully implement effective search strategies and information literacy skills.
Student Self-Efficacy of Information Literacy

Researchers Melissa Gross and Don Latham of Florida State University have conducted many studies on student IL (Gross, 2005; Gross & Latham, 2007, 2009, 2011a, 2011b, 2012, 2013; Gross, Latham, & Armstrong, 2013; Latham & Gross, 2008, 2013). However, in their studies, samples were drawn from undergraduate and graduate students in college and university populations, not K-12. In a qualitative portion of one of their studies, Latham and Gross conducted interviews with 20 second-semester first-year students in college. In being asked to reflect back on their experiences with information literacy in K-12 education, 17 (85%) of the students viewed their information literacy skills as being self-taught (Latham & Gross, 2008). In a quantitative portion of the study, 51 first-semester freshman completed the Information Literacy Test, which is a measure of information literacy skills created at James Madison University (JMU) in a collaboration between JMU’s Center for Assessment and Research Studies (CARS) and JMU Libraries (Madison Assessment, n.d.). Students were also asked to complete a pre-ILT survey and a post-ILT survey asking the question, “How have you learned what you know about finding information (either in a library, on the Internet, or by other means)?” The results of this study reflected that students with lower level skills were self-taught or had learned from peers, while those who were the most proficient in information literacy skills were taught by school librarians and teachers (Latham & Gross, 2008).

The results of these studies on undergraduate students reflecting back on their K-12 experiences with information literacy are indicators that research needs to be conducted on students that are currently in K-12 populations. Research needs to be conducted on the reasons why information literacy and information evaluation need to be taught in K-12 schools regularly as this topic is underexplored and lacking in the literature. In addition, more research needs to be
conducted on K-12 school librarians’ perceptions of the importance of these skills, and what they are currently seeing in their school libraries. Understanding what the status of information literacy is and how important it is can help determine how information literacy can be increased enabling citizens to become a part of a more informed society.

**Competency Theory and the Dunning-Kruger Effect.** “Undergraduate Perceptions of Information Literacy: Defining, Attaining, and Self-Assessing Skills,” a study conducted by Melissa Gross and Don Latham (2009), examines three categories of perceptions of first-year college freshman pertaining to information literacy. The theoretical framework guiding this study is based on competency theory, which comes from the field of psychology. Competency theory states that below proficient performing students will overestimate their own abilities with a task, skill or assignment, and that high performing students underestimate their own abilities. The authors wanted to test this theory. But equally important to them was to ascertain how students are defining information literacy, claiming it is difficult to self-assess yourself on a topic you can’t define. They also wanted to investigate students’ perceptions of how they attain(ed) their information literacy. And finally, they wanted to research how students self-assess their information literacy skills, and if a quantitative measure could verify or refute the students’ beliefs.

The review of literature for the study elaborates on competency theory for students with low-level skills. It discusses the Dunning-Kruger effect, which states that people who are unskilled often overestimate their competencies. The study is weak in elaborating on the facets of Competency Theory for average/proficient learners and learners who are highly skilled. In fact, only one participant fell into the category of not proficient. Expanding on the other aspects of competency theory would give a better basis for the study’s findings. The literature review
could also have benefited from additional studies on information literacy as most of the studies referenced were also conducted by Gross and Latham.

Their study used 14 research questions, which were broken into three categories: defining, attaining, and self-assessing information literacy. The majority of the data were collected in qualitative, semi-structured interviews with a minor quantitative piece, an information literacy competency measure (ICT), collected a week after the qualitative interviews. The quantitative competency test was only used to verify whether students’ self-assessments were accurate. An email campaign targeted the top 10% of the freshman class (determined by GPA and SAT or ACT scores) and the bottom 10% of the class. The goal of using this method was to try to get students who were proficient and not proficient in information literacy skills. This method could have benefited from a review of literature analyzing this relationship. There is no evidence provided for why a relationship would exist between GPA and SAT or ACT and information literacy competency. In fact, the researchers state that previous research has shown that there isn’t a relationship between these variables. Without a basis in literature, it is difficult to determine why this method was used to find participants.

Twenty participants were selected for the sample. Seventeen of the participants (85%) were in the top 10% of the class while only three (15%) were in the bottom. (If the reasoning was to try to get participants from both groups, stratified sampling would have been a better way to assure variability.) Unsurprisingly, 18 of the 20 participants scored “Proficient” in information literacy competency using the ICT, one scored “Advanced,” and one scored “Not Proficient.”

The semi-structured interviews that provided the qualitative method of data collection included one participant at a time and two researchers. One researcher was conducting the interview and the other was recording it. Throughout the data collection process, the researchers
would discuss each interview as it concluded and would use the information gathered to inform the next interview. An interview “schedule” was used so that the researchers could go off script. A stricter interview protocol would be recommended in order to lead to more cohesive data being collected. A pilot test of an unknown number of graduate students was conducted on the interview “schedule,” although the same questions would not necessarily be asked to all participants due to the semi-structured setup.

The findings were broken into the three perception categories for information literacy: defining, attaining, and self-assessing. It was found that students do not know what information literacy means. They had not heard of the term, and they did not see it as an important process to learn. Students report that they generally obtain their information from other people who are around them at the time information is needed, the Internet, and being “self-taught.” As far as self-assessing, all students in the sample were confident in their information literacy behaviors. The information literacy competency test showed these beliefs were accurate. This is the first time the study mentions the other aspects of competency theory that discuss average or proficient-level performing students. It notes that competency theory generally finds that students performing at this level usually self-assess correctly. The study did not report if the students receiving “Advanced” and “Not Proficient” also assessed correctly.

This study can be improved by expanding on all aspects of competency theory in the review of literature instead of solely focusing on low-skilled learners, especially if the sample does not contain a strong percentage of low-skilled learners. Stratifying the sample to include multiple proficiency levels of students and strengthening the interview protocol would improve consistency in data collection procedures, and, therefore, credibility.
One of the many studies by Latham & Gross on information literacy, “What’s Skill Got to Do with It?: Information Literacy Skills and Self-Views of Ability Among First-year College Students” (2012), focuses on four main research questions.

1. Based on an objective test of IL skills, what level of IL skills do first-year college students demonstrate?
2. Is there an association between scores on an IL skills test and students’ estimates of their IL skills?
3. Do students with below-proficient IL skills demonstrate inflated estimates of their performance on an IL skills test?
4. Do students with below-proficient IL skills adjust their self-estimates of performance in response to IL skills testing?

The study does a good job demonstrating how the ideas for the research questions stemmed from competency theory from the field of psychology. This theory states that there is a mismatch between a person’s competency and their self-perception of competency. Within the theory, the researchers are most interested in examining the Dunning-Kruger Effect of competency theory and if it applies to the domain of information literacy in college students. The Dunning-Kruger effect focuses on one direction of competency theory: Those who are incompetent believe themselves to be highly competent. In essence, the researchers are interested in determining if students have an overestimated sense of competence of their information literacy skills.

In this study, surveys are used to quantitatively collect data from first-year community college students. Two community colleges, one urban and one rural, were used as the locations for selecting participants. Students were recruited as participants from these two community
colleges in 2009 and again in 2011. There were 288 student participants from School 1 and 290 students from School 2. Two information literacy self-efficacy surveys were given: one as a pre-test to the ILT and one as a post-test to the ILT. This was an effective way to determine if taking the test influenced student self-efficacy. Demographic information was also collected in the surveys as well as a question that asked how students had learned their information seeking knowledge. This allowed researchers to be able to investigate students based upon those who received formal information literacy instruction versus those who did not.

After coding and analyzing data in SPSS, the key findings were summarized and organized by research question. Research question one investigated what level of IL skills first-year community college students could demonstrate. In School 1, 274 of the 288 participants (95.1%) scored below proficient on the ILT, and in School 2, 233 out of 290 participants (80.34%) scored below proficient. The mean scores were 44.44% and 49.39% respectively for Schools 1 and 2. An individual score of 65% was considered proficient and above 90% indicated an advanced score. No participant in either school scored in the advanced range on the ILT.

Research question two investigated whether there was an association between scores on the ILT and students’ estimates of their own IL skills. This was investigated using the pre-test survey of self-perceptions of information literacy ability as well as the post-test survey. Although the post-test self-perceptions were lower than the pre-test self-perceptions, both scores were drastically higher than the actual ICT scores. For School 1, the mean score was 44.44% while the pre-test self-perception survey indicated students thought they would score 75.62% and the post-test indicated 68.59%. In School 2, participants had a mean score of 53.74% while the pre-test indicated participants believed they would score 78.16% and the post-test indicated 72.82%. These data also answered research question three, which asked if students with below-
proficient scores on the ILT would overestimate their IL skills, and research question four, which asked if students scoring below-proficient would adjust their self-perceptions of their ability after taking the ILT. The results showed that there was a high level of overestimation before taking the ILT, and, although, they adjusted a mild amount after taking the ILT, students still drastically overestimated their IL skills on the post-test self-efficacy measures as well.

In analyzing these data, the researchers discussed the problems associated with having an inflated sense of self-efficacy. If students think they are competent at something, they don’t know to ask for help. In a world where information is ubiquitous, information literacy is important. They also noted that it is apparent that students are not receiving the IL training they need to have in K-12 education before going to college. One facet of this study that could improve credibility would be to look at the way they tested how students would rate their own abilities as compared to others. This was an important part of both the pre-test and post-test surveys; however, the analysis compared this estimation to their mean ILT score rather than their actual percentile of how well they scored compared to others. It doesn’t make sense to run a t-test and a correlation calculating Pearson’s $r$ when one variable is the student’s belief in how much better they will score than their peers, and the other is the mean ILT score. If this calculation is to be run, it should be against how much better they actually did (or did not) perform in comparison to their peers.

These studies provide for rich data on the existence of Competency Theory and the Dunning-Kruger Effect pertaining to information literacy self-efficacy and competence. There are limited numbers of studies analyzing Competency Theory and the Dunning-Kruger Effect in library science, especially pertaining to information literacy. Due to the results of existing studies that show the relationship between IL self-efficacy and performance differs based on level of
self-efficacy, it is a variable that warrants further exploration. In addition, existing studies, such as those previously mentioned have been conducted with undergraduate and graduate students of higher education. This warrants the need for research in the area of secondary education, as all current studies have taken place in the tertiary environment. It is important to determine if the Dunning-Kruger Effect exists in younger students as well.

**Discrepancies & Overconfidence.** In interviews with undergraduate students reflecting back on their experiences with IL in K-12 education, many students view their IL skills as being self-taught (Latham & Gross, 2008). These interviews also reflected that students with lower level skills were self-taught or had learned from peers, while those who were the most proficient in IL skills were taught by school librarians and teachers. The same researchers, in a later study (2011), found that first-year undergraduate students who scored low on IL measures substantially overestimate their IL skills both before and after a measurement of their actual IL skills is conducted. The study also found that overestimation still occurs for students who score proficiently on IL measures but it is to a lesser degree.

Research on student information literacy self-efficacy vs. performance has been reported in a number of studies for students in higher education (Gross & Latham, 2007; Gustavson & Nall, 2011; Molteni & Chan, 2015). Each of these studies conclude that students tend to overestimate their information literacy skills. In fact, Moore and Healy (2008) found that the easier students perceive their topic to be, in this case information literacy, the more they overestimate their skills and competence.

In 2011, Gustayson and Nall published their study “Freshman Overconfidence and Library Research Skills: A Troubling Relationship?” In this study conducted at East Carolina University, 377 first semester college freshmen were surveyed on their confidence level with
library research skills. Of this sample, 374 students were between the ages of 18 and 24. The confidence scale was followed up with a skills test that measured their actual library research skills. Convenience sampling was used as surveys were administered through introductory English classes for first semester students. A limitation of this sample, however, is that many students place out of introductory English if they scored a 3 or higher on the A.P. exam or if they successfully score high enough on the CLEP placement exam, so they would not have been represented in the sample.

The library confidence scale was designed by the researchers and asked five questions, four of which covered demographics. The main question was “How confident do you feel doing library research? On a scale from 1–5, rate your confidence doing library research” (Gustayson & Nall, 2008, p.305). A rating of 1 equated to Not confident and a rating of 5 equated to Very confident. Of the 377 respondents, 44 (12%) selected 1 (not confident), 102 (27%) selected 2, 153 (41%) selected 3, 66 (18%) selected 4, and 12 (3%) selected 5 (very confident). The average score on the library skills component of the study showed that those who selected 1 (not confident) scored an average of 45%, 2 averaged 49%, 3 averaged 51%, 4 averaged 50%, and 5 (very confident) averaged 50%. When correlating confidence level and ability test scores, the researchers found a 0.12 correlation that was not statistically significant. No effect size was reported.

The results of the freshmen overconfidence study (Gustayson & Nall, 2008) could have been affected by the confidence scale only having one question. “Library skills” is not defined and the one question doesn’t cover any actual library skill. The study also did not mention what tests were used in this study or how the conclusion was attained. The results also differ from
previous studies from other researchers (Gross, 2005; Gross & Latham, 2007, 2012). Due to the inconclusive results, more study is needed in this area.

In 2015 a study was published on the overconfidence of students when examining their level of IL self-efficacy and actual ability (Molteni & Chan, 2015). In this study researchers used a sample of undergraduate and graduate students studying in the field of health sciences. The required introductory writing course for this field begins the semester with an introductory library lesson. The researchers used a voluntary sample from these classes to measure IL self-efficacy and library skills ability before the introductory library lesson took place. Of the 325 eligible students, 279 elected to participate. Of the 279 students who participated, 79% were 18-24 years old, 11.3% were 25-29 years old, 6.7% were 30-39 years old, and 2.5% were 40-49 years old. Most participants were juniors (77.8%), followed by 18.8% seniors, 2.5% sophomores, and 0.8% graduate students.

Students were asked to rate their confidence in their ability to successfully perform four different tasks. First, a series of 13 demographic questions were asked. Then a scale was used to measure student confidence in four areas. The ratings of Excellent, Very Good, Good, Fair, and Poor were used. The four tasks were (1) differentiating between popular and scholarly materials, (2) distinguishing between primary and secondary articles, (3) revising a database search, and (4) identifying the specialized databases specific to this content area. Following this scale, students were asked to answer seven multiple choice questions designed to measure their actual skill in these four areas. In addition to the correct answer and answer detractors, each question had an option of Not Sure. This was to maintain a choice of low student confidence. Descriptive statistics using bar graphs were used to display data.
No correlations or statistical relationships were examined. Some differences the researchers discovered in looking at the data were that although students who rated themselves “Good,” “Very Good,” and “Excellent” usually received higher scores than their peers, they did not score high enough to be considered proficient in the task. In fact, they consistently selected the same percentages of wrong answers as those who rated themselves lower. And, in three of the four tasks measured, those rating themselves as “Poor” scored fewer incorrect answers than their counterparts. This, however, can be attributed to the “Not Sure” option. In looking at the data, the researchers determined that confidence level does not appear to be able to gauge proficiency or ability (Molteni & Chan, 2015). This study could be improved upon by using statistical tests to analyze data and by studying students in a K-12 environment as well.

Studies examining K-12 students information literacy self-efficacy and ability could not be found. The studies on this topic that are published sample students in higher education, not secondary education. There are studies that publish research on secondary student self-efficacy and performance with other constructs but not with information literacy. For instance, in Belgium, researchers studied sixth-grade student perceptions of ability versus performance; however, these studies researched students’ Information and Communications Technology (ICT) skills rather than IL (Aesaert et al., 2017). While ICT skills are the ability to use a computer and the Internet as tools (Aesaert et al., 2017), IL skills are the ability to locate, evaluate, and use sources effectively and ethically (ALA, 1989). ICT focuses on being able to “work” technology tools such as a computer, a device, the Internet, a search box, etc., but IL focuses on the processes used to find, evaluate and use information as knowledge sources. In 2003, Tsai and Tsai also found that students with lower ICT self-efficacy are less likely to have strong strategies for processing online information.
The Belgium study was conducted with 378 sixth grade students from 58 primary schools on ICT self-efficacy versus competence (Aesaert et al., 2017). A stratified sample was used in order to represent students across all of Belgium. To measure ICT performance, the researchers used a shortened version (9 items) of an ICT measure they had developed and tested three years prior (Aesaert, van Nijlen, Vanderlinde, & van Braak, 2014). Student answer choices were scored and reported dichotomously (1 = correct, 0 = incorrect). The nine items were selected because they paired with the ten items on the ICT self-efficacy measure. The ICT self-efficacy scale was also designed three years prior by two of the same researchers conducting the study (Aesaert & van Braak, 2014). The ICT self-efficacy scale, a four-point Likert scale, used a scale of 1 = not good at all, to 4 = very good.

The researchers used descriptive and correlational analyses to determine whether or not sixth grade students over- and/or underestimated their ICT scores. The results indicated that these “primary” students tended to overestimate their ICT capabilities but only to a slight degree; they did not overestimate by much. Students tended to rate their self-efficacy of ICT skills high (M = 3.44 on the 4-point scale). An accuracy scale was used for the performance measure (0 = complete inaccuracy, and 3 = complete accuracy). Students mean score on this scale was 2.06. However, in the area of digital processing and communication, students mean score was 0.90. The Aesaert et al. study (2017) found that higher performing students on the ICT capability measure were more likely to underestimate their abilities. This shows that the direction of ICT self-efficacy (whether over- or underestimating) can change depending on actual ability. So, lower performing students overestimate their skills while higher performing students underestimate their ICT skills. Of the nine ICT competence items that were measured, only three overlapped with IL skills: 1. Students can configure a search engine to improve an intended
search for figures or other media files, 2. Students can judge the reliability of digital information, and 3. Students can generate a new information product by comparing and synthesizing information that was found elsewhere. The remaining six ICT competence items pertained to how to work technology and could not be used as an instrument for measuring IL.

The absence of research comparing secondary students’ IL self-efficacy and performance indicates a need for study in this area. The Belgium study explores over/underestimation in students but doesn’t explore it in the area of information literacy. Numerous studies in the area of IL self-efficacy and performance have been conducted in higher education but not in secondary education. This area should be studied more so that librarians will be able to design information literacy instruction to best meet the needs of students before they reach post-secondary levels of education. Previous studies show that age may affect the relationship between IL self-efficacy and competence. Because of this, the moderating variable of grade level will also be explored in this study (Calvani et al, 2012; Gross, 2005; Gross & Latham, 2005, 2007, 2009, 2011a, 2011b, 2012; Kruger & Dunning, 1999; Latham & Gross, 2008).
Chapter 3: Methodology

Design & Participants

Design. This non-experimental quantitative investigation examines the relationships between secondary students’ information literacy self-efficacy and competence. It further examines interactions on these relationships when the modifying variable of grade level (6, 9, 12) is examined. This design is appropriate to address the research questions because it allows examination of relationships between self-efficacy and competence as well as examining a modifier that may have an effect on the relationships.

Population. The population for this study is students in grades 6, 9, and 12. The rationale for using this population is that the competency measure being used in this study, the Tool for Real-time Assessment of Information Literacy Skills (TRAILS) is designed for these specific grade levels. In addition to the measure, sixth and ninth grades were selected because they are first-year students in middle and high school. Because they were assessed at the beginning of the school year, they were coming in fresh to their middle and high schools without having previous information literacy instruction in that school. Testing these students gives baseline data reflecting beginning knowledge. Twelfth graders were also used since they are in their final year of high school. This provides a comparison for the beginning baseline scores of the sixth and ninth grades and allows grade level to be more fully explored as a modifier.

Sampling and Participants. Two types of sampling were used. First purposeful sampling was used to identify schools. Two middle schools for sixth grade and three high schools for ninth and twelfth grades within central Virginia were selected. Schools with diverse socio-economic statuses (SES) were selected. Due to studies showing correlations between SES
and achievement (Sirin, 2005) and SES and self-efficacy (Karaarslan & Sungur, 2011), it is believed that establishing this heterogeneity of the sample would increase the variability of responses within each school.

A non-probability convenience sample of students nested within classrooms was selected. Each respective school librarian helped recruit participants within the school and also sent home an opt-out form with each participant a week before the administration of the study, which would allow parents to opt their child out of the research study. Each librarian collected the original data with student names so that they could use the information to better design information literacy instruction in their schools. They used it to assess students’ strengths and weaknesses and to focus their IL instruction on the weaknesses. Each librarian was able to use the self-efficacy results for their own purposes in showing students proof of why they need instruction in this area. They also have the future option to do follow-up testing of their students at the end of the year to show any improvement and growth they have attained in their IL skills development over the course of the year.

**Instrumentation**

**Self-efficacy measurement.** Very few instruments could be found to measure student information self-efficacy. Although *infoCompetences*+, a digital tool designed by researchers at the University of Quebec, initially seemed promising, very little information can be found on the tool (Basque, Ruelland, & Lavoie, 2007). Even the tool itself is no longer available. The only existing evidence of it appears to be the report of its development and testing process. However, other tools were found that showed reliability and validity.
Information Competency Assessment Instrument (ICAI). Rodney K. Marshall created an instrument to measure information competency in 2006. His instrument was based on self-reporting from students on their skills (Marshall, 2006). The resulting scale contained 40 statements, four for each of the ten competencies the Wisconsin Association of Academic Librarians (WAAL) Information Literacy Committee determined were important criteria in becoming information literate. The ten criteria are the following:

1. Identify and articulate need which require information solutions.
2. Identify and select appropriate information sources.
3. Formulate and effectively execute search queries appropriate for the information resource.
4. Interpret and analyze search results and select relevant sources.
5. Locate and retrieve relevant sources in a variety of formats from the global information environment.
6. Critically evaluate the information retrieved.
7. Organize, synthesize, integrate, and apply the information.
8. Self-assess the information-seeking processes used.
9. Understand the structure of the information environment and the process by which both scholarly and popular information is produced, organized, and disseminated.

The instrument was tested in two studies by the instrument developer. The participants in the first study were 279 undergraduate students in a Southeastern university public speaking course. The instrument produced a Cronbach’s alpha of .90. In the second study, there were 520
undergraduate and graduate students from a Midwestern state university in the sample. Again, this study produced a Cronbach’s alpha of .90 (Marshall, 2006). Although this scale was designed to measure competence, students are self-reporting what they believe they can do. Self-reporting, however, does not indicate competence, it indicates belief of competence or self-efficacy. Because the purpose of this tool was to measure competence, it was not selected for this study to measure self-efficacy.

**Information Literacy Self-Efficacy Scale (ILSES).** This tool was developed to measure students’ self-reported beliefs of their own information literacy. A meta-analysis of information literacy self-efficacy scales determined the ILSES is the most used IL self-efficacy scale (Mahmood, 2017). Instrument developers Kurbanoglu et al. (2006) detailed the development of the ILSES over the course of five phases. In phase one of the instrument development, a review of literature on information literacy revealed seven main categories of information literacy.

1. Defining the need for information
2. Initiating the search strategy
3. Locating and accessing the resources
4. Assessing and comprehending the information
5. Interpreting, synthesizing, and using the information
6. Communicating the information
7. Evaluating the product and process

These seven main categories resulted in defining 40 category statements such as “I feel confident and competent to limit search strategies by subject language and date.” These statements were organized in a seven-point Likert scale with each point indicating the following: 1 = almost never true, 2 = usually not true, 3 = sometimes, but infrequently true, 4 = occasionally
true, 5 = often true, 6 = usually true, 7 = almost always true. After an initial field test with 50 teachers the scale revealed a Cronbach’s alpha reliability coefficient of 0.78.

In phase two of instrument development, item analysis was used to provide evidence for validity. For each of the 40 category statements on the scale, item discrimination indices were calculated. This led to dropping 12 items and reducing the number of category statements to 28. This reduction in category statements based on the item discrimination indices increased the reliability coefficient Cronbach’s alpha to 0.92.

A third stage sought to reduce the number of category statements even further. In this phase a principal component analysis with Varimax rotation was run. The factor loadings indicated three components. Of the 28-items, 17 loaded well on the three components. Eliminating the 11 items from 28 to 17 reduced Cronbach’s alpha to 0.82, which still falls within an acceptable range of reliability.

In phase four of the instrument development, discriminant validity of the subscales was assessed, which resulted in a positive correlation. This indicated that the 17-item scale could be considered a valid way to measure information literacy self-efficacy. Since the original scale was developed in Turkey, a test-retest of the English version resulted in a 0.81 correlation coefficient indicating its reliability (Kurbanoglu et al., 2006) Due to its length, frequency of use, and high reliability and validity, it was the selected instrument to measure information literacy self-efficacy for this study.

Because this scale was designed for students in higher education, cognitive interviews and a pilot test of sixth grade students was conducted to determine if the ILSES would be a credible measure of secondary students’ IL self-efficacy. The cognitive interviews and pilot test
were conducted to determine if the youngest students in the study could understand what was being asked. First, the researcher conducted three cognitive interviews with three eleven-year-old rising sixth-graders in the summer of 2018 to determine if the vocabulary of the ILSES was clear or if the language of the measure would need to be adjusted in order to be comprehensible. Based on these results, information literacy was clearly defined, British spellings were changed to Americanized spellings, and unknown words such as “competent” and “bibliographic records” were changed to “capable” and “citations.” Then a pilot test of the measure was administered to ten rising sixth-grade students through an internet link. The pilot sample contained five boys and five girls from different parts of the country. The participants were unknown to the researcher but the first few were recruited due to a personal acquaintance between the researcher and the parents of children that were rising sixth-graders. From those initial few adults, snowball sampling was employed until ten students had completed the measure. The pilot test was determined to be successful because the initial link worked, students were able to respond to the survey questions, and all students were able to comprehend what was being asked.

**Information literacy skills.** Multiple instruments exist to measure student IL skills. Very few exist for secondary students. Most are designed for tertiary students. Two assessments have been designed for secondary students: TRAILs and Stanford History Education Group’s Assessment for Civic Reasoning. An additional measure, the Information Literacy Test (ILT), was designed for higher education students but could be modified for secondary students because it follows the ACRL’s definition of IL rather than the K-12 version used by AASL.

**Stanford History Education Group.** Stanford University published a study where they field-tested 56 tasks on 7,804 students across twelve different states. Their sample included schools located in under-resourced inner-cities as well as affluent suburbs (Wineburg et al.,
Many of these assessments across multiple categories have been posted online for teachers to be able to use with their students. They cover topics such as web reliability, comparing articles, and evaluating evidence. These assessments are provided for download in paper or digital versions and also come with a rubric to use for measurement (Stanford History Education Group, n.d.).

**Information Literacy Test (ILT).** The ILT was developed at James Madison University (JMU) in a collaboration between JMU’s Center for Assessment and Research Studies (CARS) and JMU Libraries. It is a multiple-choice test developed to take place electronically. It is designed for students in higher education; therefore, it measures four of the five Information Literacy Competency Standards for Higher Education as developed by ACRL. The ILT measures all standards except standard 4 of the following standards, due to it not being an easily measured standard with a multiple-choice test (Madison Assessment, n.d.).

1. Determine the nature and extent of the information needed;
2. Access needed information effectively and efficiently;
3. Evaluate information and its sources critically and incorporate selected information into his or her knowledge base and value system;
4. Use information effectively to accomplish a specific purpose;
5. Understand many of the economic, legal, and social issues surrounding the use of information and access and use information ethically and legally (Madison Assessment, n.d., para. 2)

**Tool for Real-time Assessment of Information Literacy (TRAILS).** TRAILS is a previously validated and reliable information literacy assessment, which is a project of Kent State University Libraries. Its development was funded through a grant from the Institute of Museum
and Library Services (IMLS). The initial interest in IL competencies stemmed from Kent State Libraries high school to college transition program (Schloman & Gedeon, 2007). Each assessment item is based on AASL’s *Standards for the 21-century Learner* and the *Common Core State Standards* (“About TRAILS,” 2018, “About the Assessment,” para. 1). The assessments cover five information categories (“About TRAILS,” 2018, “More About the Assessment,” para. 1).

1. Develop topic
2. Identity potential sources
3. Develop, use, and revise search strategies
4. Evaluate sources and information
5. Recognize how to use information responsibly, ethically, and legally

TRAILS has been used in high schools since 2006 and middle schools since 2008. Since 2017, “TRAILS has been used by over 8,900 librarians throughout the United States and 30+ countries and administered to more than 288,000 students” (“About TRAILS,” 2018, “About the Project,” para. 3).

Each TRAILS assessment (one each for 6, 9, 12 grades) has been previously validated and deemed reliable using Cronbach’s alpha for test reliability and the Rasch model for person and item reliability (See Table 1) (Salem, 2014). TRAILS was designed for the population used in this research study. Because of these reasons, it was the instrument selected to measure IL competence in this study.
Table 1

*Reliability Coefficients for TRAILS for Grades 6, 9, & 12*

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Test (Cronbach's Alpha)</th>
<th>Person (Rasch Model*)</th>
<th>Item (Rasch Model*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0.78</td>
<td>0.76</td>
<td>0.99</td>
</tr>
<tr>
<td>9</td>
<td>0.8</td>
<td>0.79</td>
<td>0.99</td>
</tr>
<tr>
<td>12</td>
<td>0.82</td>
<td>0.8</td>
<td>0.98</td>
</tr>
</tbody>
</table>

* Rasch Model reliability coefficient can be interpreted similarly to Cronbach's alpha (Bond & Fox, 2007)

**Procedures**

Once schools were selected, permissions from VCU IRB and the school systems were obtained. From there, collaboration with each respective school principal and librarian was initiated. A week before the administration of the surveys, the school librarians sent home a research participant information sheet for parents (See Appendices B & C). The research participant information sheet notified parents that a copy of student answers to a survey and measure about IL, without their names included, would be used in a research study to determine their existing level of information literacy skills. Parents had the option to opt their child out of the study. On the day the measures were administered, the librarians told students they would be completing an ungraded pre-test on their information literacy skills, a measure of their ability to locate, evaluate, and use information, so that he/she could use the information to design future lessons on what students needed to learn and not what they already knew. They were told that the results would also be used in a research study to determine the existing level of information literacy skills students have.
The ILSES and TRAILS were given to students outside of the research context; therefore, all students took them. The school librarians planned to use the data to show students, faculty, and administrators why students needed to go to the library for information literacy instruction even when they claim they don't. They also planned to use the data to examine students' information literacy weaknesses and design instruction to meet their specific information needs. Any student who did not consent to have their information shared- or had a parent opt them out- had their data removed from the copy of the de-identified data that was given to the researcher. The demographics questions were the only additional data collected for research purposes, and all students were given the option on the survey to complete them or not. Students also had the option to either give consent or not for a copy of their answers to be given to the researcher.

A Google Form combining the ILSES, TRAILS, and demographics questions was created by the researcher for ease of administration and data collection. The first part of the measure was the 17-item ILSES. Only after this was completed were students able to advance to the second section. The second section was the TRAILS measure (20 items for 6\textsuperscript{th} grade, 25 items for 9\textsuperscript{th} grade, and 30 items for 12\textsuperscript{th} grade). These measures were given to all students regardless of whether they participated in the research study or not. These measures were assigned to all students as part of library instruction to be used by the school librarian for educational purposes. The final section of the form included five demographic questions (age, gender, race, number of years in present school, and frequency of library visits in the previous school year) and a page for students to actively consent or not to answering the demographic questions and the sharing of results with the researcher. For this final section, data was only collected from students who actively consented on the Google Form to being a part of the research study and who were also not opted out by their parents. The Google Form of the
combined measures was copied by the school librarians and completely dissociated with the researcher's Google Account so that the researcher did not have any ability to identify participants or collect data.

The administration of the measures took place in October of 2018 in classrooms and the library and took approximately 30-45 minutes to complete. For administration, the school librarians gave students a link to the Google Form in order for them to complete the measures at that moment just as they normally would in their classroom environment. Students completed the measure in one sitting while at school and had the option on the Google Form to either give consent or not for a copy of their answers to the measures and demographic questions to be given to the researcher.

Once students completed the Google Form, the school librarians made a de-identified copy of the data by removing student names. The librarians also removed the data from the researcher’s copy for any students who did not give their own consent to participate in the study or whose parents opted them out. No record of student names was shared or stored anywhere in the data for the researcher. In addition, the anonymity of students, schools, and school division are being maintained in the reporting of results.

**Data Analysis**

Google Forms imported the collected data directly into Microsoft Excel. Once the researcher obtained a copy of all the de-identified data from the six schools, they were combined and electronically imported into Stata from Excel. Before running any analyses, the data were cleaned and coded. Missing data was not a concern because all questions for the participants,
except demographics, were marked as “required,” so there were no missing data. Missing data on the demographics section of the form are marked “not reported.”

Coding. On the ILSES, students were asked to rate their self-efficacy on 17 information literacy skill items using a seven-point Likert scale. If a student rated themselves all 7’s on all 17 items on the scale, their raw score would total 119. The formula $x/119 \times 100$ ($x$ = raw score) was then used to convert a student’s raw score to a percent. So, a raw score of 119 translates to a student self-efficacy rating of 100%. The data from the ILSES, were also coded into groups of low, medium, and high. The seven points of the Likert scale for the ILSES naturally separate into low, medium, and high levels of self-efficacy. The points on the scale labeled (1) almost never true, (2) usually not true, (3) sometimes, but infrequently true, and (4) occasionally true show that the participant has low confidence in their capability with an item. The point on the scale labeled (5) often true shows a moderate level of confidence in their capability to with an item. And, the points on the scale labeled (6) usually true and (7) almost always true show that the participant is very confident in their capability to complete most of the items. Therefore, if a participant rates themselves an average of 4 (occasionally true) for each item, their raw score for the 17-item scale would be 68. Converting the 68 raw score to a percent would equal 57%. Due to this, a student self-efficacy score of 57% or lower was coded “low.” If a participant rated themselves an average of 4.1 to 5.5 (often true) for each item, their raw score would equal between 69 and 93.5 resulting in a total self-efficacy percent rating between 58% and 77% indicating a code of “medium.” And finally, if a participant rated themselves an average of 5.6 to 7 (usually true and almost always true) for each item, their raw score would be between 94 and 119 resulting in a self-efficacy percent on the ILSES between 78% and 100% and would be coded as “high.” This variable was coded as ilses_level. See Table 2.
Table 2

*Information Literacy Self-efficacy Scale (ILSES) Level Criteria*

<table>
<thead>
<tr>
<th>ILSES Level</th>
<th>Average Points per item</th>
<th>Raw Score (out of 119)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>low</td>
<td>0.0 - 4.0</td>
<td>0 - 68</td>
<td>0 - 57</td>
</tr>
<tr>
<td>medium</td>
<td>4.1 - 5.5</td>
<td>69 - 93.9</td>
<td>58 - 78</td>
</tr>
<tr>
<td>high</td>
<td>5.6 - 7.0</td>
<td>94 - 119</td>
<td>79 - 100</td>
</tr>
</tbody>
</table>

*Note.* The highest rating students could rate themselves on the ILSES would be a 7 on each of the 17 items on the scale, which equates to a raw score of 119 (17 items X 7 points). Using the formula \( \frac{x}{119} \times 100 \) (where \( x \) = raw score) a student’s raw score was converted to a percent. Therefore, a raw score of 119 translates to a student self-efficacy rating of 100%.

**TRAILS Score as percent.** The TRAILS measure was also converted to a percent score. Since each measure, for grades 6, 9, and 12 respectively, was different based on grade level abilities, the formulas for calculating each percent varied depending on the number of initial questions asked. The formulas were as follows:

- 6th - 20 questions - \( \frac{\text{raw score}}{20} \times 100 = \text{percent} \)
- 9th - 25 questions - \( \frac{\text{raw score}}{25} \times 100 = \text{percent} \)
- 12th - 30 questions - \( \frac{\text{raw score}}{30} \times 100 = \text{percent} \)

**Statistical Analysis.** Comparing descriptive means, bivariate correlations, and regression analyses were used for the research questions in this study.

RQ1: Do students overestimate their information literacy skill abilities?

RQ2: Are there relationships between students’ information literacy self-efficacy and their performance on an information literacy measure?
RQ3: Do the relationships between students’ information literacy self-efficacy and their performance on an information literacy measure differ depending on the level of self-efficacy?

RQ4: Does student information literacy efficacy and/or performance change with grade level? Does grade level moderate the relationship between IL self-efficacy and performance?

A comparison of means was conducted for RQ1. A paired $t$-test was used to compare the means of one sample with two measures: ILSES and TRAILS (Field, 2013). Once the comparison of means was analyzed, difference of means, standard deviation, and Cohen’s $d$ was calculated for each $t$-test. $T$-tests were run comparing the overall self-efficacy versus performance as well as by grade level (6, 9, 12), by self-efficacy level (low, medium, high), and by each grade level/self-efficacy level breakdown (6-low, 6-medium, 6-high, 9-low, 9-medium, 9-high, 12-low, 12-medium, 12-high).

Two analyses were conducted for RQ2. A basic comparison of means between student information literacy self-efficacy and performance was used to determine if students’ self-efficacy and performance aligned. In addition, bivariate correlations were used to examine relationships between self-efficacy and performance when broken down by grade level and self-efficacy level. Results of the bivariate correlations are reported as $r$ with a $p$-value for statistical significance. Hierarchical linear regression was also run to provide a more detailed analysis of the relationship between secondary student IL self-efficacy and competence.

Hierarchical linear regression (HLR) was also used for RQ3 to determine if the relationships between students’ information literacy self-efficacy and their performance on an information literacy measure differ depending on the level of self-efficacy. It was used for RQ4 to identify any interaction effects that were present when grade level was examined as a
covariate and then again as a modifier. In this case, self-efficacy became a categorical variable at high, medium, and low, but the competence score on the TRAILS measure remained continuous. This allowed for analysis of and controlling for the interactions of the moderating variable.

Using hierarchical linear regression allowed examination of relationships and associations between how secondary students rated their information literacy self-efficacy and how well they performed on an IL measure. Based on the literature for information literacy, self-perceptions, and the Dunning-Kruger Effect, the levels of student self-efficacy were expected to be higher than information literacy competence for low-level information literacy performers. Also, based on prior research studies in this area, high-level information literacy performers were expected to rate their self-efficacy lower than their actual competence scores (Gross & Latham, 2011a, Kruger & Dunning, 1999). Interaction effects were also explored by adding the moderating variable of grade level into the regression algorithm. This examined the strength grade level had on the relationship between the IL self-efficacy and performance (Acock, 2016; Mehmetoglu & Jakobsen, 2017). Regression was chosen as the statistical test to use rather than ANOVA for multiple reasons: the outcome variable is continuous; the intent of the test is to search for association; and relationships, rather than differences, between students’ information literacy self-efficacy and information literacy competence were being explored (Tabachnick & Fidell, 2014). This study had both categorical and continuous variables, so regression was the best statistical test to run to explore the interaction effects of grade level on the independent and dependent variables. A basic comparison of means was used to show surface-level relationships between self-efficacy and competence, but regression allowed for deeper exploration into the relationships of the combined effects grade level had on how students rated their information literacy self-efficacy.
Running regression showed associations between the variables of information literacy self-efficacy and competence, but adding the moderating variable of grade level (6, 9, 12) to the equation allowed for the examination of the strength (and direction) of the relationship between the two main variables (Hancock & Mueller, 2010), which revealed more. Findings in recent studies have indicated that adult information literacy skills are weak (Barthel et al., 2016). However, this seems to refute findings from Metzger et al. (2015) that reported IL skill development improves with age. Due to these conflicting ideas about information literacy improving with age, grade level was used as a modifying variable when examining the relationships between information literacy self-efficacy and performance.

In order to ensure correct statistical conclusions, power was accounted for in the regression analysis. This strengthened the statistical conclusion validity of the findings. Power is “the probability that a given test will find an effect assuming that one exists in the population” (Field, 2013, p. 69). Many statisticians state that a baseline power of .8 (80% chance of finding an effect if an effect actually exists) is sufficient (Field, 2013; Tabachnick & Fidell, 2014). Choosing an adequate sample size for the regression was necessary to achieve desired power. Several rules of thumb are used for selecting sample size. Tabachnick & Fidell (2014) cover a number of them. Each assumes a power level of .8 and an alpha level of .05 (p. 159-160).

1. \( N \geq 50 + 8m \) (\( m \) is equal to the number of IVs)
2. \( N \geq 104 + m \)
3. \( N \geq \frac{8}{f^2} \), where \( f^2 = .02 \) (for small effect), .15 (for medium effect), and .35 (for large effect)
Using these formulas, the sample size for this study of using two predictor variables and one interaction would be 74 for the first formula; 128 for the second formula; or 400, 54, or 23, respectively for the small, medium, and large effects in the third formula. Ultimately, the sample size for this study was 397.

Statistical significance, however, was not the only determinant of success of this model. In addition to showing statistical significance by reporting \( p \)-values, practical significance was also reported using effect size. Effect size is a way to show practical significance by “determining the magnitude, importance, or practicality of a difference or a relationship” (McMillan, 2015, p. 284). In reviewing statistics literature on regression, three measures of effect size tend to be used most often with regression models, \( f^2 \), \( r \), and \( R^2 \). Table 3 shows the strengths and weaknesses of each (Field, 2013; Selya, Rose, Dierker, Hedeker, & Mermelstein, 2012; Tabachnick & Fidell, 2014). Cohen’s \( f^2 \) is a function of \( R^2 \); the formula is \( f^2 = R^2/1- R^2 \). The effect size \( f^2 \) is often used in psychology and observational research when a regression model is hierarchical or uses repeated measures (Selya et al., 2012). Unfortunately, it is not often used in educational studies and many software programs don’t calculate it.

Field (2013) suggests using SPSS to convert \( z \)-scores into an effect size estimate, \( r \). Benefits of using the correlation coefficient as the effect size are that it can be used in future meta-analysis studies. This is the effect size used in meta-analysis. The correlation coefficient also shows the strength and direction (positive or negative) of the relationship on a scale of -1 to 1. A weakness, however, in using the correlation coefficient is that it is not measured on a linear scale, so 0.4 is not twice as much as 0.2. Another weakness is that, although it works for continuous variables, it does not work for categorical variables, so studies with both categorical and continuous variables have a harder time reporting the correlation coefficient for each...
variable. According to McMillan (2016) both the correlation coefficient \((r)\) and the coefficient of determination \((R^2)\) can be used to quantify practical significance.

Using the coefficient of determination \((R^2)\) provides practical significance in showing the extent of variance the regressor has explained. It is often reported in unstandardized format, which can be difficult to translate in standard deviations. Most software programs report the correlation coefficient \((r)\) and the coefficient of determination \((R^2)\).

In looking at the strengths and weaknesses of each effect size, and looking at the purpose of this study, it was determined that effect sizes would be shown as the correlation coefficient \((r)\) for the bivariate correlations and the coefficient of determination \((R^2)\) for the regression. This is so that results can be used in future meta-analyses and show a positive or negative direction in relationship strength \((r)\) and to show the percent of variance explained by the regressors \((R^2)\). In addition to these coefficients, standardized Beta coefficients were examined to look for a difference in standard deviations.

Table 3.

*Measures of Effect Size for Regression*

<table>
<thead>
<tr>
<th>Effect Size</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>(f^2)</td>
<td>● Good for hierarchical data (nested)</td>
<td>● Not as commonly used</td>
</tr>
<tr>
<td></td>
<td>● Solid method when DV and IV are continuous</td>
<td>● Not commonly shown in software programs</td>
</tr>
<tr>
<td>Pearson (r)</td>
<td>● Can be used for future meta-analyses</td>
<td>● Not measured on a linear scale (.4 isn’t twice as big as .2)</td>
</tr>
<tr>
<td></td>
<td>● Measured from -1 to 1, so shows a positive or a negative direction of the effect</td>
<td>● Interpretations can be unclear for categorical variables</td>
</tr>
</tbody>
</table>
\[ R^2 \]

- Shows the percent of variance explained by the regressors
- Works well when goal is explanation
- Need to make sure to use the adjusted version so that it’s standardized
Chapter 4: Results

This chapter will report the results of this study. It will begin with descriptive statistics including frequencies, means, and standard deviations. After the descriptive statistics have been reported, data from a t-test analysis will be reported, followed by a report of the results of a correlations analysis. Next an analysis of the assumptions for regression will be outlined, and the regression results will be reported. In the reporting of regression statistical analyses, eight models will be explored using hierarchical regression to determine predictive power as covariates are added, variables are factored, and interactions are explored. Tables will include unstandardized betas, the standard errors, and standardized betas in addition to significance values and effect sizes. The chapter will conclude with an overall summary of findings.

Descriptive Statistics

Five schools were used to sample participants. The number of participants per school and the percentage of the total sample that number represents is presented in Table 4. Descriptive statistics for the participants by school, grade, and gender are presented in Table 5.

Table 4

Descriptive Statistics of Sample by School (N=397)

<table>
<thead>
<tr>
<th>School</th>
<th>n</th>
<th>%</th>
<th>Cum.</th>
</tr>
</thead>
<tbody>
<tr>
<td>School 1</td>
<td>45</td>
<td>11.34</td>
<td>11.34</td>
</tr>
<tr>
<td>School 2</td>
<td>109</td>
<td>27.46</td>
<td>38.79</td>
</tr>
<tr>
<td>School 3</td>
<td>107</td>
<td>26.95</td>
<td>65.74</td>
</tr>
<tr>
<td>School 4</td>
<td>49</td>
<td>12.34</td>
<td>78.09</td>
</tr>
<tr>
<td>School 5</td>
<td>87</td>
<td>21.91</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Note. Schools 1 & 2 are middle schools and Schools 3, 4, &5 are high schools
Table 5

**Descriptive Statistics for Sample by School, Grade, and Gender (N=397)**

<table>
<thead>
<tr>
<th>School</th>
<th>Sixth (n)</th>
<th>Ninth (n)</th>
<th>Twelfth (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Other*</td>
</tr>
<tr>
<td>School 1</td>
<td>21</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>School 2</td>
<td>53</td>
<td>53</td>
<td>3</td>
</tr>
<tr>
<td>School 3</td>
<td></td>
<td>26</td>
<td>20</td>
</tr>
<tr>
<td>School 4</td>
<td></td>
<td>18</td>
<td>13</td>
</tr>
<tr>
<td>School 5</td>
<td></td>
<td>15</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>74</td>
<td>77</td>
<td>3</td>
</tr>
</tbody>
</table>

Grade Total: 154 | 116 | 127

* Includes participants who did not report gender or selected "Prefer not to say"

Note. Schools 1 & 2 are middle schools and Schools 3, 4, & 5 are high schools

The total number of students in the sample by grade level is shown in Table 6. A summary of self-efficacy scores once they were broken into levels of low, medium, and high can be found in Table 7, and the frequencies of students in each self-efficacy level by grade can be found in Table 8.

Table 6

**Frequencies of Sample by Grade (N=397)**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Freq.</th>
<th>Percent</th>
<th>Cum.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>154</td>
<td>38.79</td>
<td>38.79</td>
</tr>
<tr>
<td>9</td>
<td>116</td>
<td>29.22</td>
<td>68.01</td>
</tr>
<tr>
<td>12</td>
<td>127</td>
<td>31.99</td>
<td>100.00</td>
</tr>
<tr>
<td>Total</td>
<td>397</td>
<td>100.00</td>
<td></td>
</tr>
</tbody>
</table>
Table 7

*Frequencies of Sample by Self-efficacy Level (N=397)*

<table>
<thead>
<tr>
<th>ILSES</th>
<th>Freq.</th>
<th>Percent</th>
<th>Cum.</th>
</tr>
</thead>
<tbody>
<tr>
<td>low</td>
<td>122</td>
<td>30.73</td>
<td>30.73</td>
</tr>
<tr>
<td>medium</td>
<td>148</td>
<td>37.28</td>
<td>68.01</td>
</tr>
<tr>
<td>high</td>
<td>127</td>
<td>31.99</td>
<td>100.00</td>
</tr>
<tr>
<td>Total</td>
<td>397</td>
<td>100.00</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* ILSES is the *Information Literacy Self-efficacy Scale*. Students rated their self-efficacy, which was converted to a percent. Low = 0-57%, medium = 58-77%, high = 78-100%.

Table 8

*Descriptive Statistics for Sample by Grade and Self-efficacy Level (N=397)*

<table>
<thead>
<tr>
<th>Self-efficacy Level (n)</th>
<th>Grade</th>
<th>low</th>
<th>medium</th>
<th>high</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6</td>
<td>54</td>
<td>61</td>
<td>39</td>
<td>154</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>53</td>
<td>45</td>
<td>18</td>
<td>116</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>15</td>
<td>42</td>
<td>70</td>
<td>127</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>122</td>
<td>148</td>
<td>127</td>
<td>397</td>
</tr>
</tbody>
</table>

*Note.* ILSES is the *Information Literacy Self-efficacy Scale*. Students rated their self-efficacy, which was converted to a percent. Low = 0-57%, medium = 58-77%, high = 78-100%.

Frequencies, means, standard deviations, minimum, and maximum scores for self-efficacy and performance of students by grade level (6, 9, 12, all) and self-efficacy level (low, medium, high) are outlined in Tables 9 - 12. Self-efficacy percentage is labeled ILSES to represent the *Information Literacy Self-efficacy Scale*, and performance percentage is labeled TRAILS to represent the score students earned on the *Tool for Real-time Assessment of*
Information Literacy Skills measure. A bar graph in Figure 1 summarizes these results as well. These tables and the figure show that at every grade level (6, 9, 12) and every self-efficacy level (low, medium, high), the student self-efficacy mean is higher than the performance mean. This is also the case for the overall sample. This shows an overestimation of how information literate students think they are versus how information literate they actually are.

Table 9

Sixth-grade Mean Percentage Scores, Standard Deviations, Minimum and Maximum Scores for ILSES and TRAILS, by Percent

<table>
<thead>
<tr>
<th>Level</th>
<th>n</th>
<th>M (SD)</th>
<th>Min</th>
<th>Max</th>
<th>M (SD)</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>low</td>
<td>54</td>
<td>45.7 (8.9)</td>
<td>21.8</td>
<td>57.1</td>
<td>42.9 (15.2)</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>medium</td>
<td>61</td>
<td>67.4 (6.1)</td>
<td>58</td>
<td>78.2</td>
<td>50.7 (14.8)</td>
<td>10</td>
<td>75</td>
</tr>
<tr>
<td>high</td>
<td>39</td>
<td>86.3 (5.7)</td>
<td>79</td>
<td>97.5</td>
<td>57.7 (16.1)</td>
<td>20</td>
<td>85</td>
</tr>
<tr>
<td>Total</td>
<td>154</td>
<td>64.6 (17.3)</td>
<td>21.8</td>
<td>97.5</td>
<td>49.7 (16.2)</td>
<td>10</td>
<td>85</td>
</tr>
</tbody>
</table>

Note. ILSES is the Information Literacy Self-efficacy Scale. Students rated their self-efficacy, which was converted to a percent. Low = 0-57%, medium = 58-77%, high = 78-100%. TRAILS is the Tool for Real-time Assessment if Information Literacy Skills, which measures performance. TRAILS has versions for grades 6, 9, & 12.
Table 10

*Ninth-grade Mean Percentage Scores, Standard Deviations, Minimum and Maximum Scores for ILSES and TRAILS, by Percent*

<table>
<thead>
<tr>
<th>Level</th>
<th>n</th>
<th>M (SD)</th>
<th>Min</th>
<th>Max</th>
<th>M (SD)</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>low</td>
<td>53</td>
<td>45.7 (10.2)</td>
<td>21.0</td>
<td>57.1</td>
<td>31.2 (13.1)</td>
<td>8</td>
<td>72</td>
</tr>
<tr>
<td>medium</td>
<td>45</td>
<td>67.6 (5.9)</td>
<td>58.0</td>
<td>78.2</td>
<td>37.4 (13.1)</td>
<td>12</td>
<td>60</td>
</tr>
<tr>
<td>high</td>
<td>18</td>
<td>86.0 (5.8)</td>
<td>79.0</td>
<td>97.5</td>
<td>40.4 (16.2)</td>
<td>12</td>
<td>72</td>
</tr>
<tr>
<td>Total</td>
<td>116</td>
<td>60.4 (17.0)</td>
<td>21.0</td>
<td>97.5</td>
<td>35.1 (14.0)</td>
<td>8</td>
<td>72</td>
</tr>
</tbody>
</table>

*Note. ILSES is the Information Literacy Self-efficacy Scale. Students rated their self-efficacy, which was converted to a percent. Low = 0-57%, medium = 58-77%, high = 78-100%. TRAILS is the Tool for Real-time Assessment if Information Literacy Skills, which measures performance. TRAILS has versions for grades 6, 9, & 12.*

Table 11

*Twelfth-grade Mean Percentage Scores, Standard Deviations, Minimum and Maximum Scores for ILSES and TRAILS, by Percent*

<table>
<thead>
<tr>
<th>Level</th>
<th>n</th>
<th>M (SD)</th>
<th>Min</th>
<th>Max</th>
<th>M (SD)</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>low</td>
<td>15</td>
<td>44.5 (11.8)</td>
<td>14.3</td>
<td>57.1</td>
<td>42.9 (15.8)</td>
<td>23.3</td>
<td>70</td>
</tr>
<tr>
<td>medium</td>
<td>42</td>
<td>71.7 (5.1)</td>
<td>61.3</td>
<td>78.2</td>
<td>60.3 (15.1)</td>
<td>16.7</td>
<td>80</td>
</tr>
<tr>
<td>high</td>
<td>70</td>
<td>87.7 (5.3)</td>
<td>79</td>
<td>100</td>
<td>68.7 (11.3)</td>
<td>43.4</td>
<td>90</td>
</tr>
<tr>
<td>Total</td>
<td>127</td>
<td>77.3 (15.4)</td>
<td>14.3</td>
<td>100</td>
<td>62.9 (15.5)</td>
<td>16.7</td>
<td>90</td>
</tr>
</tbody>
</table>

*Note. ILSES is the Information Literacy Self-efficacy Scale. Students rated their self-efficacy, which was converted to a percent. Low = 0-57%, medium = 58-77%, high = 78-100%. TRAILS is the Tool for Real-time Assessment if Information Literacy Skills, which measures performance. TRAILS has versions for grades 6, 9, & 12.*
Table 12

*Overall Mean Percentage Scores, Standard Deviations, Minimum and Maximum Scores for ILSES and TRAILS, by Percent*

<table>
<thead>
<tr>
<th>Grade</th>
<th>n</th>
<th>M (SD)</th>
<th>Min</th>
<th>Max</th>
<th>M (SD)</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>154</td>
<td>64.6 (17.3)</td>
<td>21.8</td>
<td>97.5</td>
<td>49.7 (16.2)</td>
<td>10</td>
<td>85</td>
</tr>
<tr>
<td>9</td>
<td>116</td>
<td>60.4 (17.0)</td>
<td>21</td>
<td>97.5</td>
<td>35.1 (13.98)</td>
<td>8</td>
<td>72</td>
</tr>
<tr>
<td>12</td>
<td>127</td>
<td>77.4 (15.4)</td>
<td>14.3</td>
<td>100</td>
<td>62.9 (15.5)</td>
<td>16.7</td>
<td>90</td>
</tr>
<tr>
<td>Total</td>
<td>397</td>
<td>67.5 (18.0)</td>
<td>14.3</td>
<td>100</td>
<td>49.66 (18.8)</td>
<td>8</td>
<td>90</td>
</tr>
</tbody>
</table>

*Note.* ILSES is the *Information Literacy Self-efficacy Scale.* Students rated their self-efficacy, which was converted to a percent. Low = 0-57%, medium = 58-77%, high = 78-100%. TRAILS is the *Tool for Real-time Assessment if Information Literacy Skills,* which measured performance. TRAILS has versions for grades 6, 9, & 12.

*Figure 1.* Participant self-efficacy rating versus performance score.
Comparison of Means using \( t \)-test

In order to determine whether students have an overestimated assumption of their information literacy skill ability, a paired \( t \)-test analysis was conducted to determine the significance and difference in means between the level students project their information literacy skills ability (self-efficacy) and their actual performance level when using an instrument designed to measure their abilities. \( T \)-tests were conducted on the overall group as well as by grade level (6, 9, 12), by self-efficacy level (low, medium, high), and by grade level and self-efficacy level (6-low, 6-medium, 6-high, 9-low, 9-medium, etc.). At every level, students’ self-efficacy mean was higher than their performance mean. Each \( t \)-test was significant at \( p < .001 \) except 6-low and 12-low. Cohen’s \( d \) reflected a large effect size in the difference of means for all groups except the low group, which had a medium effect size at -0.49 and 6-low and 12-low, which did not reflect a significantly measurable effect size (\( d = -0.17 \) and \( d = -0.12 \) respectively). See Table 13. These data show that most students largely overestimate their information literacy skill ability.
Table 13

*Difference in Means, Standard Deviations, and Cohen’s d for Paired t-test: TRAILS & ILSES Percent Scores (N=397)*

<table>
<thead>
<tr>
<th>Grade</th>
<th>low</th>
<th></th>
<th>medium</th>
<th></th>
<th>high</th>
<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M(diff)</td>
<td>SD</td>
<td>Cohen's d</td>
<td>n</td>
<td>M(diff)</td>
<td>SD</td>
<td>Cohen's d</td>
</tr>
<tr>
<td>6</td>
<td>54</td>
<td>-2.81</td>
<td>16.97</td>
<td>-0.17</td>
<td>61</td>
<td>-16.71</td>
<td>15.25</td>
<td>-1.10</td>
</tr>
<tr>
<td>9</td>
<td>53</td>
<td>-14.44</td>
<td>14.00</td>
<td>-1.03</td>
<td>45</td>
<td>-30.15</td>
<td>13.29</td>
<td>-2.27</td>
</tr>
<tr>
<td>12</td>
<td>15</td>
<td>-1.66</td>
<td>13.47</td>
<td>-0.12</td>
<td>42</td>
<td>-11.42</td>
<td>14.46</td>
<td>-0.79</td>
</tr>
<tr>
<td>Total</td>
<td>122</td>
<td>-7.72</td>
<td>16.33</td>
<td>-0.47</td>
<td>148</td>
<td>-19.30</td>
<td>16.21</td>
<td>-1.19</td>
</tr>
</tbody>
</table>

*Note.* ILSES is the Information Literacy Self-efficacy Scale. Students rated their self-efficacy, which was converted to a percent. Low = 0-57%, medium = 58-77%, high = 78-100%. TRAILS is the Tool for Real-time Assessment of Information Literacy Skills.
Correlations

Correlations were run between information literacy self-efficacy and performance. Results for the overall correlation as well as results of the correlations broken down by grade level and self-efficacy level are summarized in Table 14. A scatterplot of the overall correlation between information literacy self-efficacy and performance can be seen in Figure 2. Plot lines have been added to the scatterplot at 57%, to distinguish the low self-efficacy group from the medium and high. The scatterplot shows a slightly linear relationship between IL self-efficacy and performance. It shows that many students who have low self-efficacy also have a low performance scores and many who have high self-efficacy also have high performance scores. However, the bottom right quadrant of the scatterplot shows us that there are also many students with high self-efficacy and low performance scores.

Table 14

<table>
<thead>
<tr>
<th>ILSES Level</th>
<th>TRAILS 6</th>
<th>TRAILS 9</th>
<th>TRAILS 12</th>
<th>TRAILS All</th>
</tr>
</thead>
<tbody>
<tr>
<td>low</td>
<td>0.08</td>
<td>0.29*</td>
<td>0.56*</td>
<td>0.22*</td>
</tr>
<tr>
<td>medium</td>
<td>0.13</td>
<td>0.20</td>
<td>0.29</td>
<td>0.28*</td>
</tr>
<tr>
<td>high</td>
<td>0.24</td>
<td>0.53*</td>
<td>-0.08</td>
<td>0.19*</td>
</tr>
<tr>
<td>all</td>
<td>0.37*</td>
<td>0.36*</td>
<td>0.55*</td>
<td>0.53*</td>
</tr>
</tbody>
</table>

Note. ILSES is the Information Literacy Self-efficacy Scale. Students rated their self-efficacy, which was converted to a percent. Low = 0-57%, medium = 58-77%, high = 78-100%. TRAILS is the Tool for Real-time Assessment if Information Literacy Skills, which measures performance. TRAILS has versions for grades 6, 9, & 12. *p < .05
Figure 2. Scatterplot of correlations between overall information literacy self-efficacy and performance. Quadrants are split at the 57% level for self-efficacy and performance.

Analysis of Regression Assumptions

Before collected data were analyzed, they were screened to ensure the prerequisite assumptions for regression were met. In order for the regression results to be valid, the following assumptions needed to be met: normality, linearity, homoscedasticity, independence, no outliers, and the absence of multicollinearity. In assessing the first three of these assumptions, residuals were checked to ensure there was normality (normal distribution of residuals), linearity (residuals fall along a horizontal line with predicted DV scores), and homoscedasticity (the variance of the residuals at each level of the predictor variable should be constant) (Field, 2013; Tabachnick & Fidell, 2014). A histogram (Figure 3) and a P-P Plot (Figure 4) were run to look for normality of the residuals. In addition, the Shapiro-Wilk test was run resulting in a p-value of
0.143 which meets the requirement of being larger than 0.05. For linearity and homoscedasticity, residual values were plotted against predicted values in a residuals-versus-fitted plot (Figure 5). The resulting scatterplot looked like a random array of dots indicating these assumptions were met. Although a functional form issue was found when checking assumptions, the $p$-value was 0.049 and the threshold was that it needed to be greater than 0.05. Due to the $p$-value being so close, the choice was made to defer to the other assumption checks, which showed that assumptions were met.

Cook’s distance was calculated on each observation to look for outliers. Three methods of examining Cook’s distance were employed. The first threshold held because no distance was greater than or equal to one. Next, a more conservative analysis of Cook’s distance using the threshold of $4/n$ was used ($4/397 = 0.01$). According to this analysis, 19 outliers would be removed, which is five percent of the sample. Due to conflicting results, and the possibility of eliminating five percent of the population, a scatterplot of Cook’s distance was examined. Looking at the scatterplot (Figure 6), only the participant labeled with ID number 40 appeared to be an outlier. Due to this, all models were run with and without participant 40 to check for the sensitivity of the outlier. The results showed very little difference between the two versions. Since the inclusion of the outlier did not change the overall results for the regression using self-efficacy as a percent ($B = 0.55$ with participant 40 and $B = 0.56$ without participant 40), or using self-efficacy as a categorical level ($B = 11.8$ with participant 40 and $B = 11.9$ without participant 40), it was retained in the final analysis.

Variance inflation factor (VIF) was examined to check for multicollinearity. Variables with values greater than or equal to five were considered to be violations of this assumption. VIF values for the variables of grade level and self-efficacy percent were both 1.09, which meets the
requirement of being less than five. The Breusch-Pagan / Cook-Weisberg test for heteroskedasticity was run resulting in a $X^2 = 0.106, p = .744$. This meets the requirement of the $p$-value being larger than 0.05; therefore, there were no issues found with heteroskedasticity. In addition, independence was an assumption met because each data point collected was from a different participant. All assumptions for regression were deemed to have been met.

Figure 3. Histogram of residuals.
Figure 4. P-P Plot of residuals.

Figure 5. Residuals versus fitted plot scatterplot.

Figure 6. Scatterplot of Cook’s distance.
Regression

Regression analyses were run in a hierarchical order. Four steps were used in the first hierarchical regression, which used the TRAILS percent score as the outcome variable and ILSES percent score as the main predictor variable. For step 1, a simple linear regression was conducted to predict information literacy performance based on student information literacy self-efficacy. A significant regression equation was found (F(1, 395) = 154.04, \( p < .001 \)), with an \( R^2 \) of 0.28. In step 2 of the hierarchical regression, grade level was added as a covariate. This resulted in a significant regression as well (F(2, 394) = 82.56, \( p < .001 \)), with a slight increase of \( R^2 \) to 0.29. This suggests that there is a positive relationship and that performance gets steadily higher as grade level increases.

Step 3 of the analysis explores grade level further. In this step, grade level was factored into grades 6, 9, and 12. This resulted in a large jump in the effect size, (F(3, 393) = 108.77, \( p < .001 \)), with \( R^2 \) increasing to 0.45. However, it -unlike step 2- finds a nonlinear relationship between grade level and TRAILS. In this step, the analysis shows that ninth-grade students score lower on the performance measure than sixth-grade students, and twelfth-grade students score higher. This finding supports the decision to conduct an analysis on the interaction effects of grade level and self-efficacy and performance.

Therefore, in order to explore whether self-efficacy functions differently for students in different grade levels, step 4 treated grade level as a moderating variable rather than as a covariate. This step slightly improved the results of the model over step 3, (F(5, 391) = 67.23, \( p < .001 \)), with an increase in \( R^2 \) to 0.46. Although the results of the ninth-grade analysis were insignificant, the twelfth-grade analysis suggests that self-efficacy functions differently than for sixth grade. Compared to sixth graders, twelfth graders show a much more positive relationship
between self-efficacy and performance. For twelfth graders, the slope of self-efficacy is predicted to increase by 0.21 from the main effect size of 0.35 when compared to sixth graders. Resulting unstandardized betas, standard errors, and standardized betas from this hierarchical regression can be seen in Table 14.

The last step in the regression explores the interaction between grade level and the slope of self-efficacy. The analysis shows that sixth-graders rating their self-efficacy at 0.0% would be expected to score 27.12% on the TRAILS performance measure. With each increase of self-efficacy percent, the performance on the TRAILS measure is expected to increase 0.35% ($p < .001$). However, there is a difference in this relationship by grade level. According to these data, ninth graders would be expected to score 9.91% lower on the ninth-grade version of TRAILS and twelfth graders would be expected to score 7.35% lower on the twelfth-grade version of TRAILS than sixth-graders would score on their sixth-grade version of TRAILS. Neither of these levels were statistically significant. The interaction effect of self-efficacy percent rating and grade level show that it is statistically significant for twelfth-graders to show an increase in the TRAILS measure over sixth graders, however, the interaction showing ninth graders are likely to decrease in TRAILS score over sixth graders was not statistically significant (see Table 14). The overall model shows practical significance with an effect size of $R^2 = 0.46$ accounting for 46% of the variance.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Step 1</th>
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<th>Step 2</th>
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<th>Step 3</th>
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<th>Step 4</th>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>SE B</td>
<td>β</td>
<td>B</td>
<td>SE B</td>
<td>β</td>
<td>B</td>
<td>SE B</td>
</tr>
<tr>
<td><strong>Self-efficacy</strong></td>
<td>0.55***</td>
<td>0.04</td>
<td>0.53</td>
<td><strong>0.52</strong></td>
<td>0.05</td>
<td>0.49</td>
<td><strong>0.39</strong>*</td>
<td>0.04</td>
</tr>
<tr>
<td><strong>Grade Level</strong></td>
<td>2.84**</td>
<td>0.99</td>
<td>0.13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td>-13.05***</td>
<td>1.72</td>
<td>-0.32</td>
<td>-9.91</td>
<td>6.46</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td>8.17***</td>
<td>1.76</td>
<td>0.20</td>
<td>-7.35</td>
<td>7.66</td>
</tr>
<tr>
<td><strong>Grade level x self-efficacy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.06</td>
<td>0.10</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.21*</td>
<td>0.10</td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>12.34**</td>
<td>*</td>
<td>3.11</td>
<td>12.23***</td>
<td>3.08</td>
<td>24.51***</td>
<td>3.17</td>
<td>27.12***</td>
</tr>
<tr>
<td><strong>R²</strong></td>
<td>0.28</td>
<td></td>
<td>0.30</td>
<td></td>
<td>0.45</td>
<td></td>
<td>0.46</td>
<td></td>
</tr>
</tbody>
</table>

*Note: Sixth-grade serves as the reference group.

*p < .05 **p < .01 ***p < .001
To expand on the idea of an interaction between self-efficacy and grade level influencing the outcome score on the TRAILS measure, a second hierarchical regression was developed. It also uses four steps and the TRAILS percentage score as the outcome variable, but in this regression series, the predictor variable of self-efficacy is changed from a continuous percent variable to a categorical variable split into low, medium, and high levels. This is to determine if the relationships between student information self-efficacy and performance change depending on if they have a low, medium, or high level of self-efficacy. In step 1, a simple linear regression is conducted to predict information literacy performance based on student information literacy self-efficacy level to examine if the relationship between information literacy self-efficacy and performance is different depending on the level of self-efficacy. A significant regression equation was found (F(1, 395) = 128.47, \( p < .001 \)), with an \( R^2 \) of 0.25. Similarly to the first model series, step 2 adds grade level as a covariate resulting in (F(2, 394) = 70.99, \( p < .001 \)), with \( R^2 = 0.26 \), and step 3 factors grade level into categories, which significantly increases the effect size, (F(4, 392) = 74.10, \( p < .001 \)), with \( R^2 \) increasing to 0.43. Step 4 adds an interaction between grade level and self-efficacy level, which provided a slight increase in \( R^2 \) over step 3 (F(8, 388) = 38.73, \( p < .001 \)), \( R^2 = 0.44 \). Unstandardized betas, standard errors, and standardized betas from this hierarchical regression can be seen in Table 16.

The last step in this regression shows sixth-graders with low self-efficacy are expected to score 42.87% on the TRAILS performance measure. If sixth-graders rate their self-efficacy at the medium level, they are expected to increase their TRAILS performance score (on a “100% equals 100 points” scale) by 7.87% (\( p < .01 \)) over the low group. And if they rate their self-efficacy as high, they are expected to increase their TRAILS performance score by 14.82% (\( p < .001 \)) over the low group. When compared to the sixth-grade low groups, the ninth-grade low
group is expected to score 11.63% less on their TRAILS measure, the medium group is expected to score 1.69% less, and the high group is expected to score 5.62% less. Of these ninth-grade levels, only the low group is statistically significant. For twelfth grade, the following comparisons can be made for how they will score on their TRAILS measure when compared to the sixth-grade low group on their TRAILS. The low group is expected to score 0.01% higher, the medium group is expected to score 9.57% higher and the high group is expected to score 11.01% higher. Of the twelfth-grade levels, only the high group is statistically significant. The effect size ($R^2 = 0.44$), however, shows practical significance and that the model accounts for 44% of the variance.
Table 16

Summary of Hierarchical Regression Analysis for Variables Predicting Information Literacy Performance: Self-efficacy by Level (N = 397)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE</td>
<td>β</td>
<td>B</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>11.75***</td>
<td>1.04</td>
<td>0.50</td>
<td>10.84***</td>
</tr>
<tr>
<td>medium</td>
<td>8.44***</td>
<td>1.77</td>
<td>0.22</td>
<td>7.87***</td>
</tr>
<tr>
<td>high</td>
<td>15.84***</td>
<td>1.95</td>
<td>0.39</td>
<td>14.82***</td>
</tr>
<tr>
<td>Grade Level</td>
<td>3.24**</td>
<td>1.00</td>
<td>0.14</td>
<td>-13.05***</td>
</tr>
<tr>
<td>9</td>
<td>8.92***</td>
<td>1.79</td>
<td>0.22</td>
<td>0.01</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade level x self-efficacy level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>medium 9</td>
<td>-1.69</td>
<td>3.91</td>
<td>-0.03</td>
<td></td>
</tr>
<tr>
<td>medium 12</td>
<td>9.57</td>
<td>5.02</td>
<td>0.16</td>
<td></td>
</tr>
<tr>
<td>high 9</td>
<td>-5.62</td>
<td>4.88</td>
<td>-0.06</td>
<td></td>
</tr>
<tr>
<td>high 12</td>
<td>11.01*</td>
<td>5.01</td>
<td>0.22</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>37.76***</td>
<td>1.33</td>
<td></td>
<td>35.66***</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.25</td>
<td></td>
<td></td>
<td>0.26</td>
</tr>
</tbody>
</table>

Note: Sixth-grade low self-efficacy serves as the reference group.

*p < .05 **p < .01 ***p < .001
Summary

Two hierarchical regression model series were constructed with four steps in each totaling eight models. These series used the performance score (in percent) on the TRAILS measure as the outcome variable and the self-efficacy score (in percent) as the predictor variable. In the first series, grade level was added as a covariate and then as a moderating variable interacting with self-efficacy. The four models (referred to as steps) showed an increase in effect size for each step starting with $R^2 = 0.28$ in the first step and ending with $R^2 = 0.46$ for the fourth step, which shows strong practical significance. The second hierarchical regression series again used the performance score (in percentage) on the TRAILS measure as the outcome variable grade level as a covariate and then as a moderating variable interacting with self-efficacy, but, in this series, the predictor variable of self-efficacy was changed from a continuous variable measured in percent to a categorical variable measured by level (low, medium, high). The four steps also showed an increase in effect size for each step starting with $R^2 = 0.25$ in the first step and ending with $R^2 = 0.44$ for the fourth step, which, again, shows strong practical significance. These models support the theory that there is a relationship between student information literacy self-efficacy and performance and that grade level can be a moderating variable in the relationship.
Chapter 5: Discussion and Conclusion

This chapter includes a discussion of the results detailed in the previous chapter. The discussion of results will be organized by research question. Following the discussion, study limitations will be discussed. Practical implications and implications for future research will follow the limitations. The chapter will conclude by drawing conclusions about what was learned from the overall study.

Discussion

Research Question 1

Research question 1 asked, “Do students overestimate their information literacy skill abilities?”

The Dunning-Kruger Effect is when those who are incompetent with a skill believe themselves to be competent with a skill. They overestimate their abilities. This is one aspect of Competency Theory which also states that those with high competency underestimate their abilities and those with proficient abilities are more accurate in their self-perceptions (Kruger & Dunning, 1999). The results of this study provide data supporting the Dunning-Kruger Effect showing that secondary students do overestimate their information literacy skill abilities. This study, however, does not support the remaining elements of Competency Theory that state higher performing students will underestimate their abilities and that and medium performing students will be more accurate in their self-perceptions. These results are different from previous studies conducted on this topic, which show that proficient students do a fairly accurate job estimating their abilities and that advanced/highly proficient students underestimate their abilities. This
could be a result of the age group being younger or it could be a limitation of Competency Theory as it pertains to information literacy.

The means reported for student information self-efficacy and performance show a higher mean for student self-reported self-efficacy than performance (both measured on a scale of 1% - 100%) for all levels. Overestimation is evident for the overall group, each grade level, each self-efficacy level, and each grade level/self-efficacy level break down. For example, sixth-grade students rate their information literacy abilities at a 64.6% while their performance on an actual measure of information literacy skills shows a mean of 49.7%. See Tables 9 – 12 for additional examples. This difference in how information literate students think they are versus how information literate they actually are is important. When students believe they are better at something than they are, they are less likely to ask for help or learn how to improve (Aesaert, Voogt, Kuiper, & van Braak, 2017; Cleary, 2009). This would establish dispositions rooted in information illiteracy.

To expand on analyzing overestimation in this study, a t-test was conducted to compare the means of the overall group as well as each grade level (6, 9, 12), each self-efficacy level (low, medium, high), and each grade level/self-efficacy level (6-low, 6-medium, 6-high, 9-low, etc.). The results showed that almost every group had statistical and large practical significance showing overestimation. The exceptions were that the low efficacy group showed a medium level effect, and the 6-low and 12-low groups did not show statistical or practical significance of overestimation (See Table 13). This could be because previous research suggests that students with lower self-efficacy underestimate their abilities while higher efficacy groups overestimate their abilities (Aesaert et al., 2017; Kruger & Dunning, 1999). Evidence of underestimation was not found in this study, however. The overestimation results are consistent with previous
research studies conducted with undergraduate and graduate student populations (Gross, 2005; Gross & Latham, 2007, 2009, 2011a, 2011b, 2012; Gustavson & Nall, 2011; Latham & Gross, 2008; Molteni & Chan, 2015). The results differ from that of Gross & Latham (2009), which showed that proficient students are more accurate in their self-perceptions. This could be due to the qualitative nature of their study, the age group (tertiary education rather than secondary education), the sample size of 20 students in the Gross and Latham study versus 397 in this study, or the measures used. The Gross and Latham studies that took place after the referenced 2009 study found overestimation in proficient groups as well but to a lesser degree than low performing students.

**Research Question 2**

Research question 2 asked, “Are there relationships between students’ information literacy self-efficacy and their performance on an information literacy measure?”

The evidence in this study supports the idea that there are relationships between self-efficacy and performance. The bivariate correlation of student information literacy self-efficacy and performance for the overall sample is positive, significant, and strong ($r = .53$, $p < .05$) indicating that as self-efficacy increases, so, too, does performance (Table 13). Regression also shows evidence of a positive relationship between the outcome variable and the main predictor variable ($B = .55$, $p < .001$, $R^2 = .28$) indicating that as self-efficacy increases, performance also rises. This was an interesting finding not previously explored in information literacy literature. However, when examining the scatterplot of the correlations, it also shows that a great number of students who rated their self-efficacy as high actually performed poorly (see Figure 6). This finding is consistent with previous studies in the field of information literacy (Gross, 2005; Gross & Latham, 2007, 2009, 2011a, 2011b, 2012; Gustavson & Nall, 2011; Latham & Gross, 2008;
Molteni & Chan, 2015). Although prior research has not reported a relationship between positive self-efficacy and positive performance in the area of information literacy, it hasn’t been ruled out either. These two outcomes of higher self-efficacy resulting in higher performance and each group overestimating their abilities seem to refute each other, but when examined together provide evidence that the level of self-efficacy (low, medium, high) may be a bigger influence on the relationship.

**Research Question 3**

Research question 3 asked, “Do the relationships between students’ information literacy self-efficacy and their performance on an information literacy measure differ depending on the level of self-efficacy?”

Research gathered on Competency Theory, the Dunning-Kruger Effect, and studies on self-efficacy and performance conducted on a collegiate-level population, provided evidence that higher performing students overestimate their abilities (Clark, 2017; Gross, 2005; Gross & Latham, 2007, 2009, 2011a, 2011b, 2012; Kruger & Dunning, 1999; Latham & Gross, 2008; Mahmood, 2017). Looking at the means compiled in this study, all levels of student self-reported self-efficacy (low, medium, and high) showed students having a higher percentage of information literacy skill self-efficacy than performance. This difference in means did not change based on the level of self-efficacy. The statistical and practical significance of the results held true for each group studied except 6-low and 12-low. The lack of significance occurring at two of the low-level groups show that there is a difference based on level. A difference based on level supports previous findings reported by Gross & Latham (2011).
In examining the correlations in Table 13 of self-efficacy and performance by self-efficacy level and grade level, moderate correlations seem to indicate that as self-efficacy rises, performance also rises. Through all grade levels, higher self-efficacy equates to higher performance. However, looking at the scatterplot of correlations between self-efficacy and performance, it appears that for a large percent of students, high self-efficacy equates with lower scores. The correlations by low, medium, and high are all significant when the grade levels are combined, but not all when they are split. The respective levels (low, medium, high) of sixth grade are not statistically significant for any level, but they are when combined together as a total sixth-grade sample. Correlations for ninth-grade low and high and twelfth-grade low groups are significant. No correlations at the medium level for any grade level were significant, but the overall groups of low, medium, and high were statistically significant. The overall totals for grade levels with combined self-efficacy and TRAILS correlations are significant, whereas not all low, medium, and high groups when broken down by grade level are. The evidence from this study did support a difference in the relationships between level of self-efficacy and performance; however, it did not support the idea from previous studies that students with lower self-efficacy underestimate their abilities (Aesaert et al., 2017; Kruger & Dunning, 1999). These studies, however, were conducted using information and communications technology (ICT) and other subject domains such as psychology rather than on information literacy, which could account for the difference.

**Research Question 4**

Research question 4 asked, “Does student information literacy efficacy and/or performance change with grade level? Does grade level moderate the relationship between IL self-efficacy and performance?”
The importance of teaching information literacy skills and information evaluation beginning at a young age (Asselin and Lee, 2002; Tower, 2000) and scaffolding information literacy instruction (Metzger, et al., 2015) has been noted by researchers. Due to previous studies reflecting that older students show increased evaluative skills over younger students (Metzger et al., 2015) indicating age has an effect on students’ ability to evaluate information, grade level was examined as both a covariate and as a moderating variable in this study.

Examining the bivariate correlations between self-efficacy and performance (Table 14), the correlations are stronger for each overall grade level totals than by individual grade level broken in self-efficacy levels, except in the case of twelfth-grade low and ninth-grade high. Looking at step 3 on both hierarchical regression series, grade level as a covariate is statistically significant for each grade level ($p < .001$). In the regression, sixth-graders continue to show a positive relationship between self-efficacy and performance while ninth-grade students begin to show a negative relationship when compared to sixth-grade students, although the ninth-grade results are not statistically significant. The bivariate correlation for ninth graders shows a positive relationship between self-efficacy and performance, but the regression shows that they are expected to score 13.05% lower than sixth graders on their respective performance measure. Twelve graders reverse the relationship again and show that they are expected to score 8.17% higher than sixth graders when self-efficacy is measured as a percent and 8.52% higher when self-efficacy is measured by level. It is an interesting trend to see a dip in ninth-grade performance but not in sixth or twelfth grades. Even though the ninth-grade results were not statistically significant, the effect size for the model in the first regression series was $R^2 = 0.45$, and the effect size for the second regression series was $R^2 = 0.43$, which add support to the idea that grade level makes a difference in the relationship between information literacy self-efficacy
and performance. When the interaction effect of grade level and self-efficacy level are considered, the effect size increases from $R^2 = 0.45$ to $R^2 = 0.46$ in the first regression series and from $R^2 = 0.43$ to $R^2 = 0.44$ in the second regression series providing evidence that supports the impact of grade level and self-efficacy interacting positively on the relationship between secondary student information literacy self-efficacy and performance. It also establishes that the interaction of grade level and self-efficacy is mainly present in sixth and twelfth grades. Adding grade level as a predictor variable and as a moderating variable both show that ninth graders tend to perform lower overall on the performance measure than their sixth and twelfth grade counterparts. This supports the need for instruction scaffolding by age/grade level (Asselin and Lee, 2002; Metzger, et al., 2015; Tower, 2000).

**Limitations**

All studies have certain limitations and this one is no different. In looking back over each aspect of the study, certain limitations should be noted. First, although the sample was drawn from five different schools, it was still a convenience sample. A random sample would increase the likelihood of generalizability for the study. Second, when using instruments to measure self-efficacy and performance, there will always be a limitation to selecting specific measures. There is always the possibility that selecting alternate measures could provide different results.

An additional limitation is that one of the high schools was only able to sample twelfth-grade students from Advanced Placement English classes. This school had 61 twelfth graders participate out of the 127 in the twelfth-grade sample. So, almost 50% of the twelfth-grade sample was comprised of students in Advanced Placement English classes. It is unknown, but plausible, that these students would have been in the library more over the previous three years of high school working on advanced level research projects and papers. Since 50% of a sample is
larger than most Advanced Placement students in a typical high school, this could have skewed
the results of the twelfth-grade sample and could make the results less generalizable. Also,
initially, the study was to have participants from three middle schools and three high schools
from diverse backgrounds. One of the middle schools fell through at the last minute. So, 33% of
the sixth-grade data is from one middle school and 67% of the data is from another school.
Ideally, an additional school would provide more students from different backgrounds from the
other schools.

The decision of how to separate the self-efficacy groups into low, medium, and high is
somewhat subjective. Although the researcher showed sound reasoning in the methodology
chapter for the thresholds that were selected for each group, there is the possibility that the
results could be different if alternate thresholds were used to split students into groups of low,
medium, and high levels of self-efficacy.

It should also be acknowledged that the data from this study was collected at the end of
October rather than the anticipated end-of-September timeframe. Due to this, it is possible that
some students could have had introductory library lessons before completing the measures for
this study. That would impact the prior information literacy skill knowledge they had before the
study. Knowing this was a limitation, the school librarians attempted to send forth the data for
the classes that had not had lessons with them. However, it is possible that students could have
been to the library with another class in a different subject area.

**Practical Implications**

Previous studies have shown that students’ information literacy skills are weak (Julien &
Barker, 2009; Wineburg et al., 2016). Students and teachers have incorrect assumptions of
student information literacy skills because students have grown up using technology (European Commission, 2013; Macklin, 2001), and studies have shown that students are less likely to ask for help when they believe their skills are strong (Aesaert et al., 2017; Cleary, 2009). Rosman et al. (2015) challenged the accuracy of student self-perceptions of their own information literacy. These findings show that students are not getting the information literacy instruction they need to improve their skills.

The results of this study add empirical evidence showing the need for information literacy instruction. School librarians can use these results to present to students, teachers, administrators, school board members, and parents showing that although students think they have these skills, they actually do not. They can use these results to increase collaboration with classroom teachers to implement models of information literacy instruction. Students will also be more likely to ask for help and seek to improve their information literacy skills once they see data showing their skills are lacking.

More information literacy instruction scaffolding by grade-level through schools will result in more students (and future adults) being able to distinguish between information and mis/disinformation and biased and unbiased sources. This will enable citizens to make more informed decisions on what to support and who to vote for in a democracy.

**Implications for Future Research**

Librarians can use this knowledge to present to students and teachers that students do not in fact have strong information literacy skills even when they think they do. This study provides data that show that students are weaker than they think. The results can be used to push for more
information literacy instruction, and future research can be conducted to find best practice
information literacy instruction that can increase student information literacy skill abilities.

This study establishes a relationship between self-efficacy and performance. It also shows
that students overestimate their information literacy skills. Researchers can explore why students
tend to have higher self-efficacy than their performance shows they are capable of. Expanding on
the research using an explanatory mixed methods design may add context and reasons for why
students overestimate their abilities. Adding a qualitative element to research in this area could
also provide reasoning for why ninth-grade students seem to have lower performance scores on
the TRAILS measure than sixth and twelfth-grade students even though all three measures have
high and fairly equal levels of reliability (See Table 1) (Salem, 2014).

Researchers interested in information literacy self-efficacy versus performance can use
this study in conjunction with other studies in the information literacy domain that use
undergraduate and graduate students. Research on whether overestimation increases or decreases
as students advance in education could be explored as well.

**Conclusion**

This study supports previous research suggesting that there is a relationship between
information literacy self-efficacy and performance (Clark, 2017; Gross, 2005; Gross & Latham,
2007, 2009, 2011a, 2011b, 2012; Kruger & Dunning, 1999; Latham & Gross, 2008; Mahmood,
2017). The sample of this study is important in the research of information literacy self-efficacy
and performance because it investigates this relationship for secondary students, an area that has
been lacking in the literature. The results provided in this study show that as self-efficacy rises
so, too, does performance. It also shows, however, that a large number of students are rating their
self-efficacy as high but performing low. In addition, overestimation of IL ability increases as self-efficacy level increases. High self-efficacy groups overestimate the most; low self-efficacy groups overestimate the least. However, it is important to note that students of all grade levels and self-efficacy levels overestimate their information literacy skill abilities and show information illiteracy. Grade level effects show that correlations are stronger for each overall grade level total than by individual grade level broken down into self-efficacy levels, except in the case of twelfth-grade low and ninth-grade high groups. A surprising finding of this study was that the grade-level effects on the relationship between IL self-efficacy and performance for ninth-grade students show a lower score on the performance measure than for sixth and twelfth graders. Further research could be conducted in this area to see if this phenomenon is generalizable and/or developmental for the ninth-grade age group. Further study in social development and self-confidence of this age group could add context to this finding.

The difference in percentage means for self-efficacy and performance suggest on an exploratory level that students’ level of overestimation increases as self-efficacy level increases. The low group appears to overestimate less but does not underestimate as previous research in exploring the Dunning-Kruger effect would suggest (Aesaert et al., 2017; Kruger & Dunning, 1999). This shows the IL deficit currently in students. Further study on this area is recommended.

It should be noted that this study was conducted in the Commonwealth of Virginia, which requires a certified school librarian in every school. Librarians are typically charged with information literacy instruction and look for ways to collaborate with classroom teachers to increase students’ IL skills. Policy enacted to require information literacy instruction led by
certified school librarians could improve these skills. Further study in other states without certified librarians could result in even greater overestimation and lack of IL skills.

It is encouraging that, in 2017, the Virginia Department of Education updated its English Standards of Learning to include a Research strand for grades K-12 (Virginia Department of Education, 2017). Implementing these updated standards, continuing to staff certified school librarians in each school, and advising classroom teachers to collaborate with their school librarians would greatly improve students’ IL skills. These steps are also expected to result in greater student attainment of IL knowledge as new kindergarteners advance though school using these updated standards. Much stronger IL instruction is necessary in all K-12 schools across the country in order to provide students with the skills necessary to successfully locate, evaluate, and use information ethically and effectively throughout their studies and as adult citizens able to make informed democratic decisions.
References


Acock, A. (2016). *A gentle introduction to Stata* (5th ed.). College Station, TX: Stata Press.


Appendix A

Flow Chart Detailing Study Participant Selection

Recruitment script read by librarian and parent information sheet sent home.

Parents opt-out their child

Parents do not opt out their child

Students take the standard surveys without demographics as a part of normal library instruction

Students see assent paragraph

Student agrees

Student completes demographic data

Librarians de-identify the data and provide the data to the researcher.

Data is not shared with the researcher

Student disagrees

Survey ends

Data is not shared with the researcher

Data is not shared with the researcher
Appendix B

Research Participant Parent Information Sheet

STUDY TITLE: Secondary Student Information Literacy Self-Efficacy Vs. Performance

VCU INVESTIGATOR: Jenifer R. Spisak, James McMillan

As part of an ongoing effort to improve the information gathering skills of students, your child is invited to participate in a research study about how they locate, evaluate, and use digital information. This information will be collected by school librarians as part of the school library’s ongoing efforts to improve instruction. A copy of your child’s answers without his/her name or identifying information will be given to the researcher for further study. The study will not replace classroom instructional time, and student responses will be confidential. Your child’s participation in having his/her answers shared with the researcher for this study are voluntary.

In this study, your child will be asked to do the following things:

1. Using a link provided by the librarian, your child will take a short survey and answer questions about how well they believe they are able to locate, evaluate, and use information.
2. Answer questions about how to locate, evaluate, and use information.
3. Answer five basic demographic questions.

If you have any questions, concerns, or complaints about this study now or in the future, please contact Jenifer R. Spisak at spisakjr@vcu.edu or 804-814-3055 or James McMillan at jmcmillan@vcu.edu or 804-827-2620.

If you DO NOT want your child to participate in this study, please check and sign below and have it returned to the librarian by ________________.

Only return if you DO NOT want your child’s unidentified survey responses to be shared.

_______ I DO NOT want my child, _____________________, to participate in the study “Secondary Student Information Literacy Self-Efficacy vs. Performance.”

___________________________________
Parent Signature                        Date
Appendix C

Research Protocol

Librarian script to send home information sheet

You have the opportunity to participate in a research study where we are trying to collect information on your ability to locate, evaluate, and use information. This is an information sheet for this research study. Please take it home to your parents. If you or your parent does not want you to participate, they can fill out the bottom of the sheet and return it to me by ____________.

Librarian script on the day of administration of the measures:

Today you have the opportunity to participate in a research study, unless your parent opted you out, where we will collect information on your ability to locate, evaluate, and use information. The first questions you will see are part of your normal library instruction. After you finish these questions, you will see a screen asking you if you want to participate in the research study. If you agree, you will answer five questions about yourself. You will have the ability to say yes or no about participating in this section. Your name will not be collected by the researcher. [Librarians can give additional instructions about the measures they normally give.]
Appendix D

**Information Literacy Pre-test - Middle School**

*Required*

1. First and last name

2. I feel confident and capable to
   
   Mark only one oval per row.

<table>
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<tr>
<th>1 - Almost never true</th>
<th>2 - Usually not true</th>
<th>3 - Sometimes but infrequently true</th>
<th>4 - Occasionally true</th>
<th>5 - Often true</th>
<th>6 - Usually true</th>
<th>7 - Almost always true</th>
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<tr>
<td>Use different kinds of print sources (i.e., books, periodicals, encyclopedias, chronologies, etc.)</td>
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<td>Use electronic information sources</td>
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<td>Locate information sources in the library</td>
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<td>Use library catalog</td>
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<td>Locate resources in the library using the library catalog</td>
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<td>Define the information I need</td>
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<td>Select information most appropriate to the information need</td>
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<td>Interpret the visual information (i.e., graphs, tables, diagrams)</td>
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<td>Write a research paper</td>
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<td>Create citations for different kinds of materials (i.e., books, articles, websites)</td>
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<tr>
<td>Learn from my</td>
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<td>information problems solving experience and improve my ability to locate, evaluate, and use information.</td>
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<td>Put together newly gathered information with previous information.</td>
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<td>Determine the content and form the parts (introduction, conclusion) of a presentation (written, oral).</td>
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<td>Create citations and organize a bibliography.</td>
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<td>Understand and question the quality of my information seeking process and its products.</td>
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5. What grade are you in?
Mark only one oval.

- [ ] 6
- [ ] 7
- [ ] 8

Skip to question 6.

6th Grade
1. Your teacher wants you to write a report about natural disasters. Choose the correct order of the steps from the options below.
   A. Read a list of questions about your topic that you would like to answer.
   B. Do research on a natural disaster theme.
   C. Write down a natural disaster theme.
   D. Find information about your topic.
   E. Ask what you already know about your topic.
   
   **CHOICE:** (Write the option letter)
   
   A. B, C, D
   B. D, A, C
   C. B, A, C, D
   D. A, C, B

2. You are writing a mini research paper. You are supposed to be a journalist and limit your final paper. Which research questions will be most useful?
   
   **MARK:** (Circle one option)
   
   What do families do to celebrate Chinese New Year?
   What are the origins of the Chinese New Year celebration?
   When is Chinese New Year?
   What are the main festivals in Asia?

3. You want to learn more about emperors and revolution in a science project, which sources might you use to gather background information?
   
   **MARK:** (Circle one option)
   
   Atlas
   Book on atomic scientists
   Encyclopedia
   Dictionary

4. You are studying the environment and the effects of different climate regions on different regions of the world. Select the group of topics that is organized from broadest to narrowest topic.
   
   **MARK:** (Circle one option)
   
   Tropical forest > temperate forest > desert
   Lake > freshwater > aquatic habitat
   Community > ecosystem > biosphere
   Ecosystem > forests > rainforests
10. You need to make a model of the Egyptian pyramids. Which resource would be the most useful to learn about the construction of the Egyptian pyramids?

CHOOSE ONE ANSWER.

Mark only one oval.

- An online journal of a tourist who spent a month exploring the pyramids
- An Egyptian government website that shows photos and videos of the pyramids
- A poetry database about ancient civilizations

11. You need to find the time difference in hours between Chicago, Illinois, and Sydney, Australia. What is the best source to use?

CHOOSE ONE ANSWER.

Mark only one oval.

- Atlas
- Encyclopedia
- Google
- Dictionary

12. You want to learn more about the decision to build an airport in your city. Which of the following would be a primary source for this information?

CHOOSE ONE ANSWER.

Mark only one oval.

- The airports website
- The mayor's report
- A newspaper article
- Television news report

13. You are to do a project on inventors. Which library source would be the best place to look for background information?

CHOOSE ONE ANSWER.

Mark only one oval.

- Encyclopedia
- Nonfiction videos
- Magazine databases
- Fiction books

14. You were assigned an article called "Today's Immigrants" by Mary Somm for your social studies project. You need to choose a search strategy. Identify the best search term to use to locate the article in a periodical database.

CHOOSE ONE ANSWER.

Mark only one oval.

- Title search for "Today's Immigrants"
- Subject search for Immigration
- Subject search for "Today's Immigrants"
15. Review the following books that might be found in your library. Select the correct order in which these books were published. Then, describe the main idea of each book.

- *The Hunger Games* by Suzanne Collins
- *Speak* by Laurie Halse Anderson
- *The Giver* by Lois Lowry
- *Charlotte's Web* by E.B. White

Choose one answer:

Mark only one oval.

- 4, 1, 3, 2
- 1, 4, 2, 3
- 2, 1, 4, 3
- 4, 2, 3, 1

16. You are doing a research paper on the history of the internet. You need to find information on the development of the internet and its impact on society. Which of the following websites would be the best source for your research?

Choose one answer:

Mark only one oval.

- www.batterysales.com (Listing of stores that recycle)
- recyclebattery.com (A site created by battery manufacturers to encourage recycling)
- www.duracell.com (A battery manufacturer website)
- www.epa.gov (U.S. Environmental Protection Administration with facts on battery recycling)

17. You are doing a research paper on the impact of technology on society. You need to find information on the benefits and drawbacks of technology. Which of the following statements best describe the role of technology in today's society?

Choose one answer:

Mark only one oval.

- Use the NOT operator
- Use the SOURCE filter
- Use the OR operator
- Use the DATE filter

18. You are doing a research paper on the impact of technology on society. You need to find information on the benefits and drawbacks of technology. Which of the following websites would be the best source for your research?

Choose one answer:

Mark only one oval.

- www.batterysales.com (Listing of stores that recycle)
- recyclebattery.com (A site created by battery manufacturers to encourage recycling)
- www.duracell.com (A battery manufacturer website)
- www.epa.gov (U.S. Environmental Protection Administration with facts on battery recycling)
10. You are researching the effectiveness of speed cameras in your city and need to answer the research question: Do speed cameras reduce car accidents? What did you notice about the research question?

**CHOOSE ONE ANSWER.**
Mark only one oval.

- The police department has requested funding to obtain additional cameras.
- The police department reported serious collisions fell by 27% with cameras in place.
- The police department receives many complaints that cameras are a money-making scheme.

20. You are working on a paper on the effects of high-speed driving. You find a website listing the benefits. Which of the following would most likely help you write an argument in favor of the information?

**CHOOSE ONE ANSWER.**
Mark only one oval.

- Advertisements AND celebrity endorsements
- Research articles AND facts from a government agency
- Research articles AND advertisements
- Facts from a government agency AND celebrity endorsements

21. You are researching the pros and cons of bottled water. Which resource would be most likely to include biased information about bottled water?

**CHOOSE ONE ANSWER.**
Mark only one oval.

- Magazine article about bottling
- Encyclopedia articles about bottling
- Bottling company newsletter
- Government website

22. Why is it the best practice for every student?

**CHOOSE ONE ANSWER.**
Mark only one oval.

- Citing shows your teacher that you did your research.
- Citing identifies sources that your classmates may want to use.
- Citing gives the location of the sources you used.
- Citing gives credit for the original work or the idea to the author.

23. You find a photo on the Internet that you would like to include in your report. What is the proper way to use this photo?

**CHOOSE ONE ANSWER.**
Mark only one oval.

- Copy the photo onto your paper.
- Cite the photo and include it in your list of sources.
- Edit the photo to make it your own.
- Include a title for the photo in your paper.

https://docs.google.com/forms/d/1m9Y7XR9FLeC5GZ7QmF5ApV2veK7_Eye58/edit?usp=send_form 7/8
24. Which of the following is an act of censorship?

**CHOOSE ONE ANSWER.**

- [ ] An employee fired for not following directions
- [ ] A citizen's group forcing a librarian to remove a book from the library
- [ ] The newspaper printing unpopular opinions in letters to the editor
- [ ] A teacher correcting a student's grammar

25. You have the following question to a book. Identify the publisher:

*Hidden Figures* by Margot Lee Shetterly, William Morrow, 2016

**CHOOSE ONE ANSWER.**

- [ ] William Morrow
- [ ] Margot Lee Shetterly
- [ ] Hidden Figures: Young Readers Edition

**Student Participation Information Sheet**

Today you have the opportunity to participate in a research study, unless your parent opted you out, where we will collect information on your ability to locate, evaluate, and use information. A copy of your answers without your name or identifying information will be given to the researcher for further study. Your participation in having your answers shared for this study is voluntary.

In this study, you will be asked to do the following things:
1. Allow the researcher to have a copy of your answers but not your name.
2. Answer five questions about yourself.

If you have any questions now, raise your hand to ask the librarian. If you have questions later, the librarian can give you contact information for the researcher.

26. Do you agree to these terms? *

**CHOOSE ONE ANSWER.**

- [ ] Yes
- [ ] No *Stop filling out this form.*

** Demographics **

27. What is your age?

**CHOOSE ONE ANSWER.**

- [ ] less than 10
- [ ] 10
- [ ] 11
- [ ] 12
- [ ] 13
- [ ] 14
- [ ] 15
28. Gender
   Mark only one oval.
   ☐ Male
   ☐ Female
   ☐ Prefer not to say

29. Race
   Mark only one oval.
   ☐ Asian
   ☐ Asian Pacific Islander or Native Hawaiian
   ☐ Black
   ☐ Hispanic or Latino
   ☐ Native American or American Indian
   ☐ White
   ☐ Two or more races

30. School?
   Mark only one oval.
   ☐

31. This is my ________ year at this school.
   Mark only one oval.
   ☐ first
   ☐ second
   ☐ third
   ☐ more than three
Appendix E.

Information Literacy Check - High School

Information literacy is the ability to locate, evaluate, and use information effectively and ethically.

* Required

1. First and last name

2. I feel confident and capable to
   Mark only one oval per row:

   1 - Almost always true
   2 - Usually true
   3 - Sometimes but not always true
   4 - Occasionally true
   5 - Often true
   6 - Usually true
   7 - Almost never true

   Use different kinds of print sources (i.e., books, periodicals, encyclopedias, chronologies, etc.)

   Use electronic information sources

   Locate information sources in the library

   Use the library catalog

   Locate resources in the library using the library catalog

   Define the information I need

https://doc.google.com/forms/d/1gi3mW1s8E2z9jvAueyJGJwQ4k66KuwA6-oL5yYK5s/edit
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<tr>
<td>Select information most appropriate to the information need</td>
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<td>Interpret the visual information (i.e., graphs, tables, diagrams)</td>
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<td>Write a research paper</td>
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<td>Create citations for different kinds of materials (i.e., books, articles, websites)</td>
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1. I feel confident and capable to: 
Mark only one oval per row.

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</tr>
</thead>
<tbody>
<tr>
<td>Learn from my information problems solving experience and improve my ability to locate, evaluate, and use information</td>
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<tr>
<td>Pull together newly gathered information with previous information</td>
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<td>Criticize the quality of my information seeking process and its products</td>
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5. What grade are you in? 
Mark only one oval.

- [ ] 0  Skip to question 6.
- [ ] 12 Skip to question 21.

9th Grade

Q: All of the following concepts are related to transportation. Which word matches the framework (most specific topic)?

Mark only one oval.

- [ ] Airplanes
- [ ] Hybrid cars
- [ ] Freight trains
- [ ] Bicycle helmets

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7. When students are assigned a topic, it is often quite broad. That is, it is a student's responsibility to make the topic more manageable.

Which of the following would not follow the pattern of a broad topic (see the left) reduced to a narrower topic (see the right)?

**Choose one answer.**

- [ ] Dust storms-drought-water restrictions
- [ ] Fashion-designers-novels
- [ ] Wireless network-smart phone-weather app
- [ ] Team sports-score-goals

8. Consider the task below as possible for a three-page research paper. Indicate whether the statements would be a Good topic for this paper, a Topic too broad for this paper, or a Topic too narrow for this paper. Support this impact of the Internet on education.

**Choose one answer.**

- [ ] Good Topic
- [ ] Topic Too Broad
- [ ] Topic Too Narrow

9. You have just been assigned a research paper on “fracking” for a three-page research paper. Which of the following research questions will allow you to find the most relevant and useful information for your paper?

**Choose one answer.**

- [ ] What are the possible environmental dangers with fracking?
- [ ] How much water is used in fracking to get the natural gas?
- [ ] What fracking cases have come before the Supreme Court?
- [ ] Who invented fracking?

10. Read the original news article on a recent news article. In the following news article, rewrite it from the original

Central Topic: What were the effects of the 1920s stock market crash on the economy?

Rewritten Topic: What were the effects of the Great Depression on the economy?

**Choose one answer.**

- [ ] Broader
- [ ] Narrower
11. Which of these resources would help you find information about a service you own?

**CHOOSE ONE ANSWER.**

☐ a school library catalog
☐ a science database
☐ The Food Safety.gov website
☐ a boot on food safety

12. You have a science project due tomorrow and will need a place to start. Which of the following resources would be the most useful?

**CHOOSE ONE ANSWER.**

☐ Encyclopedia and world atlas
☐ Science textbook and National Hurricane Center website
☐ Bibliography and encyclopedia
☐ National Hurricane Center website and newspaper database

13. If you want researching the topic of "fire safety", which group of tools would be the most useful?

**CHOOSE ONE ANSWER.**

☐ Newspaper database and e-book on ethics of stem cell research
☐ Online thesauruses and online encyclopedia
☐ Science database and an Internet search engine such as Google

14. You have been asked to write a research paper on Albert Einstein, which of the following is a primary source?

**CHOOSE ONE ANSWER.**

☐ A biography of Albert Einstein
☐ The chapter on Albert Einstein in the book Great Mathematicians
☐ The World Book Encyclopedia entry on Albert Einstein
☐ A speech by Albert Einstein

15. You want to write a paper for history day on the differences between meals eaten during the Civil War and the Civil War. What of the following resources would be a good place to start?

**CHOOSE ONE ANSWER.**

☐ Encyclopedia and website
☐ Bibliography and encyclopedia
☐ Website and dictionary
☐ History textbook and bibliography
16. You are writing a paper on Theodore Roosevelt, and your teacher told you that he is mentioned in a book that you have. What part of the book will direct you to the pages on Theodore Roosevelt?

   Choose one answer.
   - Bibliography
   - Footnotes
   - Index
   - Table of Contents

17. List at least five types of source materials (example: article) so that students of the term description system and index will be retrieved in your research.

   Choose one answer.
   - Annotation
   - Indexing
   - Paraphrasing
   - Translation

18. What are the steps you would take if your library had the basic article in print? What is the best type of source to do in the library's catalog in this case?

   Choose one answer.
   - Author
   - Subject
   - Title
   - All fields

19. In order to complete your research, you are creating a research paper. Here are tasks that you should not be disturbed by your professor and classmates. Select the correct order of tasks your group needs to take.

   1. Search any new articles and record information.
   2. Organize information and write a rough draft of your paper.
   3. Identify information needed and list sources.
   4. Create your outline and research for final writing.
   5. Revise the accuracy of your sources and edit your project.
   6. Present the project to your teacher and audience.

   Choose one answer.
   - 6, 3, 1, 2, 4, 5
   - 6, 2, 1, 3, 5, 4
   - 3, 6, 2, 1, 4, 5

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21. 18. “Authority” is one of three traits to consider evaluating a website. Which of the following is a definition of “authority”?

   Choose one answer.
   Mark only one oval.
   □ Power to settle disputes
   □ Expert on a particular subject
   □ Government agency
   □ Reputable individual

22. 19. You need to verify the amount owed to the IRS for a federal income tax return. Which of the following would be the best source to verify this amount?

   Choose one answer.
   Mark only one oval.
   □ "The White House Blog" on America's tax burden
   □ "Occupy Wall Street" website highlighting economic inequality
   □ "Freedom from Taxes" website on how to protect your income from taxation
   □ "Tax Foundation" website for research on tax policies

23. 19. When evaluating a website, which of the following would indicate the website's authority?

   Choose one answer.
   Mark only one oval.
   □ Clear and attractive website design
   □ The name and reputation of the website sponsor
   □ The amount of information provided
   □ Links to related sites

24. 19. You are researching "Curiosity," NASA's rover that is exploring the surface of Mars. You want to verify this information thoroughly. Which would be the best place to look for accurate and verified information about Curiosity?

   Choose one answer.
   Mark only one oval.
   □ An encyclopedia article about Curiosity
   □ A scientific article about Curiosity
   □ NASA's daily Twitter posts @MarsCuriosity
   □ A book about Mars

25. When using a website, what do you need to check first to determine if a source is accurate?

Mark only one oval.

☐ Does the information fit with what I already know?
☐ Is the site used by a lot of people?
☐ Does the page load quickly?
☐ How many paragraphs are on the page?

26. You are preparing to create a bibliography or a Works Cited page for your book report. Using information from the title page of a novel as your citation, which of the following is the best publisher?

ANIMAL FARM: A FAIRY STORY
George Orwell

Animal Farm
A FAIRY STORY
Houghton Mifflin Harcourt
Boston    New York

Mark only one oval.

☐ George Orwell
☐ Animal Farm
☐ Houghton Mifflin Harcourt
☐ Animal Farm: A Fairy Story

27. When you original creation (poem, song, etc.) uses a work form, what best describes when it is

Mark only one oval.

☐ Immediately
☐ After you apply for copyright through the U.S. Copyright Office
☐ After you hire a lawyer to help you with copyright
☐ After you submit a fee and a copy of your original creation to the U.S. Copyright Office

28. When you license, to use an image created by another, you ensure that you:

Mark only one oval.

☐ Yes, if I got permission from the creator
☐ Yes, if I cite the image
☐ Yes, if I make the image publicly available on my website
☐ Yes, if I give the creator credit
10/20/2023

International Literacy Week - High School

20. You are part of a team researching the changing habits of the daily tea. You found a few articles highlighting all the reasons. The article is protected by copyright. Under copyright law, you are allowed to do which of the following?

- Choose one answer.

☐ Make 4 copies for your other team members.
☐ Make 5 copies to distribute to every member of the class.
☐ Make 4 copies to sell to other students working on the same topic.

21. You want to include the items from the following article from the online AgResearch Magazine in your research paper. Which of the following options would best suit the author's idea for your research?


- Honey bee larvae are home to a wide range of beneficial insects—bees, wasps, ants, and flies. These insects help control pests and diseases, improving crop yields and overall ecosystem health. The larvae are a rich source of natural antibiotics and anti-inflammatory compounds, making them a valuable resource for research.

- Choose one answer.

☐ A community of bacteria in adult honey bees may help the bees survive (Kaplan).
☐ Honey bee stresses include diseases, poor nutrition, sub-lethal effects of pesticides, and many others (Kaplan).
☐ Agricultural researchers have been aware of a number of a community of bacteria in adult bees that may aid with some of these stresses (Kaplan).
☐ Agricultural researchers have found bacteria that can help honey bee larvae survive the many stresses that they face (Kaplan).

Skip to question 62.

12th Grade

31. Which of the following questions below is the best topic for a three-page paper?

- Choose one answer.

☐ What is the rationale for smoking bans in outdoor areas?
☐ What are the benefits of smoking for smokers and non-smokers?
☐ What is the status of statewide smoking bans in the U.S.?

32. A student began an investigation about the legalization of marijuana. The project focused on marijuana use and the long-term effects of abuse. While researching, the student found information about the possible benefits of marijuana for treating medical conditions. This student could use this to change the focus of the research paper. Choose the option that best reflects the new focus of the student's research.

- Choose one answer.

☐ Effects of marijuana use on fetus development
☐ Evidence of marijuana addiction
☐ Short- and long-term effects of marijuana on the brain
☐ Use of the marijuana chemical cannabinoid for treatment purposes

https://www.google.com/search?q=analysis+of+the+long+term+effects+of+smoking+on+health

9/15
32. *You have just been assigned a research paper on a topic of your choice. Your teacher has a keen sense of what it means to be a mathematician.*

Choose one answer.

- What was the inventor’s most famous invention?
- When and where did the inventor live?
- How did the inventor’s life and work influence other inventions and society?
- What was the inventor’s education?

33. *You have just been assigned a research paper on a topic of your choice. Your teacher has a keen sense of what it means to be a mathematician.*

Choose one answer.

- The subject area of an online math database
- The table of contents of a math book
- A Google search on “math topics”
- A math education magazine

34. *You have just been assigned a research paper on a topic of your choice. Your teacher has a keen sense of what it means to be a mathematician.*

Choose one answer.

- Renewable energy such as wind turbines and solar power will save our planet.
- Manufacturing electric cars is very costly.
- Wind turbines can provide energy to farms economically and safely.
- Many renewable energy sources exist such as wind turbines, solar power and water power.

35. *You have just been assigned a research paper on a topic of your choice. Your teacher has a keen sense of what it means to be a mathematician.*

Choose one answer.

- How is the Fourth Amendment applicable today?
- How has our interpretation of the Fourth Amendment changed since its adoption?
- Why was the Fourth Amendment included in the Bill of Rights?
- What legal cases have involved the Fourth Amendment?
37. You are creating a presentation on the emergency response to a recent flood in your area. Your teacher requires that you use primary sources. Which of the following is a primary source?

- Red Cross brochure of what to do in an emergency
- Newspaper article on the search and rescue efforts
- Emergency preparedness guide on the city’s web page
- Video of survivor account of the event

Mark only one oval.

☐ Red Cross brochure of what to do in an emergency
☐ Newspaper article on the search and rescue efforts
☐ Emergency preparedness guide on the city’s web page
☐ Video of survivor account of the event

38. You are doing a research paper about graphic novels and literature. Which set of sources would be the best place to start your research?

- 1. Encyclopedia article on “graphic novels”
- 2. Articles on contemporary literary history
- 3. Articles on contemporary literature
- 4. Articles on “graphic novels”
- 5. Articles on library database on “graphic novels”

CHOICE ONE ANSWER:

Mark only one oval.

☐ 2, 3, 5
☐ 1, 4, 6
☐ 1, 2, 3

39. You are creating a video public service announcement for Students Against Destructive Decisions (SADD). You decide to include data, quotes, and statistics. Which of the following groups of resources would provide you with the most useful information?

- Books, research database, government websites
- Interview with public health officer, books, local newspapers
- Books, research database, local newspaper
- Interview with public health officer, research database, government websites

CHOICE ONE ANSWER:

Mark only one oval.

☐ Books, research database, government websites
☐ Interview with public health officer, books, local newspapers
☐ Books, research database, local newspaper
☐ Interview with public health officer, research database, government websites

40. You are learning about nutrition in health class and wish to do a research project. The topic is nutrition, and you want to explore healthy eating habits. Which of the following sources would provide the best information for the creation of your project?

- Science journal database
- Popular magazine database
- Hospital website
- Government health website

CHOICE ONE ANSWER:

Mark only one oval.

☐ Science journal database
☐ Popular magazine database
☐ Hospital website
☐ Government health website
41. L. You are researching information about the costs of operating different engine models. You want to consider the cost of fuel, maintenance, and insurance. Which of the following sources would provide the least amount of information to answer your question?

- [ ] Your school library’s online catalog
- [ ] A .gov website, such as from the Department of Transportation
- [ ] Consumer websites
- [ ] Information from car manufacturers

Mark only one oval.

42. L. In ecology class, you have been asked to prepare a report dealing with sustainable harvesting of pelagic fish for all in the coastal communities. You know nothing about the topic. Which source would be the best place to obtain background information about the topic?

- [ ] A food supplement company’s website
- [ ] An article from a current affairs database
- [ ] An article in a science encyclopedia
- [ ] An online newsletter from an environmental group

Mark only one oval.

43. L. You are required to do a three-paragraph essay about the life of John Nash (1) and are searching for information on game theory. As a pointer, you begin your search as shown in the search string you typed in your search box. “John Nash OR game theory”

Which search string would result in the best use of your follow-up search?

- [ ] John Nash OR game theory
- [ ] John Nash AND game theory
- [ ] Game theory NOT John Nash
- [ ] Nobel Prize AND game theory

Mark only one oval.

44. L. Your partner has prepared a list of four credible database sources dealing with health care. The best way to keep track of your sources is by creating:

- [ ] Source cards
- [ ] Spreadsheet
- [ ] Works Cited page
- [ ] All of these

Mark only one oval.
45. You need to find a library book about the Lewis and Clark Expedition. You are interested in their encounter with the Sioux Nation. Which of the following do you need to locate in the library catalog?

- Table of contents
- Summary on the library catalog
- Index
- Preface

Mark only one oval.

46. To give a report on the Lewis and Clark Expedition, you need to design a power point presentation. Below is the correct order of steps you should follow. Select the correct order of steps you should follow:

1. Search sources, outline, and record information.
2. Create a presentation and make a rough draft of your presentation.
3. Identify information needed and study sources.
4. After writing summaries and notes for your sources.
5. Review the content of your research and final presentation.
6. Present the draft for the intended audience.

Mark only one oval.

- 3, 6, 1, 2, 4, 5
- 6, 3, 1, 2, 4, 5
- 6, 2, 1, 3, 5
- 3, 6, 2, 1, 4, 5

47. You want to search for information about the Lewis and Clark Expedition. The search results include over 10,000 digital resources including journal articles, books, newspapers, and maps. You need to select sources for your report. Which of the following search tools do you use to locate web-searched articles?

Mark only one oval.

- Results expander - search full text
- Publication - select specific magazine
- Results limiter - academic journals
- Source Type - reports

48. You are searching for information about the Lewis and Clark Expedition. You need to use keywords that produce too many results. Which of the following will help refine the information quality?

Mark only one oval.

- Date
- $
- About
- Or
49. The following news articles are related to fracking (also called hydraulic fracturing). Based on the following article topics, identify the most likely source of a reactor paper.

- "It's official: "Age of Shale" has arrived"
- "Texas fracking ban faces industry challenge"
- "EPA rule to curb hydraulic fracturing emissions draws mixed reactions"
- "Exxon says fracking 'safe as industry mounts defense"

Choose one answer.

50. You are doing a report on the environmental impacts of American fracking. You have found a source that states 60% of the federal budget to operate on energy and your teacher asks that you confirm the accuracy of the statement. Which of the following is the most effective way to determine its accuracy?

Choose one answer.

- Speech by U.S. Senator
- ForeignAssistance.gov website
- Book on Federal spending
- Wikipedia article

51. You are doing a research project and you found a website on "The Biological Traits of Spider Octopuses" (http://example.com). You know that the author of the website website is the key account to verify that the website is a credible source.

Choose one answer.

- Check the website to identify the sponsoring organization.
- Search the website name in a search engine and review the results.
- Review the links on the website.
- Learn more about the true octopus in a book on Cephialopod moluscs.

52. You are a big fan of the Star Wars movies. You find a website that lists websites. You would not be available for the following topics to have been developed at a lower. Which of the following would be the most authoritative source to determine the accuracy of your friend's claim about Star Wars?

Choose one answer.

- A movie review for the first Star Wars movie
- A book about special effects in the Star Wars movies
- An article about lightsabers posted on lightsabers.org
- A Star Wars fan site
53. This research question you have for your paper is: In what extent are profits from legal gambling favorable education standards? You have found an article about casinos and gambling in schools. Which of the following facts from this article supports your research question?

- Casino are allowed to keep up to 80% of revenue.
- Casino proceeds replaced, but did not add to school funding.
- Table games such as poker, craps, and roulette are very profitable.
- Gambling revenue is in decline.

Mark only one oval.

54. You are writing a essay on the effects of cigarette smoking on health. Which website is most likely to have the most reliable information?

- U.S. National Institutes of Health
- Terr's Mint Chew
- U.S. Smokeless Tobacco Co.
- Snuff Smokeless Tobacco

Mark only one oval.

55. You have been discussing the limits of copyright law in copyright law for a copyright course. Which one of the following areas of copyright concerns would be allowed under "fair use"?

- Short video clips from a TV show to substantiate criticisms of the show you are making in your class presentation
- Entire music video from a popular artist as part of a class project on the artist's life and work
- Any of these
- Compilation of music clips from old VHS tapes for class discussion on movies of the 1940s
58. Look at the three PowerPoint slides below. Which one shows the proper way to give credit to an information source used to create the table?

**Frame 1**

<table>
<thead>
<tr>
<th>Percentage of Teens Who Play Video Games</th>
</tr>
</thead>
<tbody>
<tr>
<td>By gender, the percentage of teens who play video games online on their phones:</td>
</tr>
<tr>
<td>- Girl 30%</td>
</tr>
<tr>
<td>- Boy 40%</td>
</tr>
</tbody>
</table>

**Frame 2**

<table>
<thead>
<tr>
<th>Percentage of Teens Who Play Video Games</th>
</tr>
</thead>
<tbody>
<tr>
<td>According to the Pew Research Center, the percentage of teens by gender who play video games online on their phones:</td>
</tr>
<tr>
<td>- Girl 40%</td>
</tr>
<tr>
<td>- Boy 50%</td>
</tr>
</tbody>
</table>

**Frame 3**

<table>
<thead>
<tr>
<th>Percentage of Teens Who Play Video Games</th>
</tr>
</thead>
<tbody>
<tr>
<td>By gender, the percentage of teens who play video games online on their phones:</td>
</tr>
<tr>
<td>- Girl 30%</td>
</tr>
<tr>
<td>- Boy 40%</td>
</tr>
</tbody>
</table>


**CHOOSE ONE ANSWER:**

Mark only one oval.

- Frame 1
- Frame 2
- Frame 3

57. You have been assigned a research project about air pollution. Which would be the best tool to use?

**CHOOSE ONE ANSWER:**

Mark only one oval.

- An environmental database
- An online atlas
- A current events database
- A newspaper database
52. 39 You want to use the information in the following passage for your paper on malaria.

In the last 35 years, hundreds of millions of anti-malarial mosquito bed nets have been distributed across the malaria-endemic world, along with containers of anti-malarial drugs and diagnostic kits. As a result, since 2000, malaria mortality has fallen by 25 percent (Shah).


Which of the examples below can be used to support the information above, please list?

CHOOSE ONE ANSWER.

Mark only one oval.

☐ Distributing hundreds of millions of anti-malarial mosquito bed nets, containers of anti-malarial drugs and diagnostic kits has reduced malaria mortality by 25 percent (Shah).

☐ Since 2000, malaria deaths have fallen by 25 percent due to distribution of anti-malarial mosquito bed nets, drugs, and diagnostic kits (Shah).

☐ Since 2000, malaria mortality has fallen by 25 percent due to hundreds of millions of anti-malarial mosquito bed nets, containers of anti-malarial drugs and diagnostic kits (Shah).

52. 39 Which of the following is considered an example of plagiarism?

CHOOSE ONE ANSWER.

Mark only one oval.

☐ Rewriting someone else’s words and giving credit.

☐ Turning in someone else’s paper as your own.

☐ Using “common knowledge” and not giving credit.

52. 39 The use of any copyrighted or other protected material is limited to documentation purposes only. The use of any material without providing proper credit is considered plagiarism. The library reserves the right to restrict access to any material used. With this information in mind, choose the example below that is an example of "fair use."  

CHOOSE ONE ANSWER.

Mark only one oval.

☐ Your friend wants to use music from a recent popular album as background music for his presentation in class. Since you already bought the album, you burn a copy for him to use for the project.

☐ To raise money for the chess club, you show a personally named copy of a recently released film after school. You charge a one-dollar entry fee per person.

☐ For a discussion on the theme of gender in comic books, a teacher scans a section of a comic book. The teacher posts this scanned portion to the password-secured class website so the class members can read and discuss the text.

Student Participation Information Sheet

Today you have the opportunity to participate in a research study, unless your parent opted you out, where we will collect information on your ability to locate, evaluate, and use information. A copy of your answers without your name or identifying information will be given to the researcher for further study. Your participation in having your answers shared for this study is voluntary.

In this study, you will be asked to do the following things:

1. Allow the researcher to have a copy of your answers but not your name.
2. Answer five questions about yourself.

If you have any questions, raise your hand to ask the librarian. If you have questions later, the librarian can give you contact information for the researcher.

http://doc.google.com/a/tomato.org/file/1A62E23H7jZk6JQwUJGOU3V8JQc/office
01. Do you agree to these terms? *
   Mark only one oval.
  ☐ No   Stop filling out this form.
   ☐ Yes

Demographics

02. What is your age?
   Mark only one oval.
   ☐ less than 10
   ☐ 10
   ☐ 11
   ☐ 12
   ☐ 13
   ☐ 14
   ☐ 15
   ☐ 16
   ☐ 17
   ☐ 18
   ☐ 19
   ☐ 20+

03. Gender?
   Mark only one oval.
   ☐ Male
   ☐ Female
   ☐ Prefer not to say

04. Race?
   Mark only one oval.
   ☐ Asian
   ☐ Asian Pacific Islander or Native Hawaiian
   ☐ Black
   ☐ Hispanic or Latino
   ☐ Native American or Alaska Native
   ☐ White
   ☐ Two or more races
65. School?
Mark only one oval.

66. This is my ________ year attending this school.
Mark only one oval.

67. How often did you go to your school library last year for research lessons (even if you attended a different school)?
Mark only one oval.

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Google Forms.

https://docs.google.com/forms/d/1g8m4vIEzytkJuaxkxkpo63muu4c/SiH4WVgk9/s/edit