INFORMATION LITERACY ON THE WEB: HOW VISUAL AND TEXTUAL CUES CONTRIBUTE TO WEBSITE CREDIBILITY ASSESSMENTS

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Abstract

One of the most important literacy skills in today’s information society is the ability to determine the credibility of the information one finds on the World Wide Web. Users must be able to sort through a staggering number of sources while discerning which of them will provide the best information. In this study, 70 participants assessed the credibility of websites with either a low design quality or high design quality, and either low credibility or high credibility. The purpose of the study was to understand if students relied more on textual or visual cues in determining the credibility of websites, and to understand if this affected their recall of those cues one week later. The results indicate that when viewing a low credibility website, high design quality will not compensate for the lack of credibility, but when viewing a high credibility website, the design quality will supplement the credibility rating. This indicates that the textual cues (or lack thereof) were more important than the visual cues in determining website credibility. The recall test also indicated that credibility perception does impact the participants’ recall of both visual and textual cues. Implications are discussed in light of Information Literacy standards and evolutions.
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Chapter One: Introduction

Literacy in today’s information society is no longer limited to basic reading and writing skills, but includes a broader set of skills including the ability to critically evaluate information, and recognize that credible information should be the starting point for making knowledgeable decisions. These kinds of skills are often called information literacy, and they have become increasingly important to members of the information society, especially as the World Wide Web has become a major source for gathering facts and data in the lives of many people living in computer-oriented societies. Faced with an abundance of information from a host of diverse sources, knowledgeable Web users must learn to sift through the large number of potential resources online and determine which sources will provide them with the best information to make their judgments and decisions.

The World Wide Web is a powerful tool in providing access to information on almost any topic one wants to explore. Typing words in a search engine usually results in thousands if not millions of websites related to the topic. According to a March 2009 survey by Netcraft, there were about 224,000,000 websites in the world (Netcraft, 2009). Each website may have just one or as many as thousands of webpages associated with it. Even if a user only accesses websites in a single language s/he has instant access to a staggering number of webpages, simply by typing in the web address, searching through an Internet search engine, or following a link. Furthermore, websites can be created by any group or individual with the relatively simple and inexpensive resources
to do so, namely access to a computer and an Internet connection. Creating a blog, for example, requires no knowledge of programming or a markup language, and can be set up for free. While there are formal and technical standards on the web, there are no requirements that website authors give their names, references, date of publication or intentions with the information they provide. There is no formal regulation of the quality of information on the Internet, and in fact the more a webpage is viewed the higher it may appear in search results, meaning that information quality is more or less evenly accessed. This mass of easily accessible webpages containing so much information creates a unique situation for users trying to determine which information to believe. A range of complex skills are required to access and harness information online, and knowing how to navigate the Internet and assess the information found there are vital components of literacy in the 21st century.

While the Internet is not new, it has become popular rather quickly. In the United States in 2008, 74% of adults said they use the Internet, compared with 46% in 2000 and only 14% in 1995 (Pew Internet and American Life Project, 2009). This indicates that the number of adults using the Internet has quintupled in just over ten years. Children and adolescents are also heavy users of the Internet. A 2005 study by the Kaiser Family Foundation (Rideout, Roberts and Foehr) found that 47% of young people in the United States between 8-18 years old use the Internet on a typical day and, considering the yearly rise of Internet use, this percentage is probably higher as of 2009. Even very young children use the Internet. Another study by the Kaiser Family
Foundation in 2006 found that 33% of children ages 4-6 look at websites for kids, and 5-10% of infants under three use computers regularly (Rideout and Hamel, 2006).

While people do many things online, such as play games and share files, finding information online is also a norm for many people in computer-oriented societies. A 2008 survey in the United States found that 72% of people use the Internet every day and of those, 81% look for information on a service or product they are thinking of buying, 75% look for health or medical information, 70% get news, and 57% do research for school or training (Pew Internet and American Life Project, 2009). This shows that the Internet is being used for a variety of information-gathering habits. This is also the case with people in different regions. In a survey of people in the United States, United Kingdom, Australia, Singapore, India and Canada, 84% of respondents claimed they typically begin their search for information by using a search engine (Online Computer Library Center, Inc., 2005). Furthermore, when asked to rate different sources and places, 56% rated search engines as very favorable, compared to 44% for physical libraries, and 38% for physical bookstores.

Understanding credibility and learning on the web is increasingly important as using the Web to find information has become commonplace amongst computer-oriented societies. College students, in particular, tend to use the Web as one of their primary tools for academic research. According to a 2002 study by the Pew Internet and American Life Project, 79% of college students say that the Internet has had a positive impact on their academic experiences. When asked how much they used the Internet for information searching, compared to the library, 73% of students said they used the
Internet more, while only 5% said they used the library more. It is likely that younger generations may have been using the Internet for as long as they’ve been using libraries, and future generations may use the Internet in lieu of hard-copy sources entirely. All of this shows that the Internet is increasingly the medium of choice for information on a variety of topics, especially for young adult users.

Whether people have adopted the Internet as adults, adolescents, or children, it is important to understand how they make accessing information online a meaningful experience. Since people are turning to the Internet more and more for their information, and since the amount of this information is so confounding, it is important to understand how they evaluate and determine the credibility of the information they find online.

**What is Credibility and Why Does it Matter**

Credibility is usually synonymous with words like trustworthiness and expertise. Credible information is more likely to be accurate information. After all, trustworthiness implies that the source can be trusted to be giving information that is not intentionally incorrect. Expertise is the other term that is often used in conjunction with credibility, and it implies that the source has a high level of knowledge and experience related to the topic, and that their information is more accurate than a non-expert’s. Credible information is an important part of accurate information, and having inaccurate information can be problematic in many ways. At a minimum it can lead to small misunderstandings, such as knowing incorrect facts or messages. It can also lead to
misinformation that gets repeated enough that it leads to mass misunderstandings. A famous example of this is the case of the Eskimo vocabulary hoax (see Pullum, 1991), in which, for decades, people proliferated the myth that speakers of a particular indigenous language have one hundred words for snow, a gross inflation from the claim of the original source (the actual source comes from Franz Boas who remarked, in 1911, that an Eskimo language had four words for snow). This claim was used both as evidence to argue that language reflects our view of the world, and as a way of describing a specific cultural phenomenon. Writers eventually started quoting each other, or simply stating the fact without citing the source, and eventually lost track of the original source. It took many decades before this was realized, and the misinformation still permeates today. Determining the credibility of information is particularly important in today’s networked information society because information is shared more rapidly and abundantly. It is not just one poor piece of information that is problematic; it is the spread and distortion of that information that makes it so problematic. As Pullum states, “Once the public has decided to accept something as an interesting fact, it becomes almost impossible to get the acceptance rescinded. The persistent interestingness and symbolic usefulness overrides any lack of factuality.” (1991, p. 159)

In the case of medical information, credibility is especially important, as inaccurate information can lead to poor treatment. An example of this is the debate over a link to autism and childhood immunizations. A February 1st, 2009 Google search of “autism immunization” reveals that the first page of results includes both websites
linking autism with childhood immunizations, and websites disputing the link. A parent considering whether or not to immunize their child would be faced with determining which sources are trustworthy and which are not. While having a credible source does not necessarily mean the information is accurate, trustworthy and expertise information is a better starting point for making more knowledgeable decisions. These examples are meant to illustrate the way that misinformation can be spread so widely, and for so many years. Credibility is a complex and multi-dimensional thing, not always resulting in accuracy, but being one of the many facets of accuracy.

Being able to determine credibility is also an important part of self-sufficiency. Having the ability to access so much information, and do so many different things online has resulted in expectations that people can do more things on their own (Lankes, 2008). As Lankes states, “Since information is the only evidence available to people when making an online transaction (e.g. buying something, talking to someone, learning about something, etc.), the credibility of that information is essential (2008, p. 670). Furthermore, people have a motivation to be correct. Even if the information being sought is not going to be the basis for a dire choice or judgment, people want to know the best and most accurate information.

**Shifting credibility from traditional methods to new methods**

Some scholars suggest that the real problem for information seekers on the web is that the presence of traditional information intermediaries, such as credentialed
journalists, researchers, lawyers, and other specialists is no longer easy to find.

Traditional methods of determining source credibility usually focus on looking at the author, date of publication, edition, publisher, and type of material, such as popular magazine or academic journal (Cornell University, 2004). These cues are important facets of credibility for a number of reasons. Author name, for example, relates to the element of expertise, especially if the author is known in his or her field. Having an author name also may place a certain amount of accountability on a person, in a way that an anonymous text does not. The date of publication, and edition, are important to know because they tell the reader how current the text is, and whether it was written or updated after events which may have affected the content. Knowing the publisher is important, as this tells the reader what kind of organization is producing the text. A text about climate change, for instance, may be perceived differently if it is published by a government agency, a newspaper, a personal blogger, a private motor company, or a university. Even within these categories users may perceive credibility very differently if, for example, it comes from a U.S. government agency or a Chinese government agency. The type of material is another important factor in traditional credibility assessments because the user probably has some notion of the traditions and standards of that medium. Consider the different perceptions of credibility one may have between magazines, newspapers, textbooks, television news, documentaries, peer-reviewed journals, and of course the variety of nuanced differences within these genres, such as gossip magazines, news magazines, hobby magazines, and sports magazines. While it
can be troublesome to rely on these cues alone to determine the believability of a source, they are generally recognized as helpful tools in doing so.

All of these traditional cues have been taught and used as credibility determinants for years. With most hard-copy material these cues, author name, date of publication, edition, and publisher, are found printed at the beginning and/or end of the text. Figuring out the type of material is the only factor requiring the user to look at non-textual cues, such as the type of paper or the type of images used. On the web, however, these conventions have changed. Author name is not always provided, particularly for content provided on organizations’ and corporations’ websites. The date of publication also may or may not be present, and the frequency of updates (revisions) is rarely given. Determining the type of website can also be difficult, as website names do not always match the name of the organization, and some websites may serve different purposes, or disguise their purposes as something else. The lack of uniformity in web design means that information that has traditionally been used to help a user assess the credibility of a website is no longer present or easily found. While people may learn early in their education how to examine a source for author name, references, credentials, etc., it is not clear if they still apply these methods to online materials. What’s more, when they do not have access to these textual cues it is possible users may also have to look for visual cues, such as design quality, to decide if a website is credible or not. Websites that have the resources to make more well designed webpages may be seen as more legitimate, and therefore more credible. These visual cues may be
the source of the credibility assessment when there is a dearth of traditional textual
cues, or may supplement it when textual cues are provided.

The purpose of this proposed research is to find out whether students rely more
on visual or textual cues when they are evaluating the credibility of a website. I will
compare their perceptions of the credibility of websites with appealing design quality to
those with poor design quality, and I will also compare their perceptions of credibility
of websites with higher textual indicators of credibility to those with low textual
indicators of credibility. Furthermore I seek to understand whether or not their
perceptions of credibility affect how well they recall information from the websites.
These results will help our understanding about how people assess credibility, and in
turn, how they develop information literacy skills as heavy users of the Internet.
Chapter Two: Literature Review

Understanding Source Credibility

Credibility is a concept that may seem simple at first, but is actually a highly complex, multi-faceted concept that has been studied in numerous communications fields for many years. While there is no one definition of credibility, much of the research in the past fifty years has defined credibility as related to believability and trustworthiness. In one of the earliest empirical research studies defining credibility, Hovland, Janis, and Kelley (1953) defined credibility as trustworthiness and expertise of the communicator. They also suggested that credibility research can fit into three categories: source credibility, audience credulity, and message credibility, a distinction which continues in much of the research today. Most of the research falls under source credibility, sometimes called media credibility, which, according to Self (1996), has endured because this kind of research can be beneficial to mass media institutions and businesses. This kind of research looks at the source of a message, whether a person, an organization or a medium, and how different sources compare based on their features.

Another early study on source credibility echoed Hovland and colleague’s definition of credibility. Roper (1985) defined credibility as synonymous to believability. He suggested that those sources which audiences find believable are those that are relatively more credible. Roper also emphasized that credibility is relative based
on the audience’s judgment, rather than something that is absolute or objectively measured.

In order to gain further understanding of the dimensions of credibility Singletary (1976) proposed a list of words which would define source credibility. He asked 91 participants to come up with words that they felt described a credible person. This list was then given to a separate group of 181 participants, and they were asked to rate which words they felt were the most consistent with their understanding of credibility. Results showed that the most important category of words describing credibility were knowledgability (educated, intelligent, fair, good sense, exact), followed somewhat distantly by attraction (pleasantness, humor, versatility, warmth), trustworthiness (truthful, reliable, objective, open-minded), and articulation (clear, coherent, comprehensive).

Gaziano and McGrath (1986) conducted a national phone survey with 1002 people asking them to rate the credibility of newspapers and television. Their credibility assessments were defined by whether mediums were accurate, fair, unbiased, trustworthy and/or complete. They also found that concern for a community’s well-being, and having readers best interests in mind were important factors in determining source credibility. This indicated that audiences were using extensive previous experience and knowledge of a source to assess its credibility.
**Credibility of the Web as a Medium**

Most source credibility studies have focused on television and newspaper media as a whole. Understanding credibility of the web medium has largely involved looking at more specific characteristics within the medium itself. For the web, this may be the case namely because features which may be easier to find in traditional information sources, such as author’s credentials, and references (collectively referred to as textual cues), do not always exist on websites, or at least, not in consistent locations, as a book index or author name would be. Moreover, the web is a highly visual medium with considerable variation in color, design, and layout, as well as high numbers of dynamic photo and video content (collectively referred to as visual or non-textual cues). For the web, some research indicates that evaluations of credibility are made more by how a site looks than by what it says. A large study by Fogg, et. al. (2001) found five major webpage characteristics that contributed to perceived higher credibility, and two that lowered the perceived credibility. The five contributing factors: real-world feel, ease of use, expertise, trustworthiness, and tailoring, were all determined from a composite scale of questions. Most of the questions within these scales point to textual cues, or anything that is written in text. Some examples that were high contributors to credibility include “The site lists the organization’s physical address,” “The site lists authors’ credentials for each article,” and “The site has articles that list citations and references.” Other high contributors of credibility perceptions, however, include visual cues, or cues which revolve around design, color scheme, photographs, and etc., such as “The site looks professionally designed.” Of the factors that lowered the credibility ratings were a
mix of visual and textual cues, such as “The site has one or more ads on each page,”
“the site is small (e.g. less than 5 pages)” and “the site has a typographical error.” This
survey highlights the variety of dimensions that factor into quick assessments of
credibility online.

A later study by Fogg et al. (2003), found that many U.S. adult Internet users
(median age 40) felt that a good “design look” was the most important factor for
deciding if a website was credible. In this study people evaluated the credibility of two
real websites and asked what features they noticed when assessing credibility.
Overwhelmingly, design look was the most frequently mentioned contributor to
credibility perceptions (46.1% of participants mentioned this). Information
design/structure was the next largest contributor, at 28.5%, which included the general
organization of the website. Other factors which may have been expected to play a
higher role were not mentioned as frequently, such as company motive, 15%, accuracy
of information, 14%, advertising 13%, and readability, 3%. This study indicates that the
features users claim contribute to their credibility assessments (as found in Fogg, 2001)
do not always match the features they notice when actually viewing a website.

Focusing only on how visual cues affect credibility assessments, Walther, Wang
and Loh (2004) looked at how credibility was rated when visual advertisements were
inserted on different web pages with different domains. They found that the presence of
advertisements had a negative impact on credibility assessments when they were on
websites in the .org domain, but had a positive impact on websites with .com and .edu
domains. This research also emphasizes the complicated nature of assessing credibility online, and the number of elements which play a factor in these evaluations.

While studies of source credibility have elucidated much about which textual and visual features people perceive as related to credibility few studies have looked at these features in a controlled environment. Most studies compare real sources with a broad variety of styles and purposes. This particular study, however, offers a unique perspective as the websites were designed specifically for the study, in order to compare specific features within and between experimental groups. This allows us to narrow in on which features were noticed and recalled by the participants, and eliminates some elements which we may not want to factor in, such as prior knowledge of the organization, or individual preference.

**Audience Credulity**

Studies in audience credulity focus on characteristics of the audience that affect their subjective assessments of credibility. Researchers have focused on factors and demographic features within the audience that may affect credibility. An early study by Becker, Cobbey, Sobowale (1978), prompted by fluctuations in support of confidence in the press over several years, looked at how criticism of the press varied amongst people during the Watergate scandal. They found that support of Richard Nixon, political affiliation, and ideology were the most important determinants in press criticism, more so than any of the psychological or socio-economic variables they tested.
This work prompted later scholars to emphasize credibility as a perception-based variable, rather than an objective variable coming from the source. Gunther (1992) pointed out the importance of involvement in credibility assessments, and argued that credibility was a relational variable between the audience and message. His research argued that having heavy involvement with an issue had a stronger affect on perceptions of media credibility than either demographic information or characteristics of the media.

Stamm and Dube (1994) built on Gunther’s study and argued that credibility relies heavily on audience attitude. They surveyed people on six different current events, measuring their intensity toward the issue, involvement with it, and closure with the issue (meaning openness to changing their view on the issue), and compared these results to trust of newspaper and T.V. media. They found that all three components were correlated to trust, on five of the six issues, arguing that these contingencies must be considered in credibility questions. They also pointed out that since relationships varied so much between issues and mediums, the attitude of the audience is not the only important factor, and that medium does in fact play a role in credibility.

A study by Johnson, Kaye, Richard and Wong, (2008), found that heavy web users evaluated blogs as more credible than light web users. They also found that blog users who consider themselves “politically interested” rate blogs as more credible than other online or TV media sources. Similarly, Kiousis (2001) found that hard copy newspaper readers rated newspapers as marginally more credibility than online or TV mediums, while online users rated online news as marginally more credible than other
mediums. This relates to the idea that the motives, values, and characteristics of the user play an important role in how they assess credibility.

**Message Credibility**

The third kind of credibility study has sought to understand how the content of a message affects credibility judgments. Prompted by findings that suggested audience reaction to messages was not related to actual evidence in the arguments, McCroskey (1969) did an early meta-analysis of previous studies related to the effect of evidence on attitude change. He found that messages with “good evidence” had no impact on audience attitude change if the source was already rated as highly credible, nor if the message was delivered poorly. However, he also found that good evidence contributed to increased attitude change if it was present in messages that came from low to medium credible sources. These results underscore that determining the credibility of a message is a very important factor in determining attitude change and persuasion by the message.

A study by McCrosky and Mehrley (1969) looked at how disorganization and nonfluency in messages affected audience ratings of source credibility. They found that disorganized messages, as indicated by rearranged introductions and conclusions, resulted in lower credibility ratings from audiences, as did nonfluency, indicated by speaker pauses and re-starts. However, they did not find that combining these two factors resulted in even lower credible ratings. They concluded that there were certain thresholds of disorganization that did not affect credibility ratings. In other words, once
a message was disorganized enough to affect ratings, disorganizing it more failed to result in still lower ratings of credibility.

In a 1993 study, Hamilton and Stewart looked at how message intensity affected its persuasiveness and credibility. They gave 518 participants brief texts on a gender-neutral topic (how too much exercise can affect your health) with varying levels of intensity, and with either a male doctor or female doctor as the source. They found that intense messages, those that used emotional, assertive, and active lexical items, had a negative impact on source credibility, although they also made the message seem more vivid. They also found that high intensity messages lowered the participant’s perceptions of competence and trust, regardless of the gender of the source. In the control groups they found that the female source was rated minimally higher on expertise and trustworthiness than the male source. These results indicate that gender may not play a large role in credibility assessments, at least in gender neutral topics, and that audiences view intensity as an indicator of low credibility.

Slater and Rouner’s research (1996) looked at how evaluations of whether a message is well written and well produced have a greater affect than simply liking or agreeing with a message. In a study with 76 individuals exposed to messages with varying quality (defined by flow and tone, and pre-tested several times for consistency), they found that the quality of the message predicted later assessments of the source when the participant had no prior knowledge of the source, but not when they had extensive prior exposure to the source. They also found that prior knowledge of a subject resulted in less peripheral analysis of the quality. In other words, having prior
knowledge made participants less likely to be influenced by message quality than those people with little to no prior knowledge of the topic. The author’s conclude that overall assessments of the quality of a message have a strong affect on credibility assessments for people without extensive prior knowledge of the topic and source.

Looking at how technical language, (defined by a presence of uncommon medical terms) and varying amounts of information (defined by the number of facts) affected participants’ intention to comply with the message, and their perceptions of the credibility of the source, Jackson (1992) showed participants videotaped messages with varying levels of technical language and information quantity. She found that, while technical language and amount of information affected participant’s comprehension of the message, they did not affect intent to comply, or credibility assessments of the source. Another facet of Jackson’s study was looking at how the message affected participant’s ability to recall the information later. Not surprisingly, she found that participants had more difficulty recalling technical messages, even when they were questioned shortly after viewing the videotapes.

**Message Recall**

Recall is an important aspect of understanding how people assess messages, particularly in mediums where both textual and visual elements compete for comprehension from the audience. A study by Walma van der Molen and Klijn (2004) compared how participants remembered television news compared to print news. They looked at how people recalled news items when the images were congruent with the
story, compared to news items with incongruent images. They found that television stories with incongruent images were more poorly recalled than print news stories with congruent images, but that television stories with congruent images were recalled better than printed news items with congruent photos. They suggest that a lack of audiovisual cues could explain why printed sources are more difficult to remember.

Looking at how pictures helped with recall of printed text, Kools, Van de Wiel, Ruiter, and Kok (2005) designed an experiment involving having participants with no prior experience with asthma devices view instructions for an asthma device along with drawings portraying how it’s used. They compared their recall to participants that read the instructions without the drawings, and found that there was a significant added value to having the drawings present. The also found that the simpler device, i.e. the one with more limited possibilities for use, did not benefit as much from the drawings as the more complicated device. This research suggests that some images may help people remember somewhat complex messages.

Moore, Stammerjohan and Coulter (2005) looked at how congruency with banner ads affected recall for those ads for website viewers. They exposed participants to websites with banner ads that had congruent background colors and text colors, and websites with incongruent coloring. They found that banner ads with incongruent coloring assisted with greater recall, whereas banner ads with congruent coloring resulted in more positive attitudes toward the ads and the website. The authors suggest that the incongruent ads, which were in high-contrast coloring, may have required more processing on the part of the participants, resulting in easier recall of those ads.
Fox, et. al. (2004) looked at how text and animated graphics affected recall of television news stories. They found that news stories with graphics resulted in better recall from participants as well as better comprehension. They also found that text graphics helped some viewers recall the information, though not as well as the animated graphics. Their findings that participants recalled harder stories better when they were accompanied with animated graphics suggests that these additions do not create a cognitive overload to processing hard stories, but actually alleviate some of the cognitive load. This is especially pertinent to our understanding of recall on the web, since much content on the web is accompanied by graphic and photographic images. This study will contribute to that understanding as well as to how color affects memory on the web, by looking at how well participants recall the color of the website they visit, and if credibility affects how well they recall the colors and photographs.

**Models of Persuasion**

Credibility is largely about persuasion. Credibility can be seen as means of persuading an audience to believe and potentially act on a message. Therefore it is important to understand which factors affect persuasion, particularly in the case of websites as communicators trying to persuade users that their information is credible.

Petty and Cacioppo’s elaboration-likelihood model (1986) explains that there are two routes to persuasion. The central route involves more thoughtful consideration of the information in a message. They claim that assessing messages through the central route is done when the person is able to, and has incentive to scrutinize an argument.
This kind of processing leads to a greater effort to scrutinize the arguments in the message. The other route, the peripheral route, involves more simple cues in the message, or anything that is not relevant to the issue, such as source attractiveness. They claim that peripheral cues can affect persuasion without processing of the actual message, and that these cues can be processed in a relatively less sophisticated manner. Petty and Cacioppo put these two routes to persuasion in the context of the postulate that people are motivated to hold correct attitudes, but that the extent to which they elaborate the message (or “the extent to which a person carefully thinks about issue-relevant information” p. 7) varies based on the individual and the situation.

Petty and Cacioppo argue that as motivation or ability to evaluate a message decreases, the peripheral route becomes the primary determinant of persuasion. In other words, as processing constraints increase, peripheral cues play a larger role in persuasion. They argue that people are more likely to use the central route when they have greater stake in the argument, are knowledgeable about it, and are motivated and able to process the information. They also argue that persuasion that occurs through the central route will be more enduring, and be a greater prediction of behavior changes, since it involves more elaborate consideration of the information.

Later models like the heuristic-systematic model builds on the elaboration likelihood model by arguing that the two modes of persuasion co-occur. For example if a user perceives an argument to be clear and unbiased, their persuasion may be hindered if they find the source unattractive, or bolstered if they find it attractive (see Skalski and Tamborini, 2007). In this model the heuristic process, similar to the peripheral route,
involves simple decisions and less cognitive processing, while the systematic process, similar to the central route, involves greater scrutiny and higher cognitive processing. These models attempt to account for both the in-depth and quick evaluations that occur when people are exposed to media messages.

Few studies have looked at how the ELM works on the web. Karson and Korgaonkar (2001) tested participants to see if involvement affected their processing of information on the web. They found that peripheral cues did not have a persuasive affect on users in either a manipulated or reported high involvement state, contradicting the predictions of the ELM. They concluded that when processing Internet sites the peripheral cues had little affect on brand attitudes. However, a study by Freeman and Spyridakis (2004) found that participants with high involvement in a topic paid more attention to central cues such as presence of an address, links to further information, and contact information.

This particular study provides a unique perspective on ELM because involvement is expected to be low for the participants. Participants are not under time constraints, nor are they expected to have a large personal or professional interest in the childhood illness Pertussis and Diphtheria. Understanding whether they focus on central or peripheral cues will shed some light on how the ELM model may be applied to persuasion online. In the case of website evaluation, research is still needed to determine which cues are analyzed heuristically, and which are analyzed systematically. While the previous research has shown that visual and textual cues both play a large role in how a message is perceived, it is not yet clear how those cues comparatively
contribute to persuasion, and how well they are recalled after the evaluation has been made.

**Information Literacy: Being Part of the Information Society**

While much of the literature on credibility has come from a journalistic or advertising perspective, it is important to also look at how assessing credibility is part of a set of literacy skills. Being able to usefully assess credibility is an aspect of information literacy, one of the most important and widely discussed literacies of the last few decades. Information literacy involves a set of skills that allow a person to find the information they need and discern between trustworthy, biased and incomplete content and sources. One of the first, and probably the most widely cited definitions of information literacy comes from a report by the American Library Association: “To be information literate a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information.” The report was written in 1989, and was one of the earliest declarations outlining the importance of information literacy. The report, titled *Presidential Committee on Information Literacy: Final Report* was actually started in 1987 by the ALA’s president, and released in 1989 in Washington, D.C. before the World Wide Web had been publicized, and long before it had become popular. The report underscores the new challenges of the information age, mentioning the rapid advances that technology has allowed in storing and organizing information and arguing that this results in an “increasingly fragmented information base” (P. 1). The report continues “Out of the
super-abundance of available information, people need to be able to obtain specific information to meet a wide range of personal and business needs.” The authors argue that information illiteracy is the reason that people are kept from experiencing the educational opportunities made available by information technologies.

In 1998 the American Library Association wrote an update to the previous report, titled A Progress Report on Information Literacy: An Update on the American Library Association Presidential Committee on Information Literacy: Final Report. By the time this report was written the World Wide Web had been created and the Web and Internet had become widely popular. Their first recommendation for further progress in this area is that “there needs to be an emphasis on communicating that quality education requires not only investments in technology, but also in programs that empower people to find, evaluate and use all information effectively.” (p. 2). The report also mentions the Internet, stating that the information from the Internet and other sources is staggering. They add that there has always been a need for information literacy, but that there are many abilities needed to be information literate, and that these abilities are more complex and more important than in the past.

Information literacy has received increased attention, both with the establishment of what many call ‘the information society’ and the development and rapid spread of the Internet as a major information-source. The idea of the information society has been around for many decades, and describes how many post-industrial societies function on the creation and use of information for their economic, social, political and cultural activities. For this reason, information literacy has come to be
considered one of the most important tools in being a knowledgeable and successful member of many computer-oriented societies. The United Nations Education, Scientific and Cultural Organization describes information literacy as one of the six survival literacies of the 21st century, along with core functional literacy, media literacy, computer literacy, distance education and e-learning, and cultural literacy (2007).

**Information Literacy Meets New Technology**

While information literacy may be an umbrella term used to describe the ability to effectively use and find information from any media source it also plays a large role in the ability to evaluate information found on the Internet. In 2005 the High-Level Colloquium on Information Literacy and Lifelong Learning met to address strategies for making information literacy a key value amongst the information society. They describe information literacy as “a basic human right in a digital world” underscoring the significance of new technologies in information literacy. One contributor in the report claims that the tradition of self-help is greatly bolstered by the Internet, but that, for health care professionals at least, this only emphasizes the need for “both ICT Literacy and Information Literacy skills.” (p.55). Likewise, UNESCO (the United Nations Educational, Scientific and Cultural Organization) states “Information literacy is an intellectual framework and a social process for understanding, finding, evaluating, communicating and using information—activities which may be accomplished in part by fluency with information technology,” (2004).

Another significant document about Information Literacy comes from the
Australian and New Zealand Institute for Information Literacy. Written in 2004 the Australian and New Zealand Information Literacy Framework begins their discussion by discussing that information is increasingly unfiltered and that new forms of information make it more difficult for people to analyze the validity of the information they find. They conclude that the “uncertain quality and expanding quantity of information also pose large challenges for society. Sheer abundance of information and technology will not in itself create more informed citizens without a complementary understanding and capacity to use information effectively.” The report also describes the information literate person as someone who is able to inform themselves, and knows where and how to find information. This seems to imply that knowing how to navigate and find information on the Web is vital to being information literate.

The Middlestates Commission on Higher Education’s report Developing Research and Communication Skills: Guidelines for Information Literacy in the Curriculum report provides guidelines to help schools incorporate information literacy skills into the requirements for accreditation. Their mention of technology begins by stating that information literacy moves beyond technology skills: “technology is a part of the process, but not an endpoint.” (p.5). They go on to state that information literacy “requires an understanding of technology, but it focuses on content and the delivery of that content.” (p.5). This report also includes assessment criteria for determining a person’s information literacy level. Giving four levels of advancement, they describe the Developing person (level 2) as “Uses a limited range of information technology” and “uses appropriate passwords, ID, and netiquette.” Meanwhile, the Proficient person
uses a range of information technology.

Information literacy has often been discussed in terms of health information literacy. One such report comes from National Health Services, the publicly funded healthcare system of the United Kingdom. In 2008 NHS Scotland released a report “What is Information Literacy and Why Does it Matter?” As part of a series for both staff and patients of NHS, this report outlines the importance of being information literate in making wise health decisions. The report mentions that information overload is a huge problem. They state “A common reaction has been to invest in more technology or to throw more information at the problem but this can aggravate rather than resolve the problem.” (p. 10). Further in the article they envisioning more positive uses of IT: “An information literate NHS Scotland, [would be] able to develop and use information and technology to support faster access to diagnosis and care.”

Very few studies look at how information literacy develops in people over time. A study by Wineburg (1991) compared the information literacy skills of high school students to post-doctoral students and professors, and found significant differences in how the two groups assessed certain documents. Wineburg compared the abilities of high school students and field experts to critique various history texts, such as diaries, court decisions, historical essays and novels. He found significant differences in how the two groups reasoned that certain documents were better than others. The experts, for example, field experts read the source information at the end of each document before they began evaluating the document itself. The high school students, on the other hand, almost never consulted the documents’ sources. These results may suggest that
information literacy skills are developed and refined during the course of undergraduate and graduate education.

**Typology of the Web**

Before discussing the domain of web literacy it is important first to clarify some of the definitional distinctions that, despite large-scale use of the Internet, are not always clearly defined. The Internet, according to Clark, 2004, is the basic communication service which connects computers and other device so that they can exchange digital information. The Internet is what allows websites (made up of one or more web pages), email, audiovisual information, and file transfer possible. While these are the applications we are most used to at this point, it is important to note, that in Clark’s words “The design of the Internet is such that new high-level services can be designed and deployed in the future” (p. 1).

The variety of websites available can be categorized as either dynamic or static, and content-based or product-based. Websites that are static appear the same for each user, while websites that are dynamic vary based on certain criteria. Websites that earn any type of revenue are either content-based or product-based. Content-based websites may sell advertising space on their pages, while product-based websites may actually sell products and services. Some websites may be a combination of content- and product-based. Websites may be further categorized based on their specialization and purpose. For example, there are corporate and organizational websites, which provide information about an organization, social networking sites, such as Facebook, rating and
review sites, video sharing sites, wikis, in which people collaborate on information sharing, search engines, humor and entertainment sites, message boards and newsgroups, blogs, personal homepages, e-governance sites, archival sites, commercial sites, and content sites, such as news sites and other information sites. Any of these types of websites can be combined in a number of ways, and can vary greatly based on size, scope, frequency of updates, number of authors and collaborators, and personal, private, and public use. Websites also vary in their design. The layout, coloring, text, images, graphics, video, size, and quality of design can vary almost limitlessly. While these variations also occur more or less in printed materials, it has tended to be more obvious to users. Based on where you got an item, what it looks like and feels like, you would know if you were reading an entertainment magazine, versus a textbook. On the web, however, these things exist side by side and of the same material.

**Web Literacy**

Information literacy as it applies specifically to the web domain may be called web literacy. Sutherland-Smith (2002) defines web literacy as a set of skills which include accessing and analyzing information on the web. While these skills may pertain to any kind of information literacy, she notes that web literacy “involves expanding critical reading skills to incorporate evaluation of visual and nontextual features and a greater use of associative logic” (p. 663). Sorapure, Inglesby and Yatchisin define web literacy as involving “an ability to recognize and assess a wide range of rhetorical
situations and an attentiveness to the information conveyed in a source’s nontextual features.”

**Evaluating Web Literacy Skills**

There are few studies which evaluate information and web literacy in people. In 2004, the UK Children Go Online project surveyed 1511 young people between the ages of 9 and 19 and found that 38% of students trust most of the information they find on the Internet, while 10% are skeptical about most of the information. They also found that people who consider themselves beginners in Internet use are more distrustful of it than those that consider themselves experts. The authors point out that “it is not that the beginners are naïve and therefore more trusting. Rather, it seems that the experts are more skilled in finding their way to material they feel they can trust,” (p. 9). They also point out that the more expert the user, either by formal or informal training, the more opportunities they took advantage of, such as civic, career, and peer-to-peer opportunities.

Children’s abilities to evaluate information on the web are another important area of study. In 2003, 70% of kids between four and six had used a computer and 25% use a computer on a typical day (Kaiser, 2003). Eastin, Yang, and Nathanson (2006) looked at how children evaluate credibility online. They showed manipulated websites to third, fourth and fifth graders (average age of nine), with either a source (a non-gender specific doctor) or no source, and advertisements or no advertisements. They found that young children had a more difficult time comprehending information on the
site when it contained advertising and more dynamic content, suggesting that, for children, these features may serve as cognitive distractions. They also found that children rated sites with advertisements as higher in credibility, and sites with author names as moderately lower in credibility. While the authors suggest that these findings are in line with children’s cognitive abilities at those ages, they emphasize that the results show the importance of teaching internet literacy at a young age.

Agosto’s 2002 study looked at a group of 14- to 16-year old high school females. Participants were asked to look at several pre-selected websites and allowed to surf the Web freely. Then they were interviewed about what they liked and didn’t like about each site. Although Agosto focused on finding groups of criteria that students use to rate websites (such as perceived quality of graphic content and level of interactivity), she also noted that the students tended to notice a lack of depth for some sites, but generally assumed that most websites were accurate.

Brem, Russell and Weems (2001) introduced 81 students to a set of evaluation criteria for websites and then tested their ability to use these evaluations on a set of websites of varying credibility. Students tended to focus on author’s credentials, goodness of motives and amount of details, in order to decide if a website was credible or not. Brem, Russell and Weems concluded that students were often mislead by information and that they tended to be absolute in their evaluations. Overall they found that introducing the evaluation criteria to the students was somewhat effective, but that it did not help them to make highly intelligent evaluations.
The Future of Literacy on the Web

The idea that the web is part of a continually developing habit of using technology-based and network-based tools to use and distribute information is widely accepted amongst computer-oriented societies. The special challenges that this creates for information-seekers, however, is often a source for concern. The web is a source of almost limitless information. While this certainly affords tremendous opportunities, it also comes it with it some challenges. Websites offer many situations for users to assess. A website may serve the purpose of entertaining, selling products, advocating causes, providing services, presenting research, providing networking opportunities, expressing opinions, or doing any combination of these at the same time. While misinformation has always been an issue in any information medium, the Web provides a unique situation because the information is so abundant, so effortlessly reached, relatively unmonitored, and can come from almost anyone, anywhere.

As Sorapure, Inglesby and Yatchisin (1998) point out, the web is not simply a new medium forcing the audience to utilize the same skills they apply to traditional texts. They argue instead that “employing criteria developed for evaluating print sources (currency, bias, author’s credentials, publisher, intended audience and so on) is useful in sifting and assessing the information one finds on the web, but it is important that these criteria be applied flexibly to the web’s broad range of rhetorical situations.” Understanding how young people evaluate information sources in such a diverse and dynamic web environment is more important than ever. This research will attempt to reveal some of their criteria for doing so, with implications for the larger context of
information literacy in the digital era. The current study will attempt to contribute to the body of literature by examining both college students’ website evaluation skills and their reliance on either visual cues, such as quality of web design, or textual cues, such as references and author’s credentials.
Chapter Three: Research Design and Methods

The current study aims to understand if participants rely more on visual cues, such as design quality, or textual cues, such as author’s credentials, to decide how credible an informational website is. I also aim to understand if participants remember the visual and textual elements from websites they perceive as highly credibly more than elements from websites with low credibility. The research will attempt to answer the following questions:

**Research Question 1**: Do university students rely more on textual or visual cues to assess the credibility of information found on websites?

This question will be tested by comparing participant ratings of perceived credibility for websites which are visually appealing and websites which are less visually appealing. Another analysis will compare students’ ratings of credibility for websites which have high credibility and which have low credibility. To answer Research Question 1, the following two questions will be answered:

**Research Question 1A**: Within credibility groups, do participants rank the high-design quality webpage or the low-design quality webpage higher in credibility?
Research Question 1B: Between credibility groups, do participants rank the high-design quality webpage or the low-design quality webpage higher in credibility?

To take the study one step further, recall of textual and visual cues will be tested, in order to answer the following questions:

Research Question 2: Within design groups, does credibility level impact recall of visual and textual cues?

Research Question 3: Within credibility groups, does design level impact recall of visual and textual cues?

Question 2 will be answered by comparing the results of a memory test one week after the participants viewed the websites. Recall of four cues will be counted and compared from the high credibility webpages to the low credibility webpages. The four cues will be author name, webpage color, pictures, and advertisements. Textual cues such as the references will not be tested, because it is likely that it would be too difficult to remember the three reference books and articles listed on the High Credibility webpages.
Question 3 will also be tested by comparing the results of a memory test one week after students view the websites. Recall of visual cues will be counted and compared from the high credibility webpages to the low credibility webpages.

Participants

While some schools may offer web literacy training, these skills are not usually the result of focused school curricula. Therefore it is important to understand how people develop these skills throughout their lifetime. We do not yet understand how web literacy skills develop with web experience. It is possible that increasing levels of maturity, years of experience using the Internet, and exposure to high levels of academic rigor lead to more scrupulous information assessments, without formal teaching. Therefore, university students are an important group for this particular subject because they tend to use the Internet for the majority of their schoolwork, and they are subjected to a higher level of academic standards than high school students and many members of the private workforce. Having a better understanding of students’ levels of critical inquiry can also help inform students, teachers, and administrators about educational choices in the college and pre-college years.

The participants for this study were gathered from a group of seventy-five undergraduate students enrolled in a Child Psychology course at Georgetown University, a private university located in Washington, D.C. Participation in the study was voluntary. Students received extra credit for participating, but were also given an alternative option to write a short essay to receive the extra credit if they did not wish to
participate in the study. Students were told that they would be required to have uninterrupted Internet access for approximately 20-30 minutes to complete the first part of the study, and another 20-40 minutes of uninterrupted Internet access to complete the second part of the study one week later. Of the seventy-five students enrolled in the course seventy-one of them signed and returned informed consent forms.

**Procedures**

Within evenly distributed gender groups, participants were randomly assigned to one of two conditions: low credibility and high credibility (see Materials Section below for operational definitions). Based on their group, participants were emailed a link to an online survey with instructions to look at a screenshot of a website, read the article on the website, and take as much time as needed. They were informed that they would be asked about it later. They were also informed that the website was no longer live and could not be accessed online, and were asked not to consult any other Internet resources about either of the topics they were about to read about. After viewing the first screenshot, participants were asked five questions on a six-point Likert scale. After they rated the website, participants were asked whether or not they agreed or disagreed with the article they read and to leave any comments about their answer to that question. Students were also given an opportunity to offer any comments about the study in general, in order to determine if any part of the survey design was difficult to understand, and to gather ideas about other potential areas of research on web use and information literacy for future exploration. This process was repeated again with a
second screenshot of a different website. At the end of the questionnaire participants were reminded that they would be emailed a link to the second part of the study one week later, and asked again not to read about the articles any further, or discuss them with other people.

The second questionnaire was administered one week later, via an email with a link to the online survey. First, participants were asked several questions to help determine if they would be ineligible to be counted in the results, such as having extensive prior knowledge of pertussis or diphtheria, having professional web design experience, or being a new user of the Internet. There were also questions related to demographic and Internet habit information, including years of experience with computers, years of experience online, type of Internet connection at home and at family home, online and offline research habits for school and other purposes, general Internet and computer use, which websites they use for different purposes (news websites, humor websites, blogs, government websites, etc.), and any comments they had about how the Internet had changed their academic habits.

The next part of the survey had four questions about which cues the participants remembered from the first website on pertussis they had viewed last week. The questions were:

What were the pictures on the webpage (if any)?

What color was the background for the webpage?

What were the advertisements on the webpage (if any)?

What was the author's name (if any)?
After this, participants were also asked to confirm that they did not discuss the article with anyone else. This whole process was then repeated for the second website.

The final part of the questionnaire had questions for how credible they felt various information sources were, including academic journals, news magazines, encyclopedias, census data, corporate webpages, non-profit webpages, government webpages, and blog posts. Finally students were asked to leave any comments they had about using the Internet for research. See Appendices I and II for the full questionnaires.

**Materials**

Much of the current research on credibility assessments has indicated that people may not always be fully aware of which cues they notice, and which cues affect their assessments. For this reason participants in this study compared only two websites with controlled variables. A total of four websites served as the independent variables. The websites were created for the study and screenshots of them were used in the questionnaires. The four websites (See Figures 1-4) varied in design quality (low and high) and credibility (low and high), so that each participant saw one website with low design (either pertussis or diphtheria) and one with High Design Quality (either pertussis or diphtheria). Credibility was the between-subjects variable, and participants were either assigned to the low credibility or high credibility group.
Figure 1: High Design Quality, High Credibility
DIPHTHERIA

Diphtheria used to be a major cause of childhood illness and death. Through the 1920’s about 150,000 people got diphtheria each year in the United States and about 13,000 of them died. The word diphtheria struck fear into the hearts of parents in those days, but today there are only a few cases a year. This change is due largely to our parents and grandparents, who got their children immunized. Diphtheria is a disease caused by bacteria called Corynebacterium diphtheriae. These bacteria live in the mouth, throat and nose of an infected person, and are easily spread to others through coughing or sneezing. Some people with diphtheria might not even seem ill, but they can still spread the disease. Two to four days after a child is exposed to diphtheria, he or she might get a sore throat, a slight fever, and chills. If diphtheria is not properly diagnosed and treated, it can then produce a powerful toxin (poison), which spreads throughout the body causing serious complications such as heart failure or paralysis. Sometimes a thick membrane forms in a child’s throat, making it hard to swallow or even breathe. About 1 person out of every 5 who get diphtheria dies from it. A child with diphtheria is contagious (can spread the disease to others) for about 2 to 4 weeks. You can protect your children from diphtheria, by getting them immunized with DTaP vaccine. A child needs five DTaP shots for maximum protection. The first three shots should be given at 2, 4, and 6 months of age. The fourth (booster) shot is given between 15 and 18 months, and a fifth shot - another booster - is given when the child is about to enter school, at 4-6 years of age. When DTaP vaccine is given according to this schedule it protects most children from the disease. If a child does get one of the diseases instead of the vaccine, it will probably be milder than it would have been otherwise. One side effect of the vaccine is fever, which is a fairly common reaction. Up to about 1 child out of 20 will get a fever of over 101 degrees Fahrenheit; more often after the fourth or fifth dose. Up to 1 out of 5 children will be fussy or lose their appetite for a day or two after the shot, and nearly half may be chewy afterwards.

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Further Reading
The Campaign to Control Diphtheria
Johns Hopkins University Press

Integrated Management of Childhood Illness
World Health Organization Report

"A Few Words On Diphtheria and Tetanus"
Pediatrics for Parents (http://findarticles.com/p/articles/mi_m0816/is_6_21/ai_n9772399)

Figure 2: Low Design Quality, High Credibility
Diphtheria

Diphtheria used to be a major cause of childhood illness and death. During the 1920s about 150,000 people got diphtheria each year in the United States and about 15,000 of them died. The word diphtheria struck fear into the hearts of parents in those days, but today there are only a few cases a year. This change is due largely to our parents and grandparents, who got their children immunized.

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Figure 3: High Design Quality/Low Credibility
Figure 4: Low Design Quality/Low Credibility

The websites had short articles on the childhood illnesses pertussis and diphtheria, and the exact content of the articles were the same for both groups. These articles were selected because it was assumed the students would have little prior knowledge or experience with childhood illnesses, and because it was a gender neutral topic. The articles were pieced together from the Centers for Disease Control vaccine information pages so that students would be exposed to information that was most likely accurate, and because the articles were written for a general audience, which
results in a tone that was neither too technical not too informal. The four websites were assessed by a group of PhDs, and graduate and undergraduate students, in order to determine 100% agreement for the readability of the articles, as well as the credibility and design quality.

To determine the dependent variable, participant credibility ratings, a measure was created which built upon Fogg, et. al.’s (2001) credibility measure. Fogg’s measure was selected because it had been used in measuring websites before, and because it included questions which capture the previous definitions of credibility in the literature, including believability and trustworthiness (see Hovland, Janis, and Kelley, 1953, and Roper, 1985). Four of the six questions from Fogg’s measure were used (How believable is this article? How trustworthy is the article? How credible is the article? How unbiased is the article?), while the other two questions (How competent is the article? and How expert is the article?) were left out to avoid encouraging the participants to look specifically for the author information on the page, since the goal of the measure was to get a general, first-impression credibility assessment from the participants. A fifth question was added to the measure “How skeptical are you of the facts presented in this article?” and the question “How unbiased is this article?” was changed to “How biased is this article?” so that the measure would have three positive questions and two negative questions. The negative questions would then be reverse-scored and averaged with the three positive questions to find the overall composite credibility score. The five questions were rephrased slightly, resulting in the credibility measure in Table 1.
<table>
<thead>
<tr>
<th>I think this article is credible.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I think this article is believable.</td>
</tr>
<tr>
<td>I think this article is trustworthy.</td>
</tr>
<tr>
<td>I think this article is biased.</td>
</tr>
<tr>
<td>I am skeptical of the facts presented in this article.</td>
</tr>
</tbody>
</table>

**Table 1: Credibility Measure**

The Likert scale for these questions included a six-question range with the options “Disagree Very Strongly,” “Disagree Strongly,” “Disagree,” “Agree,” “Agree Strongly,” and “Agree Very Strongly.” A sixth question was also included, “I would be likely to use the facts presented in this article for a school assignment related to Pertussis/Diphtheria” although this question was not used in the analysis based on feedback that it was confusing and difficult to answer.

Participants were assigned to view two websites, both having low-credibility or both having high-credibility. To determine credibility as an independent variable, low and high credibility websites were created based on several guideline sources. These include the findings of Eastin, Yang, and Nathanson (2006), Walther, Wang and Loh (2004), and Fogg, et. al (2001) which showed that advertisements adversely affect credibility perceptions, Fogg’s (2001) findings that listing the authors’ credentials and listing citations and references contributed to positive credibility perceptions, and Freeman and Spyridakis’ (2004) findings that addresses affect readers’ credibility judgments of information online. Other sources included organizations which have
published guidelines for the public and for web publishers on improving the quality of information on the web. These include the Health on the Net Foundation (1997), the United Kingdom’s Intute (2009), Cornell University (2004), and Georgetown University, (2009). See Table 4 for a full list of source guidelines.

After the criteria was established, all four websites were pre-tested by a group of six people, including PhDs, graduate, and undergraduate students, until inter-rater reliability for low and high credibility was 100%. One each of the high and low credibility sites were then showed to a separate group of five adults, who also had 100% inter-rater reliability for low and high credibility. The four websites were created based on the criteria in Table 2.

<table>
<thead>
<tr>
<th></th>
<th>High-Credibility Website</th>
<th>Low-Credibility Web-site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author name</td>
<td>Present</td>
<td>Not Present</td>
</tr>
<tr>
<td>Author has relevant credentials</td>
<td>Present</td>
<td>Not Present</td>
</tr>
<tr>
<td>Author’s contact information</td>
<td>Present</td>
<td>Not Present</td>
</tr>
<tr>
<td>Sources for further reading</td>
<td>Present</td>
<td>Not Present</td>
</tr>
<tr>
<td>Advertisements on the page</td>
<td>Not Present</td>
<td>Present</td>
</tr>
</tbody>
</table>

Table 2: Criteria for Credibility

Within groups, participants saw one website with High Design Quality, and one with Low Design Quality. Because design quality is more difficult to characterize, these elements were decided based both on Fogg’s 2001 study, in which participants
indicated that professional design and easy navigation were contributors to credibility, and from the results of an informal discussion group with six undergraduate and graduate students, and PhDs, about which elements they felt contributed to good and poor design quality in websites. The four websites were adjusted until the group of students and PhDs determined 100% inter-rater agreement for the high and low design quality. Then each of the high and low design websites was shown to a separate group of seven adults, who had 100% inter-rater reliability for low and high credibility. The four websites were created based on the design quality criteria in Table 3. The sources that provided guidelines for developing the design quality and credibility cues used on the websites are listed in Table 4.

<table>
<thead>
<tr>
<th>High Design Quality</th>
<th>Low Design Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information is organized in tables</td>
<td>Information is in one large condensed paragraph</td>
</tr>
<tr>
<td>Pleasant color-scheme</td>
<td>All white with black text</td>
</tr>
<tr>
<td>High quality pictures are used</td>
<td>No pictures are used</td>
</tr>
<tr>
<td>Professional looking</td>
<td>Not professional looking</td>
</tr>
<tr>
<td>Empty space is dispersed through the page</td>
<td>Empty space is all at bottom of page</td>
</tr>
</tbody>
</table>

Table 3: Criteria for Design Quality
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Easy Navigation</td>
<td>Fogg 2001</td>
</tr>
</tbody>
</table>

**Table 4: Source guidelines for website criteria**

The resulting four websites making up the independent variables for the study can be categorized according to Table 5. The topics for the websites were intentionally reversed in the two groups to control for article content.

<table>
<thead>
<tr>
<th>Group 1: Low Credibility</th>
<th>Group 2: High Credibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Design Quality/ Low Credibility Website (Diphtheria) Appendix A</td>
<td>High Design Quality/ High Credibility Website (Pertussis) Appendix C</td>
</tr>
<tr>
<td>Low Design Quality/ Low Credibility Website (Pertussis) Appendix B</td>
<td>Low Design Quality/ High Credibility Website (Diphtheria) Appendix D</td>
</tr>
</tbody>
</table>

**Table 5: The Four Websites and Four Conditions of the Study**
Ethical Considerations and Special Requirements

There was little if no ethical conflict with exposing students to the information on the fake websites. However, a short debrief was given to the class to make clear that the information came from the Centers for Disease Control and Prevention website. We also made this information available to the students who were enrolled in the course, but chose not to participate in the study.
Chapter Four: Results

Participants

Participants were 70 male and female undergraduates (23 males; 47 females) (one male dropped after the first part of the study). The average age was 19.8 years. The students were sophomores, juniors and seniors, with an average grade of year 2.5. Participants ranged from 18 to 22 with no outliers. Gender was mixed, with 47 females and 23 males. The Internet use history questions revealed that participants started using a computer at an average age of 7.5 years old, and using the Internet at an average age of 10.5 years old. All participants in the study reported owning a computer and having a high speed or DSL connection in their homes.

To get an idea of comfort using the computer for schoolwork, participants were asked if they usually print and edit their papers by hand, or revise them on the screen. Results were evenly split, with 35 participants stating they print and then edit by hand, and 34 stating they edit on the screen.

To gain more understanding of Internet-use habits, some questions were asked about the participants’ online behavior. Participants were asked, “On a typical day, how often do you do the following?” out of a 6 point Likert scale, 6 indicating very frequently, 5, frequently, 4, occasionally, 3, rarely, 2, very rarely, and 1, never. For “Read the news online” the average answer was 4.11, with only person indicating “never.” For “Do an Internet Search” the average answer was 5.32, between frequently
and very frequently. For “Read Wikipedia articles” the answer was 4.12, and for “Read books online” the average answer was 2.06.

Participants were also asked how credible they felt certain information sources are. According to the 6 point Likert scale, (1= Not Credible 2 = Mostly Not Credible, 3= Somewhat not Credible 4=Somewhat Credible 5= Mostly Credible 6= Very Credible) they’re average ratings were as follows.

Textbooks: 5.63
Newspapers (e.g. NY Times): 4.75
Academic Journals: 5.55
News Magazines (e.g. Time): 4.66
Encyclopedias (e.g. Encarta): 5.56
Census Data: 4.94
Corporate Webpages: 3.91
Non-Profit Webpages: 4.24
Government Webpages: 4.66
Blog Posts: 2.12

**Experimental Results**

Initially the data was assessed to look at means and standard deviations in order to check for outliers and to get a general sense of our results. The four conditions are design quality, high and low, and credibility, high and low. The dependent measures for
the test were the total credibility score from the first questionnaire, which was found by averaging the ratings from each of the five questions in the credibility measure.

First, a correlation matrix confirmed that the measures for the five credibility questions were consistent. The ratings of each statement correlated positively with each other and we can average the responses to the questions for each respondent and use this as a summary measure for the credibility rating. The mean of each participant’s five credibility ratings is an appropriate summary measure of credibility.

<table>
<thead>
<tr>
<th>High Credibility Group (Textual cues: author name, credentials, contact information, and references)</th>
<th>Low Credibility Group (No textual cues, advertisement present on page)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Credibility</td>
<td>Low Credibility</td>
</tr>
<tr>
<td>High Design Quality</td>
<td>High Design Quality</td>
</tr>
<tr>
<td>Low Design Quality</td>
<td>Low Design Quality</td>
</tr>
</tbody>
</table>

**Figure 5: The two groups and four conditions of the study**

To answer the primary research question “Do university students rely more on textual or visual cues to assess the credibility of information found on websites?” the question was broken into two parts.

**Research Question 1A:** Within credibility groups, do participants rank the high-design quality webpage or the low-design quality webpage higher in credibility?
The first research question looks at the design quality conditions. In the Low Credibility group the High Design Quality page had an average credibility rating of 4.13 and the Low Design Quality page had an average rating of 4.16. To answer the research question paired t-tests were used. The p-value of the paired t-test between the Low Design Quality/Low Credibility mean ratings and the High Design Quality/Low Credibility mean ratings was 0.8396. These results do not indicate that there is any difference between the mean ratings of credibility, on average, across the entire Low Credibility group.

For the High Credibility Group, the Low Design Quality page had an average rating of 4.24, and the High Design Quality Page had an average rating of 4.44. The p-value of the paired t-test between the Low Design Quality/High Credibility mean ratings and the High Design Quality/High Credibility mean ratings was 0.06256. These results indicate some moderate evidence of a difference between mean ratings of credibility, on average across the entire High Credibility group. These paired t-tests were both two-sided tests.

These results could be interpreted to mean that when viewing a low credibility website, High Design Quality will not compensate for the lack of credibility, but when viewing a high credibility website, the design quality will supplement the credibility rating. This indicates that the textual cues (or lack thereof) were more important than the visual cues in determining website credibility, and the visual cues were only assessed after the textual cues had indicated high credibility.
Research Question 1B: Between credibility groups, do participants rank the low-design quality webpage or the high-design quality page higher in credibility?

To answer this question a 2-sample t-test was used and backed up the results with a Wilcoxon test (non-parametric method). The 2-sample t-test between Low Design Quality/High Credibility and Low Design Quality/Low Credibility had a p-value of .5967. The Wilcoxon rank sum test also did not give significant results. These results indicate the data do not contain evidence that there is a difference in credibility ratings between the Low Design Quality websites.

For completeness, the tests for High Design Quality were performed as well. The 2-sample t-test between High Design Quality/High Credibility and High Design Quality/Low Credibility had a p-value of .089, and the Wilcoxon results were similar. These results indicate the data contain moderate evidence for a difference in credibility ratings depending on the credibility level. This also indicates that textual cues were more important than visual cues in determining website credibility.

If the results of these two questions are combined, it appears that High Design Quality and High Credibility together lead to higher credibility ratings by the participants. The High Design Quality/High Credibility webpage has significantly higher credibility ratings than the Low Design Quality/High Credibility. The High
Design Quality/High Credibility also has higher credibility ratings than the High Design Quality/low credibility.

The results of these two questions indicate that the four webpages were ranked in the order seen in Table 6. These results answer the first research question, “Do university students rely more on textual or visual cues to assess the credibility of information found on websites?” by showing that the students in this study rely more on textual cues than visual cues to determine initial credibility, and use visual cues only when high credibility has been determined.

<table>
<thead>
<tr>
<th>First</th>
<th>High Design Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High Credibility</td>
</tr>
<tr>
<td>Second</td>
<td>Low Design Quality</td>
</tr>
<tr>
<td></td>
<td>High Credibility</td>
</tr>
<tr>
<td>Third</td>
<td>High Design Quality</td>
</tr>
<tr>
<td></td>
<td>Low Credibility</td>
</tr>
<tr>
<td>Fourth</td>
<td>Low Design Quality</td>
</tr>
<tr>
<td></td>
<td>Low Credibility</td>
</tr>
</tbody>
</table>

**Figure 6: Ranking of webpages by credibility measure**

**Recall of Cues**

In order to understand how well people remember the cues that they use in their credibility assessments they were asked about these cues one week later. The first question on recall was about the textual cues.
Research Question 2: Within design groups, does credibility level impact recall?

To answer research questions one and two methods appropriate for proportions were used. For research question one, the Fisher’s Exact Test was used. The Null Hypothesis was: Credibility level does not impact the participant’s recalls, i.e., the proportions are equal. The Alternative Hypothesis was: Credibility level does impact the participants’ recalls, i.e., the proportions are not equal. The results are as follows:

High Design Level:
1. Author name -- Reject null hypothesis. Credibility level does impact the participant’s recall. (p-value = 1.335 E -10)
2. Background color -- Reject null hypothesis. Credibility level does impact the participant’s recall (p-value = 0.0238)
3. Pictures -- Alternative hypothesis is that High Design/High Credibility recall proportion is greater than High Design/Low Credibility recall proportion. p-value = 0.0866; p-value = 0.0433 (one-sided)
4. Advertisements -- Reject null hypothesis. Credibility level does impact the participant’s recall. (p-value = 1.5651 E -06)

Low Design Level Results:
5. Author name -- Reject null hypothesis. Credibility level does impact the participant’s recall. (p-value = 5.142 E -07)
6. Background color -- Do not reject null hypothesis. Credibility level does not impact the participant’s recall. (p-value = 0.3145)
7. Pictures -- Reject null hypothesis. Credibility level does impact the participant’s recall. (p-value = 0.0062)
8. Advertisements -- Reject null hypothesis. Credibility level does impact the participant’s recall. (p-value = 0.0119)
These results indicate that credibility does impact the participants’ recall of cues. In the High Design Quality group participants remembered all four cues better in the High Credibility group. In the Low Design Quality group, participants remembered three of the four cues better in the High Credibility group, with the exception of the color of the background of the webpages.

**Research Question 3**: Within credibility groups, does design level impact recall?

For this question the McNemar’s Test was used. A different method was used for this question due to the fact that the samples are no longer independent. The Null Hypothesis was that the proportion of participant’s who recall the cue is the same for the high and low design websites. The Alternative Hypothesis was that design level does impact the participant’s recall of the question answer.

High Credibility Group Results:

9. Author name -- Do not reject null hypothesis. The proportion of participant’s who recall the cue is the same for the high and low design websites. (p-value = 0.500)

10. Background color -- Do not reject null hypothesis. The proportion of participant’s who recall the cue is the same for the high and low design websites. (p-value = 0.7744)

11. Pictures -- Do not reject null hypothesis. The proportion of participant’s who recall the cue is the same for the high and low design websites. (p-value = 0.5078)
12. Advertisements -- Do not reject null hypothesis. The proportion of participant’s who recall the cue is the same for the high and low design websites. (p-value = 0.1094)

Low Credibility Group Results:

13. Author name -- Reject null hypothesis. The proportion of participant’s who recall the cue is the same for the high and low design websites. (p-value = 0.0039)

14. Background color -- Do not reject null hypothesis. The proportion of participant’s who recall the cue is the same for the high and low design websites. (p-value = 0.6072)

15. Pictures -- Do not reject null hypothesis. The proportion of participant’s who recall the cue is the same for the high and low design websites (p-value = 1.0000)

16. Advertisements -- Do not reject null hypothesis. The proportion of participant’s who recall the cue is the same for the high and low design websites. (p-value = 0.5078)

The results for Research Question 3 indicate that design quality does not impact recall of cues. In the High Credibility groups all four cues were remembered the same, regardless of design quality. In the Low Credibility groups, three of the cues were remembered the same regardless of Design Quality, with the exception of author name, which was remembered better in the High Design Quality group.
Chapter 5: Discussion and Conclusion

Participants Discussion

The results from the Internet-use questionnaire show that the participants in this study are indeed heavy users of the Internet, and have been for many years. For them, having fast and constant access to the web is a given. The demographic questions showed that participants, with an average age of 19, started the Internet at an average age of 10 years old, suggesting they have had access to the Internet for about ten years. While the design and practices of the Internet may have changed over that time, that is still a considerable amount of experience online. This is significant because it means participants were developing their information literacy and research skills while they were Internet users. In other words, their non-Internet reading, critical thinking, research, and writing skills were developed at the same time as their Internet skills.

The question about whether participants usually print and edit their papers by hand, or revise them on the screen, indicates a split in these habits. The significance of this is difficult to analyze, but it will interesting to see if this changes in the future with subsequent groups of students, especially those that have been using computers since the first years of life.

The results of the daily Internet habit questions further indicate that the participants are heavy and diverse Internet users. People search the Internet very
frequently throughout the day, and read the news and Wikipedia every day as well. While the number of them reading books online daily is low, some indicated that they do it frequently, indicating that some non-traditional web habits may be taking root. This will be especially interesting to watch for in the lines between hard copy and online books, magazines, newspapers, and journals become more blurred.

The results of the participants’ ratings for how credible they felt certain information sources are were interesting in that they showed that traditional sources are still considered more credible than online sources, overall. Textbooks, academic journals, and encyclopedias, were all rated as mostly credible, while blogs were rated as mostly not credible. However this question was somewhat vague, as ratings may vary depending on the specific source. This question could be explored more fully in a separate study, but is too limited to be discussed further here.

**Experimental Results Discussion**

The main research question for this study was whether participants rely more on textual or visual cues to assess the credibility of information found on websites. The results of all the analyses indicated that participants relied more on textual cues to assess credibility and that visual cues only supplemented the rating after the textual cues were assessed. Design quality could not compensate for low credibility.

The results of this study offer several different insights to the study of web credibility. To begin they tell us more about how specific cues contribute to credibility assessments. While past studies such as Fogg 2001 and 2003 have indicated that people
report that high design quality is an important credibility determinant, the results of this study indicate that it was less important than traditional textual cues. That is, it could not compensate for a lack of textual cues, but it did boost credibility when those cues were present. While it is not possible to isolate each cue from the study to determine the extent to which they contributed to assessments, the fact that there was significant difference between the textual and visual cues indicates that viewers are not analyzing websites indiscriminately. Different cues seem to carry different weight, and depending on the context, affect credibility in different ways.

The results also shed some light on the application of Petty and Cacioppo’s elaboration-likelihood model to website credibility. The model can help explain how the cues served as routes to persuasion. The textual cues could be considered part of the central route, which involves more thoughtful consideration of the information in a message. Because textual cues require the person to notice and then read them, they require more processing. Petty and Cacioppo suggest that assessments through the central route are done when the person is able to scrutinize an argument, which would have been the case in this study since participants were encouraged to take their time to look at the webpages. The visual cues may have been processed through the peripheral route, which Petty and Cacioppo describe as involving the simple, less relevant cues, such as attractiveness. The background color and layout require very little processing, as they are seen instantly, and do not need to be sought out or “read.” They claim that peripheral cues can affect persuasion without processing of the actual message, and that these cues can be processed in a relatively less sophisticated manner.
While the Elaboration Likelihood Model may explain how the cues were analyzed through the central and peripheral routes, the heuristic-systematic model, which builds on the elaboration likelihood model, may explain how the two modes co-occurred. This model accounts for how the heuristic and systematic processes (like the central and peripheral routes) can hinder or bolster the persuasion. This could explain why the visual cues bolstered the credibility ratings, but only in the high credibility groups. It was only after participants were persuaded by the systematic/central cues, that the heuristic/peripheral cues added to the persuasion.

Another part of the explanation for these results lies in the participants themselves. As current college students these participants are likely to be accustomed to a certain level of academic rigor. As students they have access to many campus learning resources, which may emphasize critical examination of information, such as library guides, and standards handed down by teachers. This group of participants may be above average critical information-seekers, and these information literacy skills could have been exhibited particularly because they were given plenty of time to view the sources.

Although the results showed that design did not have an impact on credibility assessments in the low credibility group, it should be noted that the average ratings for the low credibility group were 4.13 and 4.16, out of a 6.0 maximum on the credibility measure. This means that while the high credibility websites were rated higher, the low credibility websites were not rated as having below average credibility. This could be related to a few things. For one, the message itself is written in a grammatically correct,
organized, non-technical tone, with no spelling errors or emotional overtones. Therefore the message content’s credibility is not adversely affected by disorganization, technical language, poor writing quality or message intensity, which is keeping with the results of previous message credibility studies by McCroskey and Mehrley (1969), Jackson (1992), Slater and Rouner (1996), and Hamilton and Stewart (1993), respectively. Furthermore, the illnesses are not controversial ones, so there was little reason for participants to be skeptical of the information provided. If the articles had been written as opinion pieces, or on controversial topics, the ratings of all of the websites may have been affected.

There are also several explanations as for why the participants would rate the High Design Quality webpage higher than the Low Design Quality webpage in the High Credibility group. Previous literature has indicated that visual appeal plays a large role in credibility (see Fogg, 2001, and Fogg, 2003). One reason may be that having a higher design quality could indicate to the viewer that the source has more resources at their disposal, such as money and staffing. This could connote legitimacy for the source. An organization with these resources may be seen as more invested in its enterprise, and could have a higher stake in its audience’s approval. The low design website, on the other hand, could connote that the website is made by a novice, or a group with very few resources. Since the two websites in this study were made by fake organizations the viewer had no prior knowledge of the organizations’ standing to base their assessments on.
Recall of Cues Discussion

In order to understand whether credibility matters when processing information, it was important to see how well they remembered the visual and textual cues from the webpages. The analyses from the recall portion of the study indicated that credibility does impact the participants’ recall of cues. In the High Design Quality group participants remembered all four cues better in the High Credibility group. For example, only three participants could not remember whether or not an author’s name was present in the High Credibility/High Design Quality webpage, and only one could not remember the presence of the author’s name in the High Credibility/Low Design Quality group. This suggests that students paid close attention to the presence of the author name, and were able to recall whether or not it was there a week later. This can also be accounted for by the Elaboration-Likelihood Model, as Petty and Cacioppo argue that persuasion that occurs through the central route will be more enduring. The fact that students also remembered the four cues more in the High Design/High Credibility group than in the High Design/Low Credibility group indicates that they held onto the information from the high credibility source better. This means that when they felt a source was not as credible they did not commit to remembering it as well. This memory of visual cues could indicate that the color, pictures, and lack of advertisements were processed more through the central route, or could be the result simply of it being easier to recall visual elements such as these. The memory of a picture of a baby, for example, could be more enduring than the memory of an author’s name.
In the Low Design Quality group, participants remembered three of the four cues better in the High Credibility group, with the exception of the color of the background of the webpages. This explains once again that participants retained visual and textual cues better when they felt a source was more credible, with the exception of the webpage color. This could be explained by the fact that the webpage with low design quality was all white. This lack of color may have been easier to remember, regardless of credibility.

The results for the third research question also indicated that design quality does not impact recall of cues. In the High Credibility groups all four cues were remembered the same, regardless of the design quality of the page. In the Low Credibility groups, three of the cues were remembered the same regardless of design quality, with the exception of author name, which was remembered better in the High Design Quality group. These results further indicate the importance of textual cues, as lack of author name was noticed more than the visual cues. The reason for participants taking more notice of this in the Low Credibility/High Design Quality group could be that the High Design Quality webpage was examined more thoroughly, and held to a higher standard. If design quality is some indication of legitimacy, then the participants may have spent more time processing whether or not it was there. It could also be that the Low Design Quality/Low Credibility page was more disorganized. All the text was crammed into one paragraph, and participants may not have bothered looking closely at the content. The lack of organization of the text may have contributed to the lack of recall for this textual cue.
All of these results are important because they indicate that participants are not only paying more attention to websites they perceive as more credible, but also credibility assessments could affect recall of content from articles. If participants feel a source is more credible they will remember it better. This shows that credibility is an important factor in finding information online, and that participants are motivated to seek trustworthy and accurate information.

This study also suggests that these students have gained some web information literacy skills throughout their education. This could be because they have been using the Internet for so long, and could also be because of their level of education. They have clearly noticed the traditional cues used for credibility assessments. Looking at some of the comments they left at the end of the questionnaire sheds more light on their feelings about using the Internet for research. These comments indicate varying views on the validity of information online. These comments are meant to invoke more discussion about what it means to find information online for these participants, and were not analyzed further. For example, the following students all discuss specific cues that they pay attention to when looking at information online. These students indicate that they have spent considerable thought about what they think matters when finding good information.

“I always check to see who is writing the information I am reading, and what his or her credentials are. This is the biggest sign of credibility for me.”

“I do not consider the ending of a website (i.e. .com/.edu/.org) to have any bearing on websites.”
“When searching the Internet for information, I take the title of the webpage and the format into consideration when assessing its validity.”

“A website needs some sort of production value in order to seem credible.”

“The larger the organization behind whatever I am researching, the more likely I am to use it for research or even to notice it, had I done a simple search.”

Other comments from the students emphasize how different credibility is when the information is for school, curiosity, or fun. These students suggest that less rigorous sources may be acceptable for some information, but that caution must be used when the information is for academic purposes. Some of their comments follow.

“There is a difference in the type of websites that I use for inspiration, i.e. blogs or newspapers/magazines, in choosing a topic and others for more factual needs likes quotes and citations, i.e. non-profit websites or encyclopedias/academic journals. So maybe their credibility is viewed differently.”

“One must be skeptical of online information to use for academic research. Online texts, books, credible newspapers and magazines are okay to use, but things like blogs or personal websites have little credibility.”

Interestingly, some of the students left comments that point to a possible shift from authority to reliability. These students bring up the point that it is the duplication of information that they use to determine if it’s true or not. Linking to other sources, and being found on more than one webpage seems to indicate that the information is more likely to be true. This is particularly important in a networked information society, because information is shared and repeated more rapidly and abundantly. Wachbroit
(2004) points out the dilemma that the structure of the web does not allow the user to identify the source of the content easily. As Wachbroit states “it is essential…that the public can get information outside the mainstream. Identifying reliable websites simply on the basis of a reliable offline presence excludes the important new sources of information that the web can provide” (p.32). So while it is still important to be able to determine the trustworthiness of the information, users can move away from relying more or less exclusively on author or organization reputation.

“Usually I use less reliable sources like Wikipedia and random newspapers for specific dates/numbers. Otherwise I check other stuff.”

“Most of the time I do quick research on a topic through a site that I do not believe is that credible, but is easy to find information. Once I have it, I try and find it on a better site.”

“I generally try to find information on two or more different websites. If I can find similar information on a more credible website then I may use information from a less credible website, but I always try to double check it with credible sources.”

“Blog posts, in my experience, are credible because they use numerous links within the text to cite their references by linking directly to the sources. N.B.: Most of my blog reading is for news purposes, and therefore is done with greater research rigor, as many bloggers actively seek to improve their reputations.”

Students also left comments about how they feel the Internet has affected their academic performance. These comments are helpful in thinking about the Internet not just as a phenomenon, which requires users to work harder to find quality information. As one student states, “[The Internet] has definitely helped supplement information that has been unclear to me from lectures or textbooks” Yet another student says, “It has
made searching for general topics much faster and easier than having to visit a library check books out and read until finding what I need. It provides me with academic/ medical journals that I wouldn't have otherwise known how to access.” This brings up important points about how information that may have been less easily accessed in the past is now much more easily available. This highlights how information can be consumed more frequently and quickly than in the past. One student laments this easiness, however, stating “I think it has made it easier to not think critically on your own. You can do a Google search to help you get ideas or to find surface information without looking at primary documents or books and other reference materials.” One student summarizes his/her view on the benefits and pitfalls of the Internet as a research source and an activity: “It's helped immensely in doing research. I use Google and Wikipedia to find links to relevant websites, the library website to read journal articles, and sometimes Google or a site like bn.com to find books that I might want to checkout from the library. When a textbook is unclear, I often use Google or Wikipedia to find the information presented in a way that is easier for me to understand. On the other hand, I also get easily distracted by the Internet, especially when I'm in class or writing a paper. But overall, I'd say it helps more than it hinders.”
Limitations and Range of Validity

Limitations

As with any research that is not purely observational there are potential shortcomings in the design of the study. In the current study, for example, participants were shown two manipulated websites, which eliminated the element of naturalistic searching that they would do in looking for websites on their own. Looking at information seeking behavior is an important area of research in the field of digital learning, although it was not part of the scope of this study.

Another limitation of this study was that only one type of website was analyzed, the informational medical website. The cues that were used as credibility indicators, such as advertisements, and author credentials, may have different affects when used in blogs, news sites, commercial sites, large versus small organization sites, and non-medical sites. Furthermore the participants in this study were not in dire positions of needing this information. How people assess credibility when they hold a larger stake in the information, such as with medical conditions, may differ considerably. Also, since the articles provided information, rather than opinions or arguments, and since they were written on non-controversial topics, the users had little reason to suspect low credibility from the source. There would be little motivation for the creator of an informational website with an article on Pertussis or Diphtheria to provide poor information, especially when reliable medical information is so easily available. While the neutrality of these articles were selected purposefully for this study, it would be
interesting to apply the same criteria to articles which evoke more emotional responses, or which are written in a more persuasive tone.

Other limitations of this study included the size of the sample, the number of websites viewed, and the features of those websites. A larger sample is always preferred when making any kind of generalization about the population being assessed. Also, having more examples of low credibility and high credibility websites, and high and Low Design Quality websites would have allowed for a more exhaustive analysis of the credibility assessments. Furthermore, having more websites would have allowed for more detailed comparisons of specific cues, for example having a between-subjects comparison of sites with matching features, with only the advertisement being different, or only the author name being different. This would allow for more specific understanding of the affects of each feature on the assessment of credibility.

Range of Validity

The results of this study come from a sample that does not represent a full range of socioeconomic status, education, race, nationality, and age, although many were included. While socioeconomic information was not gathered, presumably most participants come from a high economic status, based on their enrollment at a private university. Race and national identity information was not gathered, but since the university’s undergraduate population is approximately 30% multi-cultural (Georgetown University, 2008) this gives some idea of the diversity of the sample size.
The age of the participants ranged from 18 to 22, so the information literacy skills of this group may not apply to older adults, adolescents, or children.

The other characteristic of this participant group that may limit the validity of the information for other groups is their digital experiences and cultures. Many people in the world have not grown up with computers and Internet at an early age, and many people have different uses and values for this medium across the globe. Experience with information seeking on the web surely plays a large role in the information literacy skills that are developed over time, so this particular sample’s findings may not be attributed to other groups with less or more experience. Furthermore, people living in a culture of the information age, one that has certain values about the sharing and creation of information for its own sake, will have very different outlooks on information on the web, and are very likely to also have different systems for evaluation the credibility of information found there.

**Ideas for Further Study**

The study of the assessing of credibility on the web is not only important to our understanding of information-seeking and information literacy, it is an evolving and intricate topic, with a multitude of variables affecting the outcome. Further study with groups of different educational and socioeconomic backgrounds is key in understanding how people learn to assess credibility online. Likewise, extending these studies to a variety of cultures and regions is important in order to understand which elements have a more universal appeal, and which cultural factors affect information seeking habits.
The current study is limited to the study of the credibility of facts-based information. Given the highly social aspect of the web, studies into the assessment of the credibility of other people and relationships, as well as the credibility of opinion-based material is crucial, due to the variety of experiences and exchanges happening online. Also, studies which observe people under natural settings are important in understanding how people assess credibility under time constraints. Petty and Cacioppo argued that as ability to evaluate a message decreases, people tend to use the peripheral route of persuasion more than the central route. Observing people under certain processing constraints could produce different results.

Finally, studies that focus on how to actually improve people’s assessment skills are imperative, as computer-oriented societies continue to build their social and economic livelihoods on the communication technologies. While some pre-college and college institutions have courses and tutorials on information literacy, there are few studies into how well these programs work. Some institutions have adapted information literacy standards, and more in the future. This seems to represent a shift in the value of critical information literacy skills, which means it will be necessary for learning institutions to push people to gain these skills.
Conclusion

This research is important, not only for the sake of assessing how well people discern information, but also in assessing the Internet as research tool. As we continue to use the Web for information-seeking purposes then research in this area becomes more important. Studies in this area may have important implications for teachers, students, marketers, web designers, policy makers and anyone else invested in the pursuit of credible information made available on the Web.

The abundance and diversity of information on the Web provides opportunities and challenges for the people using it. In order to seize those opportunities users must be able to sift through that information with a critical eye. This study has attempted to contribute to the understanding of how people determine the trustworthiness of information sources online, and how well they remember information they perceive as believable. Understanding the role that textual and visual cues play in this assessment has important implications for teachers, schools, students, parents, marketers, web designers, policy makers and anyone else concerned with the fostering of information literacy in the information society. Studies like these can help us review our current information literacy standards and habits with a goal of fostering a citizenry of critical and capable information consumers. While the web a tool for a variety of purposes information seeking is one of them, and research in this area is important in order to monitor our own behavior, rather than allow our habits to proceed without questioning them.
References


Online Computer Library Center, Inc. (2005). *Perceptions of libraries and information resources: A report to the OCLC membership.* Dublin, OH.


Pew Internet & American Life Project. (2002). The Internet goes to college: How students are living in the future with today's technology. Washington, D.C.


Appendix I. First Questionnaire

2. Please look at the following picture of a website. Read the article on the website, taking as much time as you want. You will be asked several questions about the article.

This website is no longer active, and cannot be accessed online. Please do not consult any other Internet resources about this article.

[Screenshot of website inserted here]

*1. Please indicate how much you agree with the following statements.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Disagree Very Strongly</th>
<th>Disagree Strongly</th>
<th>Disagree</th>
<th>Agree</th>
<th>Agree Strongly</th>
<th>Agree Very Strongly</th>
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<tbody>
<tr>
<td>I think this article is credible.</td>
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<td>I think this article is believable.</td>
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<td>I think this article is trustworthy.</td>
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<td>I think this article is biased.</td>
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<td>I am skeptical of the facts presented in this article.</td>
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<tr>
<td>I would be likely to use the facts presented in this article for a school assignment related to Pertussis.</td>
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</tbody>
</table>
3.

Please look at the following picture of a website. Read the article on the website, taking as much time as you want. You will be asked several questions about the article.

This website is no longer active, and cannot be accessed online. Please do not consult any other Internet resources about this article.

[Screenshot of website inserted here]

**1. Please indicate how much you agree with the following statements.**

<table>
<thead>
<tr>
<th>Statement</th>
<th>Disagree Very Strongly</th>
<th>Disagree Strongly</th>
<th>Disagree</th>
<th>Agree</th>
<th>Agree Strongly</th>
<th>Agree Very Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>I think this article is credible.</td>
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<td>I think this article is believable.</td>
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<td>I think this article is trustworthy.</td>
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<td>I think this article is biased.</td>
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<tr>
<td>I am skeptical of the facts presented in this article.</td>
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<tr>
<td>I would be likely to use the facts presented in this article for a school assignment related to Diphtheria.</td>
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</table>
4.

1. Please insert any comments you have about the webpage, the article or the questions, in the box below.

Thank you for answering the questions. You are done with this part of the study. In one week, you will receive an email with a link to the second part of the study.

In the meantime, please do not do any further reading or research into the topics of Diphtheria or Pertussis. Also, please refrain from discussing these topics with your classmates or anyone else. Thank you for your participation.
Appendix II. Second Questionnaire

1. Information-Seeking on the Web: Part Two

You have received a link to this study because you have signed the consent form agreeing to participate (IRB # 2009-115). If you have not signed the consent form, or if you have any questions, please contact Katrina Pojero or Professor Calvert at 202-687-7019.

* 1. Please provide us with your Georgetown e-mail i.d. (for example, klp32). This information will be kept confidential among the research team and will only be used to confirm your extra credit participation.

* 2. How old are you?

* 3. What is your sex?
   - Female
   - Male

* 4. What is your current year at the university?
   - First Year
   - Sophomore
   - Junior
   - Senior

* 5. What is your major or intended major?

* 6. Are you pre-med?
   - Yes
   - No

* 7. Have you taken any undergraduate health classes?
   - Yes
   - No
   If yes, please list the health classes by name.

* 8. Have you ever designed a web page?
   - Yes
   - No
   Comments
* 9. Do you personally own a desktop/laptop computer?
   - Yes
   - No

* 10. Do you have internet access in your residence hall/current residence?
   - Yes
   - No

* 11. Do you personally own a printer?
   - Yes
   - No

* 12. What kind of internet connection do you have in your residence hall/current residence?
   - Dial-up
   - DSL
   - Cable
   - Not sure

* 13. Is there a laptop/desktop computer in your family’s home?
   - Yes
   - No
   - Other/Not applicable

* 14. Is there internet access in your family’s home?
   - Yes
   - No
   - Other/Not Applicable

* 15. If there is an internet connection in your family’s home, what kind is it?
   - Dial-up
   - DSL
   - Cable
   - Not Sure

* 16. Approximately how old were you when you first started using a computer?

* 17. Approximately how old were you when you first started using the Internet?
**18. On a typical day, how often do you do the following?**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Never</th>
<th>Very Rarely</th>
<th>Rarely</th>
<th>Occasionally</th>
<th>Frequently</th>
<th>Very Frequently</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check your email</td>
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<tr>
<td>Check a social networking site (i.e. Facebook)</td>
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<tr>
<td>Read the news online</td>
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<tr>
<td>Check Blackboard</td>
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<tr>
<td>Do an Internet search</td>
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<tr>
<td>Instant Message</td>
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<tr>
<td>Read Wikipedia articles</td>
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<tr>
<td>Shop online</td>
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<tr>
<td>Read books online</td>
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</tbody>
</table>

**19. How often do you do the following?**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Never</th>
<th>Very Rarely</th>
<th>Rarely</th>
<th>Occasionally</th>
<th>Frequently</th>
<th>Very Frequently</th>
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</thead>
<tbody>
<tr>
<td>Research information on homework/exam topics</td>
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<tr>
<td>Search for academic journal articles online</td>
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<tr>
<td>Search online for news articles related to homework/exam topics</td>
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<tr>
<td>Browse forums related to homework/exam topics</td>
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<tr>
<td>Chat/IM with other students about homework/exams</td>
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<tr>
<td>Use Blackboard</td>
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<tr>
<td>Read the news online</td>
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<tr>
<td>Physically visit one of the Georgetown libraries</td>
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<td>Physically visit a public library</td>
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<td>Visit the Georgetown library’s website</td>
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<td>Visit another library’s website</td>
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<td>Read e-books from the library’s database</td>
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<td>Check out books from the library</td>
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<td>Photocopy journal articles from the library</td>
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<tr>
<td>Search for journal articles from the library’s website</td>
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</table>

**20. When viewing the following items online, please indicate how you USUALLY read them.**

<table>
<thead>
<tr>
<th>Item</th>
<th>Read on the screen</th>
<th>Print and read</th>
<th>Not sure/Not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online news articles</td>
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<tr>
<td>Online academic journal</td>
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<td>Online magazine articles</td>
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<td>Online encyclopedia articles</td>
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<tr>
<td>Online books related to school topics</td>
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</table>
* 21. When writing a paper for a class, how many drafts do you usually write?
  ○ 1
  ○ 2
  ○ 3
  ○ 4
  ○ 5
  ○ 6
  ○ More than 6

* 22. When revising a paper you are writing for a class, what do you usually do?
  ○ Print it, then edit it by hand
  ○ Edit it on the screen
  ○ Other/ Not sure (please comment)

23. Please list 1-3 of the websites you visit most often for each category (if none, write "N/A").
   
   News websites
   Magazine websites
   Academic/ School websites
   Encyclopedia websites
   Humor websites
   Shopping websites
   Social networking websites
   Educational/informational websites
   Government websites
   Blogs
   Other favorite websites

24. Please list the websites you use most often for help with schoolwork (feel free to repeat websites that you listed in the last question).

25. Please explain how you feel the Internet has affected your academic performance at the university level.
26. Please answer the following questions to the best of your memory. If the information was not present, write "Does not apply".

**If you do not remember the information write "Do not remember."**

- What was the name of the website the Pertussis article came from?
- What were the pictures (if any) on the webpage?
- When was the page last updated (may not apply)?
- What were the advertisements (if any) on the webpage?
- What color was the background for the webpage?
- What was the author's name (if any)?

27. Have you or anyone you've known had Pertussis?
- [ ] Yes
- [ ] No
- [ ] Not Sure

28. Since you read the Pertussis article have you done any other research into the disease? Please mark all that apply.
- [ ] I read about it on the Internet.
- [ ] I talked to friends/family about it.
- [ ] I read about it in a book/journal.
- [ ] I became more interested in the topic.
- [ ] I didn't look into Pertussis.
- [ ] I talked to a nurse/physician about it.

Other (please specify)
* 29. Please answer the following questions to the best of your memory. If the information was not present, write "Does not apply." If you do not remember, write "Do not remember".

What was the name of the website the Diphtheria article came from?
What color was the background for the webpage?
What was the author's name (if any)?
What were the advertisements on the webpage (if any)?
What were the pictures on the webpage (if any)?
When was the page last updated (may not apply)?

* 30. Have you or anyone you've known had Diphtheria?

- Yes
- No
- Not Sure

* 31. Since you read the Diphtheria article have you done any other research into the disease? Please mark all that apply.

☐ I read about it on the Internet.
☐ I read about it in a book/journal.
☐ I talked to a nurse/physician about it.
☐ I talked to friends/family about it.
☐ I didn't look into Diphtheria.
☐ I became more interested in the topic.

Other (please specify)
4.

**32. Overall, how credible do you feel the following information sources are?**

<table>
<thead>
<tr>
<th></th>
<th>Not Credible</th>
<th>Mostly not credible</th>
<th>Somewhat not credible</th>
<th>Somewhat credible</th>
<th>Mostly credible</th>
<th>Very credible</th>
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<tbody>
<tr>
<td>Textbooks</td>
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<td>Newspapers (e.g. The New York Times)</td>
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<td>Academic journals</td>
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<td>News magazines (e.g. Time)</td>
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<td>Encyclopedias (e.g. Encarta)</td>
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<tr>
<td>Census data</td>
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<td>Corporate webpages</td>
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<td>Non-profit webpages</td>
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<td>Government webpages</td>
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<td>Thesis papers</td>
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<tr>
<td>Blog posts</td>
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33. Please leave any comments you have about using the Internet for research. Your comments may help us shape future research in this area and are greatly appreciated.