

The Effects of Cognitive Engagement
while Learning about Misinformation on Social Media

by

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ABSTRACT

Social media platforms have emerged as leading communication channels for social interaction and information sharing in the early part of the 21st century. In an ideal world, social media users should feel that they can interpret the social interactions they witness and the information that is shared on social media platforms as inherently honest and truthful; however, reality is very different. Social media platforms have become vehicles capable of spreading misinformation quickly and broadly. Information literacy offers a pathway for mitigating the negative consequences of misinformation found within various forms of content provided that instruction is contextually defined and applicable to the current information environment. A cognitive framework was used to help facilitate greater efficiency of learning information literacy practices.

The purpose of this study was to investigate the relationships between cognitive engagement and learning performance on an instructional module about misinformation on social media. A total of 133 undergraduate students participated in the study. They were surveyed for demographic characteristics, social media activity, and self-efficacy before being randomly assigned to one of four instructional conditions (passive, active, constructive, control). Additional measures included a pre-test, post-test and an instrument measuring users' satisfaction with their instructional experience.

The study produced several statistically significant differences: (a) in the ability of demographic factors encompassing age, gender and years in college to predict the prior knowledge of misinformation on social media; (b) between the means of the three treatment and one control groups and their scores on the post-test assessment controlling for prior knowledge; and (c) between the means of the three treatment and one control

groups and time necessary to complete instruction. Using a regression analysis, no significant differences were found with respect to information-focused self-efficacy factors being able to predict prior knowledge of misinformation on social media. The findings from this study can contribute to the basis of support for the use of the Interactive, Constructive, Active, Passive (ICAP) framework in assessing the use of cognitive engagement in designing instruction.

To my parents, Carmen and Leonard, for instilling in me the value of persistence.

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CHAPTER 1

Introduction

The United Nations Educational, Scientific and Cultural Organization's (UNESCO) International Institute for Education Planning has defined a literate person as a person who can engage in the functional activities such as reading, writing and calculations for improving themselves or the community (Oxenham, 2008). This definition represents a traditional viewpoint of literacy as a function of the performance of fundamental human tasks. An alternate perspective of literacy acknowledges that literacy is the result of "social practices," that are "patterned by social institutions and power relationships," with varying degree of influence (Tusting, 2005, p. 40). Literacy involves more than just the knowledge to perform specific tasks, literacy involves the awareness, ability and knowledge to communicate based on in the situation that confronts that person or institution.

The increasing diffusion of personal communicative devices as well as the emergence of social media has led to a greater focus on how people ultimately use information. Daily, using digital devices, individuals are passively presented with or are actively seeking out information to satisfy emerging or existing information needs whether they be policy stances of political candidates, the price of a vacation or the weather patterns of a destination. Furthermore, the creation of new technologically enhanced environments now allows for instant collaboration among individuals. For instance, according to a 2016 report from the American Press Institute, 65% of adults from a representative sample of United States households ($n = 2,014$) actively seek out news with 51% of these adults obtaining their news from social media (Rosenstiel et al.,

2016). Of those who receive their news from social media, the study also revealed that 87% receive their news from Facebook. Trust was found to be a significant factor in determining the perceived quality of the news that they view. In a more recent report from the same organization attempted to investigate the issue of trust and information sharing on social media (Rosenstiel et al., 2017). This study used mock social media posts from either a trusted or untrusted social media source. The post contained a link to a news story from either a legitimate or fake news outlet. The results of the study revealed that the publisher of the news story was not as important to influencing the trust of the social media user as the person who supposedly shared the link to the news story.

The reports from the American Press Institute (Rosenstiel et al., 2016; 2017) highlight the need to investigate the information-seeking behavior of social media users and how an intervention may change this behavior. When looking at behavior, primary models revolve around the basic assumption that information, even if not necessarily completely accurate, is complete and presented as the truth as one sees it. Misinformation is seen as information that has unintentionally been placed in a piece of information. Disinformation is a subset of misinformation where the writer has intentionally placed false and misleading information for the purpose of confusing or deceiving the reader (Karlova & Fisher, 2013).

The emergence and widespread use of social media has led to a state where there is curated access to the nearly unlimited amount of information that is available on the Internet. From a macro-level view, the access afforded by the adoption of social media could be construed as an overall benefit to a greater effort to inform and educate users; however, social media users also have a choice as to what to read thereby creating a

situation where their information sources and opinions are now limited, as they can restrict their social media timelines and news feeds to those information sources that align with their current beliefs. Although the user can have access to all the publicly available information on the social network, his or her own preferences along with computer algorithms implemented by the social media company will narrow the spectrum of information that the user views. In a series of recent studies, researchers examined the change in a person's misperceptions once he or she is exposed to corrective information (Nyhan & Reifler, 2010; Sanna, Schwarz, & Stocker, 2002). The results of the experiments indicated that the corrective information did not remedy the misperception (i.e., *debiasing*) that was developed and, in many cases, *backfired* by reinforcing the currently held misperception.

The existence of new avenues of communication and information sharing such as social media as well as the development of new and affordable media creation tools have given rise to what Gee (2009) and others have termed Professional-Amateurs (Pro-Ams). Pro-Ams are individuals who are non-experts but use digital technologies to become pseudo-experts (not real experts) in a specific area. They are characterized as generally younger in age and share their knowledge of a specific area as well as receive information and knowledge in a selected community. They desire to be deeply knowledgeable about their selected area and to share that knowledge with others. This community can be either physical or virtual. Social media sites (SMS) such as Facebook and Twitter provide the platform for anyone, including Pro-Ams, to create an account, share their ideas and theories and portray themselves as an expert to the average social media user regardless of their actual level of expertise.

Recently, general interest has become focused on investigating how people select and use information as they attempt to fulfill an information need. In this sense, New Literacies (Coiro, Knobel, Lankshear & Leu, 2014a; Gee, 2009) expands upon the traditional notions of a single literacy into multiple literacies. Among them, it characterizes a literacy about information, or information literacy, that is of increasing importance within the presence of digital environments that are information-rich (Bruce, 2000; Eisenberg, Lowe & Spitzer, 2004; Snavely & Cooper, 1997; Tuominen, Savolainen, & Talja, 2005).

Given the trend of social media becoming even more pervasive in people's lives it is necessary to investigate the abilities of people to handle information in a competent manner in settings that take advantage of the collaborative nature of newer forms of technological communication. The reasons for this need can vary depending upon the context of the investigative environment. Social media is an example of where the environment can support a range of social interactions, where data and information can be shared, received, and reacted to in an instantaneous manner. The nature of social media creates an increasing emphasis on the benefits of user's being information literate, meaning a person who has acquired the necessary skills and knowledge that are defined in information literacy theory and models. Of particular interest to this study is the investigation of self-efficacy in information literacy, *cognitive engagement*, and its impact on users' social media behavior such as the level of trust and their behavior toward seeking information from different perspectives (i.e., diversity).

CHAPTER 2

Literature Review

The nature and increasing popularity of social media platforms have brought up the prevalence of misinformation and, more importantly disinformation. To examine this phenomenon, it is necessary to review not only the current models that describe information-seeking behavior, but also how information literacy is taught. Information process models focus on the steps and skills to make one information literate (Eisenberg et al., 2004; Kuhlthau, 1991), but must be presented in a way that contextualizes the current challenges of easy access to misinformation on social media platforms (Tewell, 2015; Wardle, 2017; Webber & Johnston, 2017). A person will need to master skills as part of the process of influencing self-efficacy and promoting knowledge creation that will result in a more literate populace.

New Technologies: New Literacies and Information Literacy

Historically speaking, advances in technology such as the invention of the printing press or the advent of the computer have brought about changing patterns on human communication (Bruce, 2000; Tusting, 2005). A renewed focus on literacies has accompanied the use of these new and emerging technologies (Coiro, Knobel, Lankshear, & Leu, 2014b; Holliday, 2017; Tewell, 2015). Although there is not a single uniform definition of literacy, traditional notions of literacy center around a person's use of reading and writing through printed text for the purposes of communication (Keefe & Copeland, 2011; Leu, O'Byrne, Zawillinski, McVerry, & Everett-Cacopardo, 2009). Ultimately, literacy can help a person formulate meaning which is a fundamental process of human activity (Gee, 2005; Holliday, 2017).

The development of digital technologies has brought about a need to question the traditional view of literacy (Holliday, 2017; Webber & Johnston, 2017). Given the technological capabilities that encompass the current social media environment, it is necessary to acknowledge that new forms other than printed text are prevalent as communication activities. For instance, the recent proliferation of smart phones has led to the increased portability of communication in a variety of formats. This includes both the receiving and the sharing of information and knowledge. There is also the presence of new contextual environments based on the person's use of the smart phone in his or her normal course of human behavior.

The emergence of new literacies is the result of attempts to address the interaction of literacy with new and emerging technologies (Coiro et al., 2014a). Coiro et al. (2014b) postulated that the wide variety of researchers from different fields of study have contributed to many different theoretical perspectives of what encompasses new literacies. A general approach to research in new literacies or any other area that encompasses the area of learning theory is the motivation to advocate or conduct this research primarily through the major theoretical perspective that fits researcher's beliefs about how learning is accomplished (Coiro et al., 2014a; Lave, 1991; Sfard, 1998). When examining learning theory, Lave (1991) noted that viewpoints often emphasizes a person's individual cognitive processes, or the processes that depend upon a person's interaction with the social environment. A more cognitively dependent definition of new literacies may be represented by the need for a person to locate and evaluate information and to create knowledge that is more reflective of the individual's means and motivations (Coiro et al., 2014a). A more socially oriented definition of new literacies may represent

the need to investigate literacy as it relates to the human practices that form from the use of digital technologies in a social environment (Gee, 2009). These viewpoints coalesce into acquisition and participation metaphors, respectively, that are designed to act as methods of associating the conceptual system to a given culture (Sfard, 1998).

When discussing the differences among these varying theoretical perspectives of learning, Sfard (1998) noted that, “it takes a common language to make one’s position acceptable, or even just comprehensible, to another person” (p. 9). Leu et al. (2009) noted that characteristics are shared by the area of new literacies and the interdisciplinary background disciplines that new literacy researchers originate. These characteristics include the recognition of the need to adapt to changes in technology, the recognition of the importance of new literacies in facilitating this adaptation, and the recognition that multiple perspectives is a benefit to the understanding and evolution of the field. Taken together, these common factors contribute to the positive development of new literacies as an area of inquiry.

Although there may be an urge to adhere to only one metaphorical perspective to explain the theoretical foundations of new literacies, Sfard (1998) argued that there should be a balance, that is, to recognizing the existence of both metaphors of learning and implementing them into research so that researchers allow for the benefits of each perspective while mitigating the theoretical drawbacks that may occur when exclusively applying one to research. In this respect, a study may address the acquisition of skills and knowledge in an environment where participation in activities reflects the basis for the cultural norms and practices that make up the social media network.

Information as a unit of description may only be limited by the ability to facilitate communication through existing technologies. Under the lens of learning, the practice of facilitating communication is a recognition that it is necessary to develop theories and methods to address how to navigate the world of information systems to achieve specific purposes. In other words, as new technologies emerge and develop, existing methods are revised and new methods are developed to adjust to the changing environment. In this sense, information literacy is defined as the process of accessing, identifying, analyzing and using information (Eisenberg et al., 2004).

Strategies, techniques and models have been designed and developed to facilitate the acquisition of information literacy skills and knowledge. One such model is the Big Six Skills developed by Eisenberg and Berkowitz (1990). Their model addresses both applied technical skills as well as the higher order knowledge required for analysis and evaluation. A criticism of this model is that the processes like Big Six are problem-based, whereas information need is often much more ill-defined than what problem-based instruction provides (Doty, 2003). Further, the designers of this model have noted that the issue of information overload is not addressed in a sufficient manner which can lead to learner confusion and cognitive overload (Eisenberg et al., 2004).

Another popular information literacy model is the Information Search Process (ISP) developed by Kuhlthau (1991). The ISP model comprises six distinct stages that represent the differentiated behaviors that a person undertakes in his or her information-seeking effort. The first stage (*Initiation*) represents a person's recognition of information need. The second stage (*Selection*) revolves around the identification of a general topic that will form the basis for further information discovery. This investigation or

Exploration (Stage 3) will result in a collection of general information. This broad collection of information will result in the *Formulation* (Stage 4) of a narrower topical focus which provides the framework for a more specific information search effort. This second effort (*Collection*: Stage 5) should result in information that forms the basis of a new understanding which can then be *Presented* (Stage 6) in a manner that put this new-found knowledge to use (Kuhlthau, 1991; 1995).

Overlapping each of the stages of the ISP are three factors that represent the Affective, Cognitive, and Physical domains (Kuhlthau, 1991). Affective factors represent a person's feelings that are exhibited throughout the ISP effort. Based on the ISP model, a person will exhibit a feeling of uncertainty toward the information goal. This is further represented in cognitive thinking that is broad and vague in nature. The physical response from a feeling of uncertainty and vague thinking is to seek out the problem that is the root cause for the current affective and cognitive states.

Once the problem is identified, there is a brief feeling of optimism based on this accomplishment; however, cognitive thoughts are still vague, which leads to further exploration. In the Exploration stage, Kuhlthau (1991) noted the possible existence of different feelings, such as confusion, frustration and doubt, that will need to be overcome to persist into further stages. In fact, Kuhlthau further noted that the next stage (Formulation) is a critical point for the individual. At this stage, a person's level of uncertainty will decrease, and a correlating increase in confidence will be exhibited. In addition, cognitive thinking will go from vague in nature to becoming more focused. As more relevant information is collected, examined and analyzed, confidence will continue to increase, and the focus will become clearer with the person exhibiting an increased

interest in the narrowed topic. In the final stage, the person will present the synthesis of the information search and analysis while generally exhibiting a sense of pleasure or disappointment with the final product that can be presented to others.

The ISP model was used as a theoretical basis in an experimental study that examined how subjective and objective factors impact an individual's web search (Gwizdka & Lopatovska, 2009). The results of the study showed that there was a positive correlation between subjective (perceived) difficulty and objective difficulty. Further, the subjective state of the individual was positively correlated with individual information search behavior and the outcomes the search. In two additional ISP studies (Taylor, 2012), undergraduate students performed information searches in which they were asked to convey the relevance judgment of their searches. Results of the studies showed that criteria choices became more refined, and positively impacted searcher understanding, as they progressed through the ISP. These criteria also became more impactful toward their perceived relevance and evaluation that is necessary in later stages of the process.

The process models by Eisenberg and Berkowitz (1990) and Kuhlthau (1991) are largely based on an individual's specific processing of what is useful and what is not useful to fulfill his or her own information need. Some may object to the notion of giving a strict prescription as to what type of information is right or wrong, valid or invalid (Snaveley & Cooper, 1997). Others believe that these methods pose “invisible constraints” on development of Information Literacy theory by focusing too much on individual cognitive skills (Bruce, 2000, p. 105). Shapiro and Hughes (1996) have defined information literacy in a manner that goes beyond the traditional focus on specific skills and emphasizes the need to extend a person’s knowledge to make, “critical reflection on

the nature of information itself, its technical infrastructure, and its social, cultural and even philosophical context and impact” (p. 34).

By focusing almost primarily on the individual, these methods fail to account for the practices that occur in the social environment (Fister, 2003). It has been shown that individuals depend on peers and others for specific support when needed and reading occurs more efficiently when in groups instead of individually (Bruce, 1999; Burbules, 2001). Some have argued that information literacy theories and methods should be rethought to encompass the dynamics of behavior surrounding information-seeking (Marcum, 2002). Some have further argued that the traditional information literacy theories are tied to an environment dominated by print text instead of digital technologies, as well as to an environment in which knowledge authority is primarily consolidated with experts instead of the current presence of Pro-Ams who may share multiple roles (Tuominen et al., 2005).

The benefits that have been shown from group interaction support the need to expand the conceptualization of information literacy that is based overwhelmingly on individual behavioral constructs. The environments of social networks are maintained by the practices that, in turn, form the culture of those networks. The models articulated by Eisenberg and Berkowitz (1990) and Kuhlthau (1991) may represent guide posts for learners in their activities and practices within these networks.

Information-seeking

Information-seeking represents behavior that focuses on an individual's intentional efforts to find information (Shah & Marchionini, 2010). Whereas *information behavior* (i.e., actions as a result of interacting with information) can represent both

intentional and unintentional instances of contact with information, *information-seeking* represents an intentional effort to search for information (Ikoja-Odongo & Mostert, 2006). Concentrating on precise behavior, it has been noted that people without specific information literacy skills have difficulty successfully analyzing the quality and validity of the information that is retrieved from an information search (Kim, 2009; Tanni & Sormunen, 2008). Given the intentional nature of information-seeking, an adequate level of motivation is required for the process to have a chance of being successful. This motivation is more properly described as information need (Kim, 2009; Tanni, & Sormunen, 2008). Much of the research into information-seeking has focused on seeking at an individual level; however, given the communication behaviors which have emerged in the era of social media as well as the increasing presence of complex communication (time and space) in modern organizational systems (even outside social media), it is important to investigate information-seeking at a group level where collaboration is necessary for a successful information-seeking effort.

Collaborative information-seeking (CIS) is used to describe group level information-seeking efforts (Reddy & Spence, 2008). Three factors were identified as reasons for initiating a CIS group. They include lack of expertise, lack of immediately accessible information and the complexity of the information need. To explain the relationship among these factors, Reddy and Jansen (2008) proposed a model which explained the difference between individual information-seeking and CIS. Increasing problem complexity, the inclusion of multiple agents (i.e., individuals or systems) and interactions that are less direct and more conversational in nature are all factors that contribute to the existence of a CIS environment. In a study referencing the ISP model

that specifically focused on information-seeking behavior in a collaborative setting, Hyldegard (2006) found that group members exhibited similar cognitive experiences in this group setting to that of a person in an individual setting.

There are common psychological factors, such as anxiety, frustration and stress, which can inhibit any information-seeking effort, whether it is individual or collaborative in nature (Brumfield, 2008). Common grounding, also known as shared understanding, is important in reducing these factors and increasing the chances of a successful information-seeking effort (Hertzum, 2010). Shah and Marchionini (2010) have identified common grounding, as well as logistical factors such as time and space as a sort of *awareness* which has a significant impact on a successful CIS effort.

The complex nature of CIS does require a greater amount of logistical and systematic effort on the part of the collaborative group. Sometimes, there can be breakdowns in the CIS structure which can have negative consequences. Hertzum (2010) investigated the use of an electronic medical records system implemented in a medical region in Denmark and found that these breakdowns were a significant factor in medication error incidents. Lack of common grounding was attributed to be the main cause of these breakdowns. In this particular information environment, information sharing was also found to be very difficult.

Contextual features are important in describing the nature of a CIS group. In investigating the activities of a working group in a military environment, Prekop (2002) proposed a CIS model which identified CIS as actors interplaying between an organizational context and a CIS context. Contextual frames can be developed based on the prior experience of individuals. These experiences form emotions that, in turn, allow

individuals to develop perceptions, or frames of reference, to predict the social world around them (Levanthal & Scherer, 1987; Mobbs et al., 2006). The development of a CIS group will carry these personal contextual frames and can lead to the adoption of specific roles within the group. In his model, Prekop (2002) was able to identify specific roles that encompass the CIS group. For instance, an information gatherer acquired needed information. This role was usually voluntary based on the ability to access the information in a timely manner. An information verifier will verify the information that is gathered. There are also roles that are more administrative and managerial in nature.

Although it varies in level of importance based on the case, the success of a CIS effort is dependent to some degree on the abilities of the participants in the group to analyze and evaluate the information once it is located. Blumfield (2008) described an intervention that was shown to have a significant effect in reducing psychological factors which inhibited a traditional (individual) information-seeking process. These factors contribute to a contextual environment that is inherent in a joint enterprise. A joint enterprise comprises more than just common grounding and shared technology. A central premise of a joint enterprise is not only the production of a shared learning outcome, but the formulation of meaning-making (Davies, 2005). As individuals develop, refine and expand their base of knowledge supported by their prior experiences, they construct their own meaning and use it to guide their future behavior in similar and not so similar experiences. In the space of social media, a joint enterprise could be a network of users interested in an organization or an activity. The social network develops its own set of practices concerning how to share, deconstruct and evaluate information for the benefit of the community. The principles that are guided by information literacy can influence the

development of the social practices that occur in that social community by developing a culture that deters substandard practices from new and existing members.

Self-efficacy

Self-efficacy, the perceived ability to achieve a desired goal (Bandura, 1993, 1997), has been positively linked to outcome performance in a specific domain (Coutinho & Neuman, 2008; Schwoerer, 2005). Those who maintain a strong level of self-efficacy were found to focus on analyzing their circumstances and focus on resolving the problems that face them. Those who maintain a weak level of self-efficacy tend to be preoccupied, while feeling a sense of doubt in their own skills and abilities to address the problem at hand and may ultimately anticipate their failure. More specifically, weak self-efficacy was associated with higher levels of stress and limited usefulness in applying cognitive strategies, which leads a failure to achieve the desired outcome (Bandura & Wood, 1989). Ultimately, strong self-efficacy is obligatory for learning (Schwoerer, 2005). Self-efficacy's relationship to outcomes permits its inclusion as a behavioral factor that may impact information-seeking that, in turn, impacts the outcome of later stages in the information literacy process.

Self-efficacy can be narrowed further based on the stage of the learning process. For instance, in a study conducted in a training environment, self-efficacy was measured before the training session (i.e., *pre-training*) and after the training session (i.e., *post-training*). Pre-training self-efficacy refers to confidence in one's ability to learn, whereas post-training self-efficacy refers to confidence in one's ability to successfully apply what was learned (Thayer & Teachout, 1995). Thayer and Teachout (1995) found that pre-training self-efficacy successfully predicted post-training self-efficacy. Further, low pre-

training self-efficacy was found to undermine learning (Quinones, 1995). Self-efficacy was a contributor to avoiding the misalignment of performance learning that is associated with cognitive failure (Hong et al., 2016), and is a direct predictor of formal academic achievement (Komarraju & Nadler, 2013).

Self-efficacy can also be seen as a construct can predict experiences with information complexity, information source trust and diversity (Kurbanoglu, 2003). Kim and Glassman (2013) found that self-efficacy directly correlates to information complexity. A person maintaining low information self-efficacy would be able to search for and receive information while being less likely to perform more complex behavior such as the organization and evaluation of information that is representative of a person with higher information self-efficacy.

Social media platforms can also be communication conduits for formal and informal learning situations. Hocevar, Flanagin, and Metzger (2014) investigated self-efficacy with respect to social media and its impact on how users evaluated the information that was presented to them. Social media users with higher social media self-efficacy tended to trust shared information found on social media platforms compared to those with lower social media self-efficacy. Further, those with greater social media self-efficacy tended to pursue the opinions of others (Hocevar et al., 2014). The introduction of new technologies will mean the possible introduction of new complexities to information activities. This research shows that increased self-efficacy may be required to perform more complex information behavior and to exhibit behavior that is necessary for a social media user to become a critical examiner of information. In this sense, self-

efficacy is a possible predictor of a social media user's behavior when using the software platform to communicate.

Cognitive Engagement: The ICAP Framework

The research studies that have been discussed thus far have focused on the psychological and social experiences of users as they perform their information-based activities. A question remains concerning how to engage the user to learn about the benefits of information literacy models and processes to bring about successful social media experiences. Chi and Wylie (2014) provided a four-tiered hierarchical framework, known as ICAP, for identifying levels of cognitive engagement from specific instructional activities to expected learning outcomes. ICAP stands for Interactive, Constructive, Active and Passive. An initial base level of engagement is identified as *passive* in nature.

Typical passive activities would involve a person listening to a lecture or viewing a video without the user controls. A person can be receiving information and storing it in memory, but not linking this new information to prior knowledge. Therefore, the learning is inert and has a minor influence on learner understanding (Chi & Wylie, 2014). A higher degree of engagement with learning materials is described as *active* participation. The main factor that elevates passive engagement to active engagement is the manipulation of instructional materials. Common activities that would be described as active include highlighting text or replaying video. In these instances, the learners are linking the new information to prior knowledge while enhancing their existing schematic understanding. Activities in the active category will lead to shallow learning with a limited contextual variance for use by the learner.

Both passive and active activities have limited usefulness in facilitating the learner to apply new information to existing knowledge. Activities that will lead to deeper learning involve more than the simple manipulation of instructional materials. *Constructive* activities require the learner to conduct further explanation or self-reflection. Chi and Wylie (2014) cited concept maps and activities that integrate prior knowledge through elaboration such as writing notes in their own words rather than simply highlighting the text or prompting learners to situate themselves in a contextual manner that allows them to infer and create new knowledge that can enhance their existing schema. Further, the new knowledge is portable and can be applied to other contextual situations outside of the environment in which it was learned.

The highest of the four modes of engagement involve activities that are *interactive*. Activities pertaining to this mode of engagement generally involve the constructive engagement of two or more individuals. A common example of an applicable activity may involve debates or other discussions with a partner concerning the new information. Chi and Wylie (2014) described this situation as co-infering, meaning that each individual is able to create new schema through the integration of the new information and the existing prior knowledge of each member of the group. Because each member has his or her own unique set of knowledge and experiences, there is the possibility that new schema can emerge from this activity. Such a process would involve the same information being delivered to all members of the group, then being applied by each person with his or her own prior knowledge with each resulting perspective being shared with other members of the group. Under this scenario, each member can utilize the prior knowledge of all the other members to create an interactive process of knowledge

creation and development. These discussions will involve full participation. Instances where one member of the group dominates the discussion (resulting in other members being passive) are not interactive but are more passive in their process and outcome.

The ICAP framework has been applied to varying degrees in research pertaining to individual and collaborative learning. Research focusing on individual outcomes in a collaborative setting has shown that rigid procedures or formulas such as argumentation scripts did not have a significant effect on learning outcomes, whereas one's awareness of the collaborative group as well as the interaction effect of argumentation scripts and group awareness did have a positive impact on learning (Tsovaltzi, Judele, Puhl, & Weinberger, 2015).

Other research has focused more on the performance outcomes of a group particularly with respect to computer-supported collaborative learning (CSCL). CSCL research has shown how constructive and interactive activities may result in different levels of learning performance. In one instance, the higher degree of argumentation used in an interactive (or transactive) process of engagement resulted in a lower reliance on a group partner for their own learning (Vogel et al., 2016). In another instance, individual prior knowledge was identified as a significant factor that influenced individual learning among a group when comparing two different levels of knowledge interdependence (Deiglmayr & Schalk, 2015). Weak knowledge interdependence is characterized as a situation where all members of a collaborative group are given all of the core concepts that are needed to solve a problem before collaboration occurs, whereas strong knowledge interdependence is characterized as a situation where one member of a group is given one core concept and another member of the group is given a different core

concept to learn prior to collaboration. More specifically, Deiglmayr and Schalk (2015) found that those with low prior knowledge under a weak knowledge interdependence condition had greater learning gains compared to a person with low prior knowledge under a strong knowledge interdependence condition.

Social media platforms create an environment where a user can participate in an activity that can fall under all four modes of engagement. For example, a user can watch a video or article that was shared and sent to their time line or news feed (*passive*). A person can share this same video or article while putting a single direct quote or headline at the top of the post (*active*). Instead of putting the direct quote in the shared post, the user may write down their own reactions or similar experiences (*constructive*). Finally, the user may interact with other users in real time while offering, receiving and re-offering their own reactions, opinions or possible solutions to whatever topic was highlighted in the shared video or article (*interactive*).

The derivative research using the ICAP framework, particularly the CSCL research (Deiglmayr & Schalk, 2015; Vogel et al., 2016), noted the findings from Chi and Wylie (2014) that found that interactive-level engagement (i.e., a group-oriented activity) was superior to the lower individual-oriented levels of engagement; however, the CSCL research was based on the notion of a common objective among the members of the collaborative group. A common objective could be learning the basics of topic, solving a given mathematical problem, or providing policy options for a social need; however, the people who communicate through social media platforms do not always share the same common objective(s) that are present in CSCL research. One social media user may want to look for differing opinions on a social topic. Other members may just want to

distribute messages that are campaign advertisements instead of offering a possible solution to the initial inquiry. Other users may simply want to argue, badger, or harass the user who may take a position on a topic that is different from their own. This is in addition to the prevalence of misinformation that is present on social media platforms.

Overview of the Present Study

The purpose of the present study was to determine how existing demographic and internal measures such as self-efficacy can predict prior knowledge of misinformation on social media, as well as to examine the impact that three of the four levels of cognitive engagement outlined in the ICAP framework have on learning performance. The interactive condition was not included because it requires a peer component, which would significantly increase the complexity of study, such as including a larger sample size requirement of the study and the lack of independence among the peers, leading to the need to average their scores to mitigate this effect. Therefore, the three levels of the ICAP framework that could be implemented on an individual basis with participants were selected for the final design.

All treatment conditions used the same text, graphics and video while distinguishing between increasingly complex activities required for completion. An experimental design with a single independent variable with four levels was used and participants were randomly assigned among the four conditions. These conditions included three treatment groups representing three of the four level of the ICAP framework (passive, active, and constructive) or a *business-as-usual* control group that consisted of an existing presentation about misinformation on social media. This existing presentation was selected from a publicly available course on news literacy from the

Center for News Literacy at Stony Brook University (Stony Brook Center for News Literacy, 2018). The study was performed in a laboratory setting involving undergraduate students at a large public university located in the southwest. A laboratory setting was chosen over a field study because it increased the reliability and internal validity of the study and reduced the probability of confounding variables compared to a similar study that may be given in the field.

Research Questions

Based on the review of the relevant literature, the following research questions were established to examine the pertinent phenomena:

1. Does using some form of cognitive engagement—from passive, to active, to constructive—in an online instructional intervention designed to identify misinformation in social media impact learning?
2. Is the learning from the different types of cognitive engagement consistent with the ICAP framework?

These questions aim to determine how differing levels of cognitive engagement influence learning performance specifically via a pre-test/post-test design. Additionally, are there learning differences between the three treatment groups that have some form of recognizable cognitive engagement from the control group as shown from the participant responses on the pre-test and post-test? In other words, how do each of the three treatment groups compare to the control group. The second question can help in determining whether using the ICAP framework can support learning and at incrementally better levels. According to the ICAP framework, the constructive condition is predicted to produce the largest learning gains, the active condition is predicted to

produce modest gains, and the passive condition is predicted to produce the smallest gains.

3. Does using some form of cognitive engagement—from passive, to active, to constructive—in an online instructional intervention designed to identify misinformation in social media impact learning time?

This question seeks to determine whether there is a difference in the time that participants took to complete the instructional module. Ideally, most instructional designers pursue efficiency as a measure of their instruction, hoping for the most efficient way to produce the largest learning gains.

4. To what degree could different factors of self-efficacy identified by Kim and Glassman (2013) predict prior knowledge pertaining to social media literacy?
5. To what degree could a select set of demographic and behavioral features such as age, gender and years in college as well as social media practice predict prior knowledge pertaining to social media literacy?

These questions were intended to examine how useful self-efficacy and common demographic independent variables were able to in predict the prior knowledge of the participant with respect to how they perceive and reconstruct the information that is presented to them on social media platforms via a pre-test examination. The demographic variables were chosen based on their use in research as well as the ability to complement the design of this study.

CHAPTER 3

Method

Participants

Participants for this study were comprised of 135 undergraduate students from a large university located in the southwestern United States. Out of the 135 respondents, 131 of them successfully completed the instructional module. Out of all participants, 115 of the respondents ranged in age from 18 to 23. There were 88 (65%) males, 46 (45%) females, and 1 (0.74%) respondent who identified as someone who was neither male nor female. With respect to the ethnic makeup, 68 (46%) respondents identified themselves as Asian/Pacific Islander, 41 (28%) identified themselves as Caucasian, 23 (16%) identified themselves as Hispanic, 7 (5%) identified themselves as African American, and 8 (5%) identified themselves as something other than any of the above.

Approximately 31% of respondents were in their first or second year of postsecondary education, whereas 51% (69) of respondents were in their third or fourth year of postsecondary education. The remaining portion of respondents had more than four years of postsecondary education. With respect to academic interest, 99 (62%) of respondents expressed interest in an Engineering discipline, 35 (22%) of respondents expressed an interest in a discipline in the Arts & Sciences or the Humanities, 16 (10%) expressed an interest in Business, 3 (2%) identified an interest in Education, and 7 (4%) identified an academic interest other than the above.

When asked about their prior experiences with social media, 131 (97%) of the participants stated that they have used social media for more than three years, 2 (1.5%) stated that they have been using social media for three years, and 2 (1.5%) stated that

they have been using social media for one year. In their daily use, 17 (13%) of the respondents stated that they check their social media feeds between 1 and 3 times per day, whereas 19 (14%) stated that they check their social media feeds 4 to 6 times per day. Additionally, 25 (19%) respondents stated that they check their social media feeds between 7 and 9 times a day, whereas 74 (54%) of the respondents stated that they check their social media feeds at least 10 times per day. Once they decide to check their social media feeds, 36 (27%) respondents stated that their average social media visit is less than five minutes, whereas 47 (35%) respondents stated that they average 6 to 10 minutes per visit. Additionally, 16 (12%) respondents stated that their average social media visit is anywhere between 16 and 20 minutes, whereas 10 (7%) respondents stated that their average social media visit last for at least 20 minutes. Finally, most respondents (69; 51%) stated that their top reason for using social media is to keep up with family and friends, whereas 48 (36%) respondents stated that keeping up with news and other current events is their top reason for using social media. Promoting oneself or their business as stated as the top reason by 4 (3%) respondents, whereas 14 (10%) respondents had another reason for using social media.

Design

This study employed an experimental design with a single independent variable with four levels where participants were randomly assigned to one of four conditions with the requirement that there were equal numbers among the conditions. There were the treatment groups that reflected three of four the levels of the ICAP framework (passive, active, and constructive) and a control condition consisting of existing topical instruction.

The original goal was to ensure that each condition was randomly assigned 30 participants; however, due to the randomization of the study software along with a combination of participant sign-up follow through and incomplete participant responses, unbalanced groups were generated. Specifically, the Passive group was comprised of 33 participants, the Active group was comprised of 33 participants, the Constructive group was comprised of 35 participants, whereas the Control group was comprised of 31 participants. Each of these four conditions are described below.

Instructional Environment

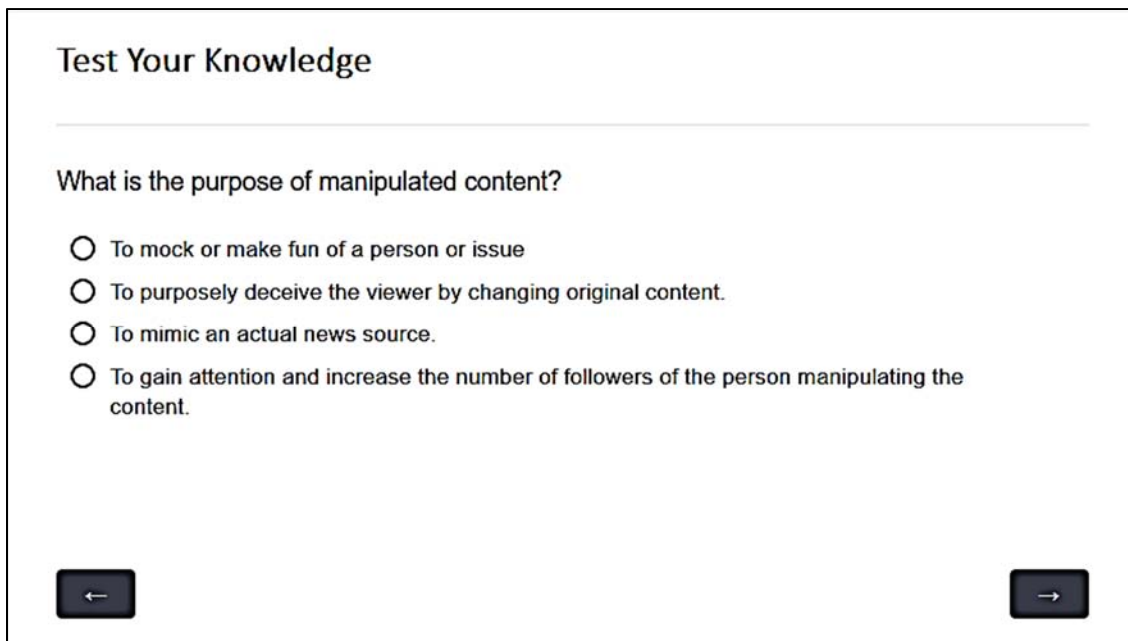
An online instructional intervention or module was presented to respondents that explored how misinformation is shown on social media and how it can impact those who use social media to gather information and form opinions. The instructional module representing each of the treatment conditions was designed and developed by the researcher (Martinez, 2018). The instructional module representing the control condition was designed and developed by a neutral third party, the Center for News Literacy (Stony Brook Center for News Literacy, 2018).

The content for the instructional module is chunked into specific topics with periodic opportunities to review the topic and test what they have learned. Specifically, three of the seven types of misinformation identified by Wardle (2017). The three specific types of misinformation highlighted in the instructional module correspond with the types of misinformation that are intended to inherently deceive and cause the most harm (Wardle, 2017).

Three versions of this instructional intervention were offered to respondents along with an existing instructional presentation that was used to compare with the proposed

instructional interventions. With respect to the treatments, the differences among the passive, active and constructive interventions were determined by the instructional cues and activities that were given to the respondent. The description of concepts as well as the media provided were the same across the experimental treatment conditions.

The passive condition represented the passive mode of engagement of the ICAP framework. Specifically, the passive mode involved the learner's (in this case, the participant's) ability to store and recall information (Chi & Wylie, 2014). Figure 1 below represents one of the questions that participants received under the passive condition. The question emulates a passive-type strategy such as simple recall of a term that was defined earlier in the instruction.



Test Your Knowledge

What is the purpose of manipulated content?

- To mock or make fun of a person or issue
- To purposely deceive the viewer by changing original content.
- To mimic an actual news source.
- To gain attention and increase the number of followers of the person manipulating the content.

← →

Figure 1. Passive question. Source: Martinez, 2018.

The active condition represents the active mode of engagement found in the ICAP framework. The active mode was designed to encompass the learner's ability to apply and integrate the terms and concepts that are introduced to them that are characteristic of

the active mode of engagement (Chi & Wylie, 2014). Figure 2 shows an active question that was used in the active condition. In this instance, the learner would choose the selection based on the content that he or she may have highlighted or noted from the prior instruction.

Test Your Knowledge

Finish this sentence. "Manipulated content ..."

- "involves creating content or imagery that is designed to manipulate others."
- "is the same as other types of content that are designed to deceive others"
- "involves taking content or imagery and changing it in order to deceive others."
- "is the same as other types of content that are designed to be humorous."

← →

Figure 2. Active question. Source: Martinez, 2018.

The constructive condition represents the constructive mode of the ICAP framework. A constructive mode of engagement entails more complex cognitive applications such as inference and transfer (Chi & Wylie, 2014). This form of engagement can involve identifying concepts and terms in a way that is personal to them. Constructive engagement can also focus on one's personal reflection to integrate the terms and concepts of instruction. In this study, constructive engagement involved participants explaining terms and concepts by referencing their own experiences or in their own manner of expression. Figure 3 shows an example of a constructive question that was used in the constructive condition.

Test Your Knowledge

In your own words, describe the purpose of manipulated content.

← →

Figure 3. Constructive question. Source: Martinez, 2018.

The control condition consisted of an existing publicly available PowerPoint presentation from the Center for News Literacy at Stony Brook University (the Center). The Center (Stony Brook Center for News Literacy, 2016) was established to provide instruction and resources for students to appropriately “judge the reliability and credibility of news reports and news sources” (para. a). The presentation used for the control condition was part of a larger course on news literacy. Specifically, the presentation, entitled *Deconstructing Digital Age Media*, was adapted and narrowed to focus on the same types of misinformation that were also presented in each of the three treatment conditions. The control instruction selected for use in the study covered the same types of misinformation used in the treatment instructional modules. Based on the ICAP framework, this presentation would be characterized as largely passive in nature. Furthermore, instead of presenting questions to the participant intermittently, as in the treatment conditions, all questions were designed to be presented at the end of the

presentation. No opportunities for review were presented to the learner in the control presentation.

Measures

The study utilized six surveys and measures: demographics, social media activity, self-efficacy, usability survey, along with a pre-test and post-test as learning measures.

Demographics. On the demographics survey, respondents were asked to give their age, ethnicity, gender, number of years in college, along with their academic interest.

Social media activity. Additional questions asked participants to report on their level of social media activity. Specifically, four ratio scale items were created to measure participants' typical social media visits and purpose for their visits.

Self-efficacy. A survey on self-efficacy was adapted from prior research on Internet self-efficacy (Kim & Glassman, 2013). This five-factor (1: *Search*, 2: *Communication*, 3: *Organization*, 4: *Differentiation*, 5: *Reactive/Generative*) instrument consists of 21 items, and was developed to address the rapidly changing size (i.e., both volume and communication choices) of the Internet, the information types available for access through the Internet, and to address a focus on *social experiences* as opposed to technical skills. Items on the instrument are based on a 7-point, Likert-type scale ranging from 1 = *Not at All Confident* to 7 = *Very Confident*. Although there are many validated instruments that address related aspects of Internet self-efficacy, this specific instrument was chosen because a purpose of the research was to investigate the levels of information literacy of the participants with respect to misinformation on social media rather than social media itself. Five scores were compiled based on a summation of each of the five

factors that were identified by the from the original instrument construction. Each of these five scores were then entered as a single variable for eventual analysis.

Usability. A survey designed to capture the user's experience of the instructional module was presented to each respondent. The Post-Study System Usability Questionnaire is a 19-item instrument that is based on three factors of user satisfaction including user perceptions toward (a) *System usefulness*, (b) *Information quality*, as well as (c) *Interface quality* (Lewis, 1995). Items on the instrument are based on a 7-point, Likert scale ranging from 1 = *Strongly Disagree* to 7 = *Strongly Agree*. Three scores were compiled based on the summation of each of the three factors that were identified and provided in the original instrument construction. Three scores were then compiled based on a summation of the questions that represent each of the three factors.

Learning. Last, a 20-item test bank developed by the researcher was used to measure prior knowledge (pre-test) and learning from the respective learning environments for all participants (post-test). The items on these measures consisted of 4-option multiple-choice and short-answer items. This test bank was broken-up into sets that were then randomly assigned to participants to counterbalance for a possible testing effect. This randomization was evenly distributed so that half of the participants received at least two test sections before experiencing the instructional module (pre-test) and then received the remaining sections after the instructional module (post-test).

An answer key was used to complete participant scoring on the pre-test and post-test. For the open-ended questions, a list of key phrases and terms were used to help identify correct and incorrect answers. Each question was worth one point resulting in a possible score range of 0 to 10. Overall scores were created by summing across and

dividing by total number of questions to create a percentage correct score. The researcher conducted all grading. For the purposes of controlling bias, the answers given by the participants were anonymized by extracting participant answers along with a copy of a unique response identification generated for each participant by the survey software from the larger data set prior to grading.

Procedure

The data for this study were collected at a university lab. The lab consisted of four computers with wired Internet communication where the respondents were presented with a digital document containing a link to an online survey that was being hosted through the Qualtrics website. Participants were recruited through an email that was sent to instructors of the target population who were then asked to share this letter with their students. The recruitment letter stated the purpose of the study, their request for participation including the expected time commitment, and their compensation for participation, a gift card to Amazon.com. Potential participants were then given a link to an online sign-up sheet where they would sign-up for specific hour-long blocks to participate in the study.

Participants who arrived at their scheduled time were guided to an open computer by the researcher. Once the participant was settled, the researcher gave instructions pertaining to using headphones during the study and to notify the researcher if he or she had any questions. Once ready, the researcher opened the survey and a statement of consent was presented on the computer for the participant that described the purpose of the study, the requirements needed to participate, the benefits and risks from participation, and notification that they could decline further participation at any time

without penalty. All participants consented to the study prior to participating in the study. The researcher was present throughout the study.

Once consented, the participant completed a demographic questionnaire, the adapted instrument of self-efficacy and then the pre-test. At this point each, participant was randomly provided with an instructional lesson that will represent one of three degrees of cognitive engagement or an alternative existing presentation representing a control condition. Participants then took part in a short lesson that pertains to the current issues of social media including the benefits and risks of using social media, and how to distinguish the information that is shared through these networks. The participant then completed a post-test following the instructional module and then the usability survey. Once participants gave their opinions on their level of satisfaction with the instructional module, a notification of completion appeared asking them to notify the researcher. Once the researcher was notified of completion, the researcher handed an acknowledgement sheet for the participant to sign and date. This sheet was meant to recognize the participant's receipt of compensation for their participation in the study. After signing the acknowledgement sheet, the participant was presented with a \$20 gift card to Amazon.com. Participants were thanked for their participation and subsequently left the computer laboratory.

CHAPTER 4

Results

Research Questions 1 and 2

The first and second research questions asked, “Does using some form of cognitive engagement—from passive, to active, to constructive—in an online instructional intervention designed to identify misinformation in social media impact learning?” and, “Is the learning from the different types of cognitive engagement consistent with the ICAP framework?” These questions were designed to examine the comparative differences of each level of cognitive engagement with respect to performance on an assessment after instruction controlling for performance on a pre-assessment that was given before instruction.

A one-way Analysis of Covariance (ANCOVA) was performed to satisfy the needs of this inquiry. The analysis was performed under a fixed-factor condition because the pre-study assumptions assumed random assignment and equal groups. The independent variable was composed of four levels: passive, active, constructive, and control. The dependent variable was the score from the post-test, whereas the covariate was the score from the pre-test. The results of the ANCOVA were significant, $F(3, 126) = 3.401, p = .02, \eta^2 = .075$. The unadjusted means and standard deviations are presented in Table 1. Estimated marginal means were calculated by controlling for prior knowledge as shown on the pre-test. Because the ANCOVA was significant, an adjusted post-hoc pairwise comparison was examined to determine whether there were statistical differences among each of the groups. The post-hoc comparison was based on the adjusted means due to the inclusion of the covariate in the analysis. There was a

significant difference between the active group and the control group ($p = .04$) as well as between the constructive group and the control group ($p = .04$).

Table 1				
<i>Unadjusted and Adjusted Post-test Means (and Standard Deviations)</i>				
Cognitive engagement level	<i>n</i>	Pre-test <i>M</i>	Unadjusted Post-test <i>M</i> (and <i>SD</i>)	Adjusted Post-test <i>M</i> (and <i>SD</i>)
Control	31	64.2%	63.2% (1.681)	62.3% (.325)
Passive	33	62.7%	73.0% (1.649)	72.7% (.314)
Active	32	57.2%	73.1% (1.533)	75.0% (.323)
Constructive	35	63.4%	75.1% (2.513)	75.0% (.306)

Following instruction and assessment, participants gave an evaluation of their interaction with their respective instructional module. Feedback on the usability of the instructional module was captured by using the Post-Study System Usability Questionnaire (Lewis, 1995). This instrument has three factors: (a) System usefulness, (b) Information quality, and (c) Interface quality. A summary of the means for each factor and the overall mean for each group is shown in Table 2. Based on the mean data, there is a consistent pattern of higher percentages from Control to Passive, to Active, with a dip with the feedback representing the Constructive level of cognitive engagement.

Participants were allowed the option of providing comments for each response that they made. The comments that were provided by the participants in the constructive group were not vastly different from the other groups. When looking at the scores provided by each participant, one member of the Constructive group consistently provided low marks and was not satisfied with the instructional module. This participant specifically noted that they had no interest in the material, they did not learn anything and that they “would

rather be taught in a classroom.” If the answers from this person were removed from analysis, the resulting means for the Constructive group would be in line with the trend of increasing usability as the level of cognitive engagement required by the participant increases.

Cognitive engagement level	<i>n</i>	System usefulness <i>M</i>	Information quality <i>M</i>	Interface quality <i>M</i>	Total <i>M</i>
Control	31	89.2%	82.5%	83.3%	85.8%
Passive	33	90.4%	87.9%	85.1%	88.7%
Active	32	91.8%	88.1%	87.4%	89.8%
Constructive	35	88.0%	86.1%	85.2%	87.9%

Research Question 3

The third research question asked, “Does using some form of cognitive engagement—from passive, to active, to constructive—in an online instructional intervention designed to identify misinformation in social media impact learning time?” This question is intended to examine the comparative differences at each level of cognitive engagement with respect to the time to complete the instructional module.

An Analysis of Variance (ANOVA) was performed to evaluate the effect of cognitive engagement on a learner’s time to completion. The means and standard deviations are presented in Table 3. The results of the ANOVA indicated a statistical difference among the four conditions, $F(3, 127) = 6.635, p < .005, \eta^2 = .135$. Follow up tests were performed to determine the mean differences among the four treatment groups using the Tukey-Kramer method. This method was chosen because the groups have

unbalanced sizes. The results of this post-hoc test show that there is a significant difference in the time to completion between the group that experienced the passive level of cognitive engagement and the control ($p < .005$), as well as those in the group that experienced the constructive level of cognitive engagement and the control group ($p = .009$). There were no significant differences between those that experienced either the passive or active levels of cognitive engagement ($p = .127$), as well as those that experienced either the passive or constructive levels of cognitive engagement ($p = .667$). Further, it was determined that there was not a statistically significant difference between those that experienced the active level of cognitive engagement and the control group ($p = .169$), as well as those that experienced either the active or constructive levels of cognitive engagement ($p = .684$).

Table 3	
<i>Time to Completion Means (and Standard Deviations)</i>	
Cognitive engagement level	Time to Completion <i>M</i> (and <i>SD</i>)
Control	745.52s (334.40)
Passive	924.13s (341.88)
Active	835.56s (257.06)
Constructive	1094.35s (346.93)

Research Questions 4 and 5

The fourth and fifth research questions asked, “To what degree could different factors of self-efficacy identified by Kim and Glassman (2013) predict prior knowledge pertaining to social media literacy?” and, “To what degree could a select set of demographic and behavioral features such as age, gender and years in college as well as social media practice predict prior knowledge pertaining to social media literacy?” A

series of multiple linear regression analyses were performed to evaluate how well demographic and self-efficacy variables predicted performance on a pre-test designed to measure prior knowledge.

Model 1. The aim of the initial model was to explore how the adapted instrument of information self-efficacy from Kim and Glassman (2013) predicted prior knowledge of misinformation on social media platforms that was measured via a pre-test. The predictors applied to this initial model included of the following five factors: (1. Search, 2. Communication, 3. Organization, 4. Differentiation, and 5. Reactive/Generative) from the self-efficacy survey, whereas the measured criterion was the overall score on the pre-test, which was designed to measure prior knowledge. Self-efficacy has been identified as a construct that may predict a person’s comfortability and expertise with a concept or topic.

One respondent did not give a response to all the self-efficacy items and his or her responses were excluded from this analysis. Therefore, for the purposes of this analysis, $N = 130$. The average pre-test score was 61.9% with a standard deviation of 1.59.

Table 4	
<i>Information Self-efficacy Means (and Standard Deviations)</i>	
Factor	Information Self-efficacy M (and SD)
Search	12.92 (1.62)
Communication	11.24 (2.44)
Organization	15.53 (3.55)
Differentiation	21.53 (4.20)
Reactive/Generative	31.61 (6.19)

All predictors were entered simultaneously into the equation (in one step), also called *forced entry*. The linear combination of the self-efficacy factors did not

significantly predict the score on the prior knowledge measure, $F(5, 125) = 0.346, p = .884$. The multiple correlation coefficient for the sample was .014 indicating that 1.4% of the variance of the scores on the pre-test can be accounted by the combination of the self-efficacy variables. The Cornbach alpha coefficient of the 17 items that comprise the 5 predictors was .903, indicating that the items have a high level of internal reliability. Based on the results of this initial analysis, further refinement of the model would be necessary to increase effect size.

Table 5 summarizes the bivariate and partial correlations of each of the self-efficacy factors with respect to prior knowledge. All self-efficacy factors were positive except for the factors relating to differentiating and organizing information using social media. With correlations ranging from -.03 to .12, no singular predictor can be described as having a strong correlation to the criterion.

Table 5		
<i>Bivariate and Partial Correlations of the Self-efficacy Predictor Scores with Prior Knowledge Pre-test Scores</i>		
Self-efficacy predictor	Bivariate correlation	Partial correlation
Search	-.009	.016
Communication	.055	.058
Organization	-.037	-.040
Differentiation	-.061	-.071
Reactive/Generative	.026	.041

Model 2: Including gender as a predictor. A second model was evaluated by adding gender as a predictor to the five self-efficacy factors to predict the score from the test taken prior to instruction. One incomplete respondent record was excluded from this analysis. The linear combination of the self-efficacy and gender variables was not

significantly related to the score from the pre-test, $F(6, 124) = 1.875, p = .090$. The multiple correlation coefficient for the sample was .083 indicating that 8.3% of the variance of the scores on the pre-test can be accounted by the combination of the self-efficacy and gender variables. Table 6 summarizes the bivariate and partial correlations of each of the self-efficacy factors and gender with respect to the pre-test score. The self-efficacy factors relating to differentiation, organization and search were found to be slightly negative. The self-efficacy factors relating to generative and communication were found to be slightly positive, apart from the factors relating to differentiating and organizing information using social media. With correlations ranging from -.061 to .269, no singular predictor can be described as having a strong correlation to the criterion. Comparatively, the inclusion of gender as a predictor did improve the model, but the improved model did not reach a standard that could be considered statistically significant.

Table 6		
<i>Bivariate and Partial Correlations of the Self-efficacy Predictor Scores and Gender with Prior Knowledge Pre-test Scores</i>		
Self-efficacy predictor	Bivariate correlation	Partial correlation
Search	-.009	.038
Communication	.055	.071
Organization	-.037	-.033
Differentiation	-.061	-.044
Reactive/Generative	.026	.022
Gender	.269	.264

Model 3: Demographic measures. A third model was analyzed by removing the self-efficacy factors and including other demographic measures in addition to gender to predict performance on a test taken prior to instruction. The demographic measures

included gender, age and number of years that the respondents have attended college. All respondents replied to these measures, therefore $N = 131$. The linear combination of the demographic variables was significantly related to the score on the pre-test, $F(3, 128) = 4.33, p = .006$. The multiple correlation coefficient for the sample was .093, indicating that 9.3% of the variance of the scores on the pre-test can be accounted for by the combination of the demographic variables. Table 7 summarizes the bivariate and partial correlations of each of the demographic variables with respect to the prior knowledge of the participant. The correlation between age and the score on the pre-test was found to be slightly negative, whereas the correlations for gender and years in college were slightly positive. No single predictor was found to have a strong relationship with the criterion.

Table 7		
<i>Bivariate and Partial Correlations of Demographic Predictors with Prior Knowledge Pre-test Scores</i>		
Demographic predictor	Bivariate correlation	Partial correlation
Gender	.269	.287
Age	-.053	-.148
Years in college	.028	.117

CHAPTER 5

Discussion

The purpose of this study was to explore how different forms of cognitive engagement—from passive, to active, to constructive—in an online instructional intervention designed to identify misinformation in social media impacted learning. The need for research addressing the impacts of social media with respect to changes in user behavior has increased with social media's use as a primary information source, particularly information that can be political in nature. This study specifically aims to address the emerging gap that has been recognized by the need to address learning information literacy knowledge by analyzing the cognitive effort that one uses in their learning experience. It is in fact the experience that can affect the learning differences that occur from specific instruction. The findings indicated a statistically significant difference on the mean learning performance scores among the treatment and control groups. Further, the increased cognitive complexity may influence how quickly a person completed the instruction via the finding of statistical significance among the groups means.

Increasing Cognitive Engagement to Foster Learning

The instruction was designed and developed based on the ICAP framework (Chi & Wylie, 2014) that distinguished instructional complexity based on the level of cognitive engagement that the learner is exposed to. Utilizing three of the four levels as treatment conditions along with a control group, an ANCOVA statistical analysis was conducted to determine differences in learning performance among the groups. The analysis has shown that differences do indeed exist among the groups at an appropriate

statistical level. Adjusted post-hoc comparisons revealed statistically significant differences between some (Active versus Control; Constructive versus Control), but not all, groups. These comparisons indicate that there are significant differences between the selected pair and the overall main difference that was found in the ANCOVA.

Additional analysis was performed to determine whether there were differences among the groups with respect to time of completion. An ANOVA statistical analysis was performed to investigate the time of completion among the groups. The analysis showed that mean differences for time did exist among the groups. A post-hoc analysis using the Tukey-Kramer method for unbalanced groups sizes revealed statistically significant differences among the passive and control groups as well as the constructive and control groups. These findings support the belief that the notion outlined in the ICAP framework that increasing cognitive engagement can result in better learning. Further, increases or decreases in complexity can influence the time it takes to complete a series of tasks, in this case, associated with instruction.

A secondary purpose was to investigate how self-efficacy may predict user's evaluation of information on social media platforms, and how differing levels of cognitive engagement could impact learning performance. The exploration of psychological factors and consequences associated with the inability to properly evaluate information have been highlighted significantly within the last few years as numerous instances of disinformation being exploited by individuals to persuade and misdirect social media users (Stony Brook Center for News Literacy, 2018; Wardle, 2017).

The study produced interesting results that can contribute to the dynamics of cognitive engagement, self-efficacy and the study holds implications for how one

processes information to make decisions. Information literacy as a topic of research has a long history in which many have developed process models that focus on the individual person finding and collecting information to make informed decisions (Eisenberg et al., 2004; Kuhlthau, 1991). These models have focused on information-seeking as a solo activity where information may be inaccurate but is not necessarily designed to deceive. The mass adoption of social media platforms as a popular method of information sharing has extended the notion of information-seeking as a collaborative situation where the individual users may be misdirected based on patently false information. Social media has the added potential of assistance or harm based on a user's network that can be viewed by the user as trusted and reliable. If a trusted source of information is not trustworthy or reliable, the social media user can be misled (Nyhan & Reifler, 2010). Therefore, the user has ceded their information decision-making to this trusted person and whatever he or she decides to proclaim as right or wrong. The situation that was just described results in the social media user losing their own sense of agency. This potential situation of a social media user's loss of agency can have severe consequences for what is means to be an informed citizen.

With respect to the added volatility that has been introduced with the establishment of social media platforms, self-efficacy could be seen as a way to predict an individual's prior knowledge concerning the topic of instruction (misinformation on social media). In other words, as a psychological construct, self-efficacy could be seen as a way to measure one's sureness in engaging in the selected process. If one has high information self-efficacy, then he or she may be able to cope with the evaluation of information. The adapted instrument of self-efficacy was not able to statistically support

the hypothesis that self-efficacy pertaining to the Internet (specifically social media) could predict prior knowledge.

Implications

The findings from this study reveal possible implications for several aspects of the facilitation of learning, such as the design of instruction and assessment. The access, organization and presentation of information is simultaneously becoming less decentralized on one level, but more centralized on another level. Less decentralized with respect to who gatekeeps what information is published and not published, but less decentralized with respect to who users go to get the information that they need. It is important to recognize and examine how design and instruction can adapt to changing information behavior.

The results of this study show that the instructional modules based on the ICAP framework (Chi & Wylie, 2014) were more effective and efficient than the control condition in providing greater learning performance that occurred over a shorter period of time. Further, the results of the study show that the a priori assumptions of the ICAP framework held true where increased cognitive engagement produced increased learning gains but also reduced time to complete the instruction.

Therefore, further results from this study, specifically statistically significant findings when differences in learning performance and time were analyzed, support the notion that the ICAP framework may be used as a reference for introducing different activities to achieve a specific level of engagement depending upon the objective of the instruction that will be created. Instruction that aims for the surface level learning characteristic of the passive mode of engagement could use the types of activities

identified in the passive mode such as simple recall. Instruction that aims for a deeper level of learning could employ activities identified under the constructive mode of engagement. Further, the use of this specific framework can also assist in determining what learning outcomes may be possible for the type of engagement that the learner undertakes.

Although the results of this study have shown that higher levels of cognitive engagement can be an important factor in potential learning, it is important to recognize that over a longer course of instruction, multiple levels of engagement may occur during the learning process. The type of engagement will also be a factor in designing the estimated time to completion of the instruction. More complex engagement activities could correlate with a longer estimated time to completion instruction.

Based on the statistical findings from this study, the ICAP framework (Chi & Wylie, 2014) can be useful toward the construction of assessment items that balance the expectations of cognitive effort and the resulting time to completion. Specific learning objectives could be designed, in part, using on the ICAP framework. A passive recall question would normally elicit lower mental effort and time to complete than a constructive self-explanation of a concept. This choice will depend on the objective of the instruction. Will the learner need to define specific terms? Would the learner need to apply the term to a specific situation? How about re-forming the use of the concept to a learner's personal experience? All of these situations can be referenced and sorted using the ICAP framework.

Strengths and Limitations

With respect to generalization and replicability, there are several aspects of this study that can contribute as either a strength or limitation. The nature of an experimental research design lends itself to increasing its internal validity by standardizing the experimental procedures, the ability to specifically manipulate independent variables as well as the ability to randomize the sample among treatment or control groups. In this study, participants were randomly assigned to one of four groups, and all study participants were presented with the same experimental procedures where the only actions across the sample of participants were due to the specific variables that were being examined. This procedure was intended to limit the possibility of confounding variables that could influence the dependent and independent variables and alter the results of the study.

On the other hand, an experimental design may leave itself open to criticisms concerning external validity or the ability of the results of the study to be generalizable to the wider population. Actions taken to address this concern would be to design experiments that could be implemented a variety to groups representing the target population, the use of multiple settings and the use of multiple times for participants to complete the study (Maxwell & Delaney, 2003). In this study, the participant recruitment took place at a large research university in the southwestern United States. This limited the population to college students, who may not be truly reflective of the broader social media population. All participants completed the study in the same laboratory setting. Although this decision reduced the chance of introducing confounding variables that could bias the results, it also reduced the generalizability of the results to other settings.

There was an opportunity for participants to take part in the study over different days and times which reduced the potential criticism that there may be a biased sample from only offering one day or time to participate in the study.

A portion of the data were also collected via self-report. Although self-reporting allows participants to willingly provide information, there does exist the possibility that participants could be falsifying or imprecisely reporting their information. In this study, there is no reason to believe that such a situation exists; however, the possibility cannot be eliminated.

A further limitation of this study is the fact that it only considers one-time instruction as a method of facilitating learning. Additional opportunities to instruct participants about the learning topic may make the learning performance results more generalizable to typical learning experiences that take place over multiple instances.

Avenues for Future Research

There are many avenues in which to pursue further study in the areas of cognitive engagement, self-efficacy, social media, and information processing and evaluation. Further research could be designed to encompass all four levels of the ICAP framework to fully examine the impacts of cognitive engagement on learning. For example, the use of synchronous messaging could be used to replicate the interactive mode of engagement.

Additional research could also focus on designing instruction using the ICAP framework that involves taking part in multiple instructional sessions with assessments before and after instruction to measure learning performance. The current study employed instruction that was designed to be completed in a single sitting. The use of multiple sessions could help bolster the use of the framework under other types of

instruction. Multiple sessions would also allow for the introduction of more complex concepts that could also influence the efficacy of the framework.

It may also be useful to explore additional content topics utilizing the ICAP framework for cognitive engagement to assist in determining the generalizability of the framework across contextual topics. A framework that focuses on how one learns should be just as effective regardless of the topic of instruction provided that the instruction properly utilizes the framework. For example, the results from instruction on diet and nutrition utilizing the ICAP framework should be similar to the results of this study assuming that the results of this study correspond to the expected results outlined in the framework document.

Cognitive engagement was not specifically measured in this study. The level of cognitive engagement was assumed by the researcher based on the random selection of the instructional module; however, there was not a measure to ensure that the participants were using the level of cognitive engagement that was supposedly required by the instruction. Further research into cognitive engagement should include measures to ensure that participants are utilizing the prescriptive level of cognitive engagement required to complete the instruction as designed. To this end, future research may look more intensely at the interactions that participants make during instruction. This study relies on self-reporting for a portion of the data. Data collection devices such as eye-trackers and other biometric devices could be used to gather data that may be more valid than traditional self-reporting methods, as these devices are able to parse out the reporting bias that may occur from the traditional self-reporting methods.

With respect to information, self-efficacy and social media, it may become even more necessary to examine social media information flows under a critical lens that recognizes that information can and often does have a political essence. In the past, the gatekeepers of information (e.g., librarians) may have been seen as apolitical, or just a collecting and organizing a collection of facts. The development of the Internet and social media platforms that run on the Internet, along with their popular adoption as a method of information gathering and distribution, has revealed that there is no gatekeeper to monitor and guide the information seeker. It is important for researchers to recognize the inherent political characteristic of how information is presented and to examine how different populations interact with said political influence.

In this respect, the future development of these areas of research can benefit from examining other target populations such as high school students, non-college education adults or senior-aged adults who use social media. This study examined a specific subset of the general population, undergraduate students. The generalizability of the framework could be improved by conducting research among the other subsets of the general population. Of particular interest may be analyzing two or more of these groups simultaneously to look at differences between groups that have had experiences with social media as part of their development and those that were adults before the introduction of modern social media platforms. For instance, could the fact that one has grown up with a particular method of communication, in this case, social media, predict behavior such as information source trusting and sharing? Could instruction similar to what was presented in this study mitigate any possible difference among the groups?

Finally, further research could focus on individual responses to actual social media examples of misinformation in a non-instructional setting to see how existing demographic and psychological constructs can predict or impact an individual's response to these examples. Could the use of applied examples influence the examination of prior knowledge compared the approach used in this study? In such a scenario, additional opportunities for collecting qualitative data could be employed to gain further perspective on how participants interpret information found on social media.

Conclusion

The purpose of this study was to investigate how cognitive engagement could influence learning along with an exploratory examination of how the psychological construct of self-efficacy could predict prior knowledge of information on social media. The ICAP framework (Chi & Wylie, 2014) was used to model three different levels of cognitive engagement: passive, active, and constructive. An existing topical presentation (Stony Brook Center for News Literacy, 2018) was adapted and used as a control. The results of this study provide additional perspective on how cognitive engagement can influence learning efficiency. Researchers could use the findings from this study to explore additional questions that may make the constructs of cognitive engagement and self-efficacy more robust. Designers could use the results of this study to create more effective learning experiences.

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APPENDIX A

SURVEY OF DEMOGRAPHIC AND SOCIAL MEDIA ACTIVITY

Hello!

Thank you for participating in this study. Before we get started with the lesson, please answer the following questions.

1. Age
 - A) 18 – 19
 - B) 20 – 21
 - C) 22 – 23
 - D) 24 – 25
 - E) 26 +

2. How many years have you been in college?
 - A) One Year
 - B) Two Years
 - C) Three Years
 - D) Four Years
 - E) More Than Four Years

3. Gender
 - A) Female
 - B) Male
 - C) Other

4. Ethnicity (Choose all that apply:)
 - A) African American
 - B) Asian/Pacific Islander
 - C) Caucasian
 - D) Hispanic
 - E) Native American
 - F) Other

5. What is your current general academic interest? (Choose all that apply:)
 - A) Arts, Sciences and the Humanities
 - B) Business
 - C) Education
 - D) Engineering
 - E) Other

6. Approximately how long have you been using social media
 - A) Less than one year
 - B) One year
 - C) Two years
 - D) Three years
 - E) More than three years

7. On average, how many times per day do you check your social media feeds?
 - A) 1 – 3 times
 - B) 4 – 6 times
 - C) 7 – 9 times
 - D) 10 or more times

8. On average, how long does your social media visit last?
 - A) Less than five minutes
 - B) 6 – 10 minutes
 - C) 11 – 15 minutes
 - D) 16 – 20 minutes
 - E) 20 + minutes

9. What is your top reason for using social media?
 - A) News and current events
 - B) Keep up with family and friends
 - C) Promote myself or my business
 - D) Other

10. Please answer the following statements according to your opinion toward information and social media:
 - A) I generally trust the information that is shared from Facebook friends or people I follow on Twitter.
 - B) I tend to believe a trusted information source even if that source might occasionally present information that might be false or made-up.
 - C) I make it a point to read information from others who share a different opinion than my own.
 - D) When I look at the results of an Internet search, I usually look at more than the top five results.

APPENDIX B

THE INFORMATION SELF-EFFICACY SCALE (ADAPTED)

Please answer the following statements according to your opinion toward information and social media:

1. I generally trust the information that is shared from Facebook friends or people I follow in Twitter.
2. I tend to believe a trusted information source even if that source might occasionally present information that might be false or made-up.
3. I make it a point to read information from others who share a different opinion than my own.
4. When I look at the results on an Internet search, I usually look at more than the top five results.
5. I can use social media as an effective way of connecting with others.
6. I can write social media posts that other people will read and be interested in.
7. I can be very effective using social media sites like Facebook, Twitter or SnapChat.
8. I can have a positive impact on the lives' of others through social media.
9. I can offer other people important and interesting information by posting on social media platforms.
10. I can find important and interesting information by reading other people's social media posts.
11. I can improve my own well-being through the use of linked information.
12. I can use links to find information that is important to others.
13. I can use links to find information that is important to me.
14. I can improve others' well-being by providing links to more information.
15. I can use social media to answer other people's questions in a productive way.
16. I can use social media to answer my own questions in a productive way.
17. I can organize the information I find on social media so that it is coherent and answers specific questions.
18. I can use social networking sites as an effective way of connecting with others.
19. I can be very effective communicating using social networking sites like Facebook.
20. I can use the Internet to help me find good information about a specific topics relating to school or work.
21. I can use the Internet to find good information about topics that are important to me.

APPENDIX C

THE POST-STUDY SYSTEM USABILITY QUESTIONNAIRES

1. Overall, I am satisfied with how easy it is to use this system
2. It was simple to use this system
3. I could effectively complete the tasks and scenarios using this system
4. I was able to complete the tasks and scenarios quickly using this system
5. I was able to efficiently complete the tasks and scenarios using this system
6. I felt comfortable using this system
7. It was easy to learn to use this system
8. I believe I could become productive quickly using this system
9. The system gave error messages that clearly told me how to fix problems
10. Whenever I made a mistake using the system, I could recover easily and quickly
11. The information (such as on-line help, on-screen messages, and other documentation) provided with this system was clear
12. It was easy to find the information I needed
13. The information provided for the system was easy to understand
14. The information was effective in helping me complete the tasks and scenarios
15. The organization of information on the system screens was clear
16. The interface of this system was pleasant
17. I liked using the interface of this system
18. This system has all the functions and capabilities I expect it to have
19. Overall, I am satisfied with this system

APPENDIX D

TEST BANK

1. What is misinformation?
 - A) Information that does not align with my beliefs
 - B) Information that is incorrect or inaccurate (Correct Answer)
 - C) Information that is designed to sell a product or service
 - D) Information that does not comply with international information standards

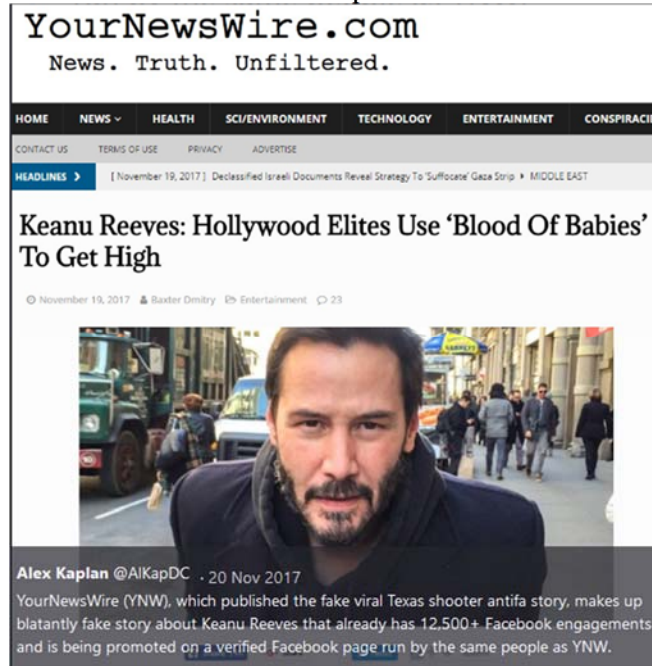
2. What is disinformation?
 - A) Information that is presented by media outlets
 - B) Information that does not have proper citations
 - C) Information that is designed to deceive the reader (Correct Answer)
 - D) Information that goes against my beliefs

3. Information that changes existing content to try to deceive others is called _____ content.
 - A) imposter
 - B) manipulated (Correct Answer)
 - C) satire/parody
 - D) misleading

4. In technical terms, what is the purpose of using bots on social media programs?
 - A) To customize a social media user's friends/followers list
 - B) To enable social media users to filter information
 - C) To automate information collection or sharing tasks (Correct Answer)
 - D) To systematize personal tasks like a personal calendar or email

5. What type of misinformation can be described in the following image:

[Screenshot of social media post with misinformation]



- A) Manipulated Content
 - B) Parody/Satire
 - C) Fabricated Content (Correct Answer)
 - D) Misleading
6. How do you come up with the answer in the previous question about Keanu Reeves? [more of a user perception question]
- A) I looked at the user and I know that they are a parody site
 - B) The image was photoshoped to deceive the reader
 - C) The content gives no indication that they are to be taken seriously
 - D) The headline was written to deceive the reader
7. What type of misinformation can be described in the following image:
[Screenshot of social media post with misinformation]



- A) Manipulated Content
 - B) Parody/Satire (Correct Answer)
 - C) Fabricated Content
 - D) Misleading
8. How do you come up with the answer in the previous question about the wolf going to the State of the Union Address? [more of a user perception question]
- A) I looked at the user and I know that they are a parody site
 - B) The image was photoshoped to deceive the reader
 - C) The content gives no indication that they are to be taken seriously
 - D) The headline was written to deceive the reader

9. What is the Backfire Effect?
- A) When a writer of an article fails to correct misinformation
 - B) When a social media user posts something satirical, but the information is believed to be serious by other users.
 - C) When corrections to misinformation does not result in the viewer believing the correct information (Correct Answer)
 - D) When a user manipulates original information for a specific political purpose
10. What is a correct way to describe “fake news”?
- A) News that is designed to deceive the reader into supporting something that may not exist (Correct Answer)
 - B) News that does not support your social beliefs
 - C) News that is based on anonymous sources
 - D) News that is comes from a news source that does not support your political beliefs
11. What is the psychological process where people inflate their own knowledge expertise about a subject?
- A) The Backfire Effect
 - B) The Mays-Kurning Effect
 - C) The Dunning-Kruger Effect (Correct Answer)
 - D) The Blowback Effect
12. What is the main feature that separates more innocent types of misinformation from the types of information that attempt to deceive?
- A) Using more than one type of content (video/images/text/etc.) to deliver information
 - B) Having multiple social media accounts to spread the information quickly
 - C) Whether there was a manipulation of preexisting content
 - D) The intent of the content creator to make content that tries to deceive (Correct Answer)
13. Look at the image of the Twitter user below. Identify why this user may be a fake account.



(Short Answer Question – Possible Answers)

- A) The Twitter user does not have a blue checkmark after the user name.
- B) The Twitter handle misspelled “Adam”

14. Identify why this social media user may have retweeted disinformation from a fake account.



(Short Answer Question – Possible Answers)

- A) The Twitter user does not have a blue checkmark after the user name.
- B) The Twitter handle misspelled “Adam”

15. What type of misinformation does “clickbait” fall under?

- A) Parody/Satire
- B) Manipulated Content
- C) False Connection (Correct Answer)
- D) Misleading Content

16. What describes false connection misinformation?
- A) When information is shared under a false pretext
 - B) When headlines do not support the actual content (Correct Answer)
 - C) When visual content is made up to deceive viewers
 - D) When ideas are framed to mislead readers
17. What is the difference between satire and manipulated content?
- A) Manipulated content is designed to be propaganda while parody does not
 - B) Satire is designed to deceive the user into believing something is true while manipulated content does not
 - C) Manipulated content is completely fake while satire is partially true
 - D) There is virtually no difference between satire and manipulated content
18. What is the difference between parody and fabricated content?
- A) Both forms of misinformation can trick the reader, but satire is not designed to be propaganda (Correct Answer)
 - B) Satire is designed to deceive the user into believing something is true while fabricated content does not
 - C) Fabricated content is completely fake while satire is real and true
 - D) There is virtually no difference between satire and fabricated content
19. You see that a news story from has been sent to you from another social media user. You trust this user, but as your start reading the story, there seems to be some information that you do not trust. What actions do you take to alleviate your concerns about this story's legitimacy?
- (Short Answer Question – Possible Answers)
- A) Perform a web search to look up the source of the information. Is the information source legitimate? Is the web address from this source, or is it from a fake source made to look like the legitimate source?
 - B) See if the user was verified and is not now. Maybe it is a fake account that you mistake for the real trusted user.
20. You receive an article from another social media user. From the headline, you get the sense that the arguments presented in the story are different from your current beliefs and positions. Are you more motivated or less motivated to read the article? Why?
- (Short Answer Question – Possible Answers)
- A) More motivated because I want to learn about other perspectives.
 - B) More motivated because I want to see how I can combat this information
 - C) Less motivated because I have prior experience that the news reporter does not report truthful information
 - D) Less motivated because I have prior experience that the news source does not report truthful information

APPENDIX E

COMMON TREATMENT INSTRUCTIONAL CONTENT

That's fake news!
It's all fake news!
You are fake news!

If someone follows social media or the news, they would have undoubtedly heard these phrases used to comment of the favorability of information that is being reported by news outlets. In an era marked by a need to have instant access to information, social media has been the conduit to satisfy our information fix. In fact, according to a 2017 Pew Research Center survey, found that two-third of adults go to social media to get their news.

At first glance, the instantaneous sharing and receiving of information that is a fundamental characteristic of social media platforms can be seen as a tremendous benefit to individuals and to the greater benefit of society with little to no downside. However, with the crowdsourcing of information that occurs on social media platforms comes some risk to the social media user. That risk is the chance that social media users can be fooled into believing anything that is shared by other users no matter how outlandish that information might be. For instance, following the recent mass shooting in Las Vegas, a rumor was spread throughout social media networks that falsely identified the shooter. Even after the real gunman was identified, social media networks still failed to take down posts and tweets that mentioned the false rumor and Google was still listing the false rumor from less than reputable websites. The false shooter rumor was part of a number of other hoaxes that started immediately after the shooting.

A common reaction to an emerging societal problem is to increase government oversight, pass new laws and/or enact regulation to control the problem. Social media and Internet search companies have taken steps to contain the spread of Internet hoaxes on their platforms, but their current measures have not been very effective. Given what happened on social media after the Las Vegas shooting and the increasing reliance on social media networks for our news it is easy to see that significant improvements need to be made to limit the impact of Internet hoaxes.

Even if social media and Internet search companies make the improvements required to limit the spread of hoaxes and other misleading information, there is no guarantee that this information will not slip through these hypothetical monitoring systems. If you can see it and read it, you have the potential to be fooled in to believing something that is false. A better choice is to improve you own ability to spot potentially false information, or misinformation, and to evaluate its accuracy. This not only makes you able to interpret the information that comes to you in your social media feeds or in your Internet search results, it also makes you less dependent on Internet companies to be the guardian in determining what information is accurate and what information is false.

Before we get into ways to determine the accuracy of the information that we receive, we need to understand the different levels of misinformation. Misinformation is defined as the information that is false and inaccurate. Misinformation can be the result of a mistake or it can be a deliberate action. Disinformation is misinformation that is deliberately used to mislead or deceive. From these definitions, you can see that there is a difference with how we treat honest mistakes from blatant attempts to deceive.



When reading information on social media it is important to recognize the that there are different types of misinformation and disinformation. Claire Wardle of First Draft created a list of seven types of misinformation and disinformation that you commonly see on social media.

TYPE OF MISINFORMATION	DESCRIPTION
False Connection	When headlines, visuals or captions do not support the content
False Context	When genuine content is shared with false contextual information
Manipulated Content	When genuine information or imagery is manipulated to deceive
Satire or Parody	No intention to cause harm, but has the potential to fool
Misleading Content	Misleading use of information to frame an issue or individual
Imposter Content	When genuine sources are impersonated
Fabricated Content	New content, that is 100% false, designed to deceive and harm

There are some types of misinformation that are more devious than others. When people create these types of misinformation, the purpose is to trick or deceive primarily for political or other social purposes. We will go over these more devious types in more detail.

Imposter Content:

Imposter content is a type of misinformation where an information source like a website tries to impersonate a legitimate source of information. The fake site has the same look and feel to it as the original site. There are stories with content that may look like what you would see at an actual news site, but the news stories that they present are fake. There is usually not an overt political intention, but that is not always that case.

For example, a website called ABCNews (www.abcnews.com.co) was created to impersonate the legitimate ABC News (www.abcnews.com). You can see that the fake news site ends with ".co" while the legitimate news site ends with ".com". Once you are on the fake news site, you see that there is an ABC News logo and a content layout that is similar to the legitimate site. The logo for the fake site uses a black oval instead of a black circle associated with the legitimate site. Also, look at the "News" in the logo on both images. The fake site has a thicker font than the "News" on the legitimate site. If a story from the fake news site was shared by a friend and showed up in your social media timeline, would you be able to notice the slightly different web address and logo when you viewed the story?

Imposter News Website



Real News Website



Let's Review

- Imposter content is a type of content that intentionally tries to deceive readers usually for political purposes
- Imposter websites use similar web addresses and logos to trick the reader into believing that the site is legitimate



Manipulated Content:

Manipulated content involves taking content or imagery and changing it in order to deceive others. By its very nature, misinformation that falls under this category is considered disinformation since there is an explicit desire for the creator to deceive others. With social media, there is no shortage of shared information containing content that has been changed to sensationalize a current event or movement.

The political controversy with NFL players kneeling during the national anthem has created a high level of passion from those that support the players kneeling and those that believe that kneeling during the anthem is unpatriotic. The post below shows an NFL player celebrating in the locker room while apparently holding a burning American flag. Noah Rothman, who is an editor for a political culture magazine, explains how the manipulated photograph is clearly fake. He points out how the material that flag is made of that is on fire would burn, and how the player would be reacting towards the flame near his body than what is being displayed in the photograph. Manipulated content, while eventually disproven, has a direct and lasting impact on social media users since once they see the manipulated content, and rarely see any correction.



Original



Manipulated



Let's Review

- Manipulated content changes original content to trick the reader into believing that the manipulated content is actually true
- There is often a political motivation behind creating manipulated content



Fabricated Content:

Fabricated content is content that is entirely fake with the intention to deceive. It is different from manipulated content by the fact that with manipulated content there is an original version that is not intended to distort and deceive. Another difference from manipulated content is that fabricated content may have a parody and/or profit motive, but not always.

At this root level, fabricated content is similar to manipulated content in the sense that it the content creator often has a political motivation and the content is seen more a propaganda than objective information. Fake news sites often have both manipulated and fabricated content, but fabricated content is also found on social media posts. In the example below, a fake news site, US WORLD NOW, published a story stating that Sandra Bullock supported Donald Trump and told Hillary Clinton to leave the country. A fact checking website, Snopes.com, found that the quote was completely made up. In a People magazine article from 2015, Sandra Bullock, made statements to show her dislike of Donald Trump and what he said about Mexican-Americans.

Fabricated Content on a Fake News Site



CLAIM

In October 2017, Sandra Bullock defended President Donald Trump and Urged Hillary Clinton to leave the United States.

RATING



ORIGIN

In October 2017, several web sites falsely reported that the actress Sandra Bullock had publicly defended President Donald Trump, while launching an attack against 2016 Democratic presidential nominee Hillary Clinton.

The [US World Now](#) web site used the following lengthy headline:

Actress Sandra Bullock to Hillary Clinton: 'If You Don't Like Our President You Can Leave and Never Come Back Again, You Are One Jealous Woman Who is Nothing to Compare With Trump, I Hope He Will Arrest You Soon.' Do You Support Her?

Let's Review

- Fabricated content is content that is completely fake
- The motivation to create fabricated content often has more to do with making a profit than political



Bots in Social Media:

Social media has created a powerful mechanism for communication and information exchange. Social media users may often believe that they may be interacting with a real person, but that may not be so. The use of bots, software programs designed to perform automated tasks, and botnets, a collection of bots, in social media has opened up an opportunity to routinely gather data and information from sources or to broadcast data and information to users. A simple example of data collection would be recording the performance of a stock index while an example of delivering information would include broadcasting local weather reports to users.

Bots have also been used to advocate certain positions in an attempt to persuade public policy issues and political elections. In these cases, the purpose of the bots can be benign or malicious. A bot can broadcast an alert to about an important vote in Congress or Supreme Court decision. Bots can also broadcast information that is distorted or completely made up (fake news) for the purposes of manipulating how a social media user perceives the truth.

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A recent memo about the 2016 United States political election noted that, "Bots are versatile, cheap to produce, and ever evolving." The small cost to develop bots, implement and adapt them to emerging factors creates an environment where a social media user who is not aware of the misinformation may believe the information that is presented to them.

The image below shows a botnet broadcasting a political tweet during the 2016 US election campaign. The twitter handles have actual names with an accompanying picture. This is an attempt to humanize the message to make their tweets more believable.



Source: Gordon Resnick, "How Pro-Trump Twitter Bots Spread Fake News" in *The Daily Beast*, November 16, 2016.

The video below is a short trailer by 60 minutes that focused on fake news on the two main social media sites, Facebook and Twitter.



You can see how the a person could manipulate Twitter traffic using bots to amplify the spread (via retweets) of a tweet. A few hundred dollars to a batch of twitter accounts and a person who who can synch a botnet can make the impression that more people share are sharing information than is actually true. Having the skills and knowledge to analyze the legitimacy of information will make you less prone to manipulation.



Let's Review

- Bots are software programs designed to automate specific activities like collecting or distributing information
- When used for malicious purposes, bots can amplify the impact of misinformation



Psychological Effects that Influence our Social Media Behavior

Bots would not have the impact that they do if it were not for a person's ability to be manipulated. Several psychological effects have been identified that influence how a person perceives a situation, policy or event.

The Backfire Effect represents the instances where someone is motivated for or against something due to misinformation, and they are unable to change their perception when the misinformation is corrected. In fact, the strength of their misperception actually increases when they are exposed to the corrected information.

The Dunning-Kruger effect focuses on how people overestimate their own ability to interpret and explain the details of a topic. For instance, a person that may have read a couple of articles and saw a few instructional videos on a topic might think that have the same knowledge and experience as an actual subject matter expert. By thinking that they know more than they actually do, they are unable to recognize their own limitations. They are unable to evaluate their own competence and when they should defer to actual experts.

The following video explains the Dunning-Kruger Effect.



Let's Review

- There are several psychological processes at work when we interact with social media
- Processes like the Backfire Effect deal with how we trust information
- Processes like the Dunning-Kruger Effect deal with how we evaluate our own knowledge and expertise on a subject



How Not to be Fooled

There are several forms of misinformation that are placed on social media. As social media users, you are either able to filter out the misinformation, or you are captive to the outrage and other emotions that occur when you are pulled long by false information that is naturally sensational. If you are a social media user or any other user who gets information from the Internet, how do you make sure that you have done your best to not get fooled and manipulated by misinformation?

There are fundamental aspects to investigating information, determining its relevance and its truthfulness. There are some simple questions that can help you navigate the information evaluation process. IMVAIN is an acronym developed by the Center for News Literacy to evaluate information.

- I = Independent sources are better than self-interest sources
- M = Multiple sources are better than one source
- V = Sources with verifiable evidence to support their claims are better than those you only declare that something happened
- A/I = Authoritative/Informed sources are better than uninformed sources
- N = Named sources are better than unnamed sources

