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Communication Can Mislead Our Perceived Knowledge

An Exploratory Study on the Illusion of Knowing in Science Communication

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Abstract

The current study explores the influence of media use and interpersonal communication as antecedent variables to the *illusion of knowing*, the difference or discrepancy between perceived and factual knowledge. This study also examines the role of personal interest in science as mediating the relationship between communication activities and the illusion of knowing. A survey of undergraduate students showed interpersonal and mass mediated communicative actions, as well as interest in science, increased the illusion of knowing in the context of science communication. Support for the hypothesized mediation model was found, indicating that the effects of media use and interpersonal communication on the tendency to overestimate perceived knowledge about scientific issues occur indirectly through interest in science.

Keywords: Illusion of knowing, scientific knowledge, science communication, interest in science

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Introduction

After formal education, the public most often obtains science- and technology-related information through their use of media, particularly the Internet and television (KOFAC, 2011; National Science Board, 2016). In 2014, for example, 47% of Americans indicated the Internet as their primary source of science and technology information and 28% cited television as their primary source (National Science Board, 2016). About 57% of South Koreans said television and 23% cited the Internet as their primary source of science and technology information (KOFAC, 2011). As Retzbach and Maier (2015) pointed out, media sources can help individuals' decision making related to medical treatment options, and can exert influence on policymaking processes such as the regulation of new medicines. Although a scientifically-informed citizenry can provide guidance for public policy or public funds regarding science and technology, such influence is inherently misguided if the citizenry lacks an accurate understanding (e.g., scientific literacy) related to the issue. Specifically, *scientific literacy* refers to "citizens' awareness of the importance of science to politics, policy, and our collective future" (Mooney & Kirshenbaum, 2009, p. 18). In this context, it is important to note what the public believes or understands science and technology may be incongruent with what it actually understands.

The *public understanding of science*, or *scientific literacy,* is often operationalized using two related, albeit distinct constructs. The first, and most common approach, tends to assess discrete comprehension of a particular topic, by measuring an individual's "capacity to use scientific knowledge, to identify questions and to draw evidence-based conclusions in order to understand and help make decisions about the natural world and

the changes made to it through human activity" (OECD, 2003, p. 133). Research employing this conceptualization of scientific literacy often employs cognitive tests, such as asking true-false questions designed to capture topic-specific comprehension, in an effort to determine to what degree study participants understand basic scientific terms, concepts and facts (i.e., National Science Board, 2016). The second approach to measurement employed by researchers working within this paradigm is through the use of perceptual measures that target an individual's *perceived scientific knowledge* or *subjective knowledge* (e.g., Cobb & Macoubrie, 2004; Ladwig, Dalrymple, Brossard, Scheufele, & Corely, 2012; Park, 2001). Combined, these perceived and factual knowledge measures not only offer insight into the public's understanding of scientific issues, but allow researchers to explore how closely an individual's perception of how much she or he knows aligns with their actual understanding of a given topic (Raju, Lonial, & Mangold, 1995). This discrepancy between perceived and factual knowledge has been called the *illusion of knowing* (Glenberg, Wilkinson, & Epstein, 1982; Park, 2001).

The purpose of this study is to examine the relationships between communication channels such as media use and interpersonal communication and the illusion of knowing in the context of science communication. Data for this study come from a sample of college students in South Korea. The current work seeks to examine the interplay between hypothesized antecedents to the illusion of knowing by examining perceived and factual scientific knowledge. Because public engagement or involvement in science can be an important precondition for science-related behaviors (Powell, Colin, Kleinman, Delborne, & Anderson, 2011; Retzbach & Maier, 2015), this study also examines whether the effect of communicative behaviors on the illusion of knowing is mediated by personal interest in science.

Literature Review

Illusion of Knowing and Science Literacy

The "illusion of knowing" phenomenon was conceptualized by Glenberg and colleagues (1982) in an effort to understand the difference between perceived and factual knowledge. Defined as "the discrepancy between self-assessment of understanding and objective accuracy of understanding" (Glenberg et al., 1982), the illusion of knowing phenomenon occurs when citizens perceive themselves well informed about a certain scientific issue, but their actual knowledge about the issue is low.

Understanding the difference between factual and perceived knowledge, or the illusion of knowing, is important because the public's perception of science and technology often differs from experts or scientists, which, in turn, can serve as an impediment to scientific progress and public policy. For example, according to a survey (Pew Research Center, 2015), the majority of American adults (57%) believe that genetically modified organisms (GMOs) are generally unsafe to eat, while most scientists (88%) agree that GM food is safe for human consumption. In the field of communication studies, it is important to note the illusion of knowing phenomenon because communication forces such as media use and interpersonal talking may potentially mislead the public's perception or understanding of information.

While few studies to date examine how scientific knowledge varies across national lines (e.g., Kim, McKeever, Chang, & Ha, 2017), the conceptual underpinnings of the illusion of knowing suggests a discrepancy between human estimations of perceived knowledge and factual knowledge may manifest uniformly across individuals, regardless of nationality (Glenberg et al., 1982; Park, 2001). This phenomenon of biased perceptions regarding

perceived knowledge may have psychological underpinnings, such as those posited by theories devoted to understanding decision making and rationalization (See, for example, Festinger's (1964) theory of cognitive dissonance).

It is important to identify factors other than discrete knowledge measures when studying how perceived knowledge about scientific issues is cultivated and much of the research devoted to this topic focuses on political communication (e.g., Hollander, 1995; Mondak, 1995; Park, 2001). Mondak (1995), for example, found that although individuals who more frequently read a major local newspaper perceived themselves well informed about the local political campaign, their actual local political knowledge was not associated with newspaper reading. By measuring self-perceived and actual knowledge about the 1998 gubernatorial election campaign in Michigan, Park (2001) examined the relationship between media exposure and the illusion of knowing. Among three types of news media (local TV programs, newspapers, and radio), only watching TV increased the illusion of knowing (Park, 2001). That is, those who more often watch local TV programs were more likely to perceive themselves as well informed even though their actual knowledge about the election campaign was low.

Researchers, however, have focused little attention to the illusion of knowing in the context of science communication. A key tenet of the illusion of knowing phenomenon is that there can be a gap between perceived and actual knowledge because of an individual's biased perception, and need for downward comparisons. Thus, a logical venue for studying this phenomenon is in the context of scientific literacy, which has garnered both scholarly and media attention in contexts such as the controversy surrounding anti-vaccination advocates (Holton, Weberling, Clarke, & Smith, 2012) and skeptics of climate change

(Kellstedt, Zahran, & Vedlitz, 2008). As previously noted, scientific literacy refers to an understanding of the importance of science to policy and our future (Mooney & Kirshenbaum, 2009).

Laugksch (2000) argues that scientific literacy is important because it enables the public to participate more intelligently in the economic field and it can enhance greater public support for science, which in turn influence the policymaking process about science and technology. Also, he maintains that scientific literacy can help individuals to live in a science- and technology-dominated society. Logan (2001) demonstrated that scientific literacy traditions can not only increase the publics' capacity to make decisions about science policy but also improve the individual's quality of life. Additionally, Nisbet, Scheufele, Shanahan, Moy, Brossards, and Lewenstein (200) found that factual scientific knowledge was positively associated with belief in promise of science. That is, scientific literacy may have a positive effect on the attitudes toward science and the process of science-related policy decisions. On the other hand, misperception of a scientific subject can impact the public's view of an issue. Scientific literacy (i.e., poor knowledge or high confidence) may negatively influence the public perception or decision-making. For example, the public can be manipulated and swayed by information provided by the media (Hmielowski, Feldman, Myers, Leiserowitz, & Maibach, 2014; Foster, Tanner, Kim, & Kim, 2014), and then urgent policies about science, health and technology can fail in practice because of the public's low support. For example, a recent study reveals that those who are more likely to use conservative media tend to be skeptical of climate change, while those who predominately use liberal media view global warming as scientifically linked to human activity (Hmielowski et al., 2014). Thus, it is important to look at the impact of scientific literacy in communication studies.

While improving the current levels of scientific literacy among the general populace is certainly an important agenda among members of the scientific community (Besley & Tanner, 2011; Eiks, Nielsen, & Hofstein, 2014), research exploring the factors that influence the illusion of knowing also represents an area of great need (Rozenbilt & Keil, 2002). This is largely due to the distinct social ramifications that arise from this phenomenon. For example, past studies indicate that confidence about one's knowledge is a prominent antecedent to decision-making (e.g., Carbon, 2008; Rozenbilt & Keil, 2002), meaning the illusion of knowing has the potential to yield negative societal consequences beyond those that arise solely as a function of poor scientific literacy. This is evident from findings in recent research, which suggests that individuals who are highly confident about their knowledge related to childhood vaccinations (e.g., "anti-vaxxers") tend to be more outspoken than individuals who understand the scientific evidence relaying the importance of vaccinations (e.g., McKeever, Mckeever, Holton, & Li, 2016). From this research, confidence – not poor scientific knowledge – appears to operate as a separate, powerful determinant of public advocacy for detrimental social policies. That is, this confidence about scientific issues can be discussed as the second approach of scientific literacy. Previous research, however, also suggests that under certain circumstances low levels of scientific knowledge do not impede social policies (e.g., Tversky & Kahneman, 1974). Thus, the current study expands further upon the distinct role of the illusion of knowing relative to the effects of poor scientific knowledge.

Media Use, Knowledge, and Illusion of Knowing

Mass communication theorists have maintained that the media

serve as socializing agents, and for the public, mass media can serve as a primary source of scientific information (Brossard & Shanahan, 2006; Nelkin, 1987). Also, it has been argued that the media can be the only sources of the citizens to gain information related to science and technology (Brossard & Shanahan, 2006). Mares and Cantor (1999) note that mass media can be effective in informing students of science. This argument concurs with the findings in related studies, which suggest the public generally receives scientific information via the media in the U.S. and South Korea, most often through the Internet, television, and newspapers (National Science Board, 2016; Rhee, Lee, & Shim, 2011).

As Graber and Dunaway (2015, p. 9) note, the media can provide a surveillance function, suggesting that the media might comfort people into feeling secure, "whether or not they remember what they read or hear or see." Salwen and Driscoll (1995, p. 270) called this function "a possible assurance function of the mass media." Recognizing the role of the media is important when examining the illusion of knowing phenomenon because the media can provide cues about any important issues about science and also can mislead the public to perceiving well informed about the issues (Park, 2001).

Previous studies focusing on the illusion of knowing have explored the relationships between media use and knowledge (Ladwig et al., 2012; Lee & Scheufele, 2006; Salwen & Driscoll, 1995; Southwell & Torres, 2006; Takahashi & Tandoc, 2016; Zhao, 2009). For example, by asking questions used in earlier GSS surveys, Takahashi and Tandoc (2016) found that Internet use was positively associated with science knowledge, but television viewing was not related with science knowledge. Another study also showed that television use about science was not associated with factual knowledge (Lee & Scheufele, 2006), but Nisbet and

colleagues (2002) reported that science magazine use and science television use were significantly related to factual scientific knowledge. In addition to factual knowledge, studies have shown that media use, such as newspaper, television, and the Internet, was significantly correlated with perceived scientific knowledge (Salwen & Driscoll, 1995; Southwell & Torres, 2006). By measuring perceived knowledge about global warming, for example, Zhao (2009) found that media use through newspaper and web was significantly correlated with perceived knowledge. Study results also revealed that media use mediated the relationship between age, race, and education and perceived knowledge (Zhao, 2009). It is important to point out, however, that these studies measured science knowledge as either factual scientific knowledge (Lee & Scheufele, 2006; Nisbet et al., 2002) or perceived knowledge (Southwell & Torres, 2006; Zhao, 2009).

Only a few studies, to date, have tested the relationships between media use and both perceived and factual knowledge (Ladwig et al, 2012; Park, 2001). Ladwig and colleagues (2012) found that attention to newspapers and the Internet was positively related to perceived familiarity with nanotechnology, while the relationships between attention to newspapers and the Internet were no longer statistically significant when information processing and related variables were entered as predictors in their regression analysis. They also found that only attention to science on the Internet was associated with increased factual knowledge about nanotechnology. Park (2001) examined the illusion of knowing in the context of political communication by asking respondents perceived and actual knowledge questions about a political campaign in Michigan. Study results found that media exposure and education increased the illusion of knowing (Park, 2001).

Informed by these findings, the current study seeks to explore the relationship between media use and the illusion of

knowing phenomenon in the context of science communication. As previous studies have shown that science media use is associated with perceived science knowledge rather than factual knowledge (Ladwig et al., 2012; Lee & Scheufele, 2006), the current study theorizes that media use will be positively associated with an individual's illusion of knowing. That is, media use, in particular, television viewing, will play an important role in increasing perceived knowledge related to scientific topics. Although many studies measured media use as exposure to or attention to the media, in this study, media use is operationalized as paying attention to science news in the media according to the previous study (e.g., Ladwig et al., 2012). Attention to media is more conscious and proactive behavior than exposure to media. Thus, attention to science stories or information can be more appropriate to analyze the concept of perceived scientific knowledge as well as factual scientific knowledge. Thus, the current study posits the first hypothesis:

*H*1a: The amount of attention to media coverage of scientific topics will be positively associated with the illusion of knowing.

Interpersonal Communication, Knowledge, and Illusion of Knowing

In addition to examining the role of attention to science media and the illusion of knowing, the current study also explores the effect of interpersonal communication. Previous research suggests that interpersonal communication affects knowledge (Eveland, 2004; Eveland & Thomson, 2006; Southwell & Torres, 2006). For example, Eveland (2004) found that political discussion was

related to political knowledge, both perceived and factual. He measured political knowledge by assessing perceived familiarity with prominent political figures and respondents' ability to recall the candidates' names and the ideological placement of two major candidates. Other studies exploring the influence of interpersonal political communication, however, examined only factual knowledge (Eveland & Thomson, 2006; Hively & Eveland, 2009). For example, Hively and Eveland (2009) found that respondents who were more likely to talk to someone about politics indicated higher levels of factual political knowledge.

In the context of science communication, Southwell and Torres (2006) examined the relationship between interpersonal communication and science knowledge. In an experimental setting, they found that conversation about science was correlated with perceived ability to understand science (Southwell & Torres, 2006). However, there is little evidence that interpersonal communication can increase factual science knowledge. In this study, it is assumed that those who are more likely to talk about science topics with others have an increased perceived scientific knowledge more than factual knowledge. Therefore, the illusion of knowing is more likely to occur. The current study posits the following hypothesis:

*H*1b: The frequency of interpersonal communication about scientific topics will be positively associated with the illusion of knowing.

Interest in Science, Knowledge, and Illusion of Knowing

As Eveland (2001) posited, news media uses are contingent on individuals' motivation to seek news information. In the context of science communication, this suggests that people who are

interested in science try to use the media for the information in which they are interested (Takahashi & Tandoc, 2016). Park (2001, p 420) also pointed out, "As people are driven by self-interest, we expect the illusion of knowing phenomenon to occur mainly in conditions of social involvement in an event or issue portrayed by news media." Thus, the concept of interest in science can be important to examine the illusion of knowing phenomenon.

Several studies found that interest in science or motivation for science-related information can influence personal understanding of political and scientific issues (Eveland & Thomson, 2006; Takahashi & Tandoc, 2016; Zhao, 2009). For example, Eveland and Thomson (2006) found that political interest was related with political knowledge while Takahashi and Tandoc (2016) found that interest in science was significantly associated with scientific knowledge. Further, those who are personally involved with social issues reported by the media are more likely to misperceive themselves as well informed (Park, 2001). Based on these findings, this study posits another hypothesis:

*H*1c: Interest in science will be positively associated with the illusion of knowing.

While media use and interpersonal communication are all known predictors of the illusion of knowing, evidence from prior research suggests these factors are unlikely to function independently of one another (Besley, 2010; Retzbach & Maier, 2015; Powell et al., 2011; Yaros, 2006). For example, Besley (2010) found that consumption of science-related media was positively associated with personal interest in science. In a related study, Yaros (2006) indicated that attention given to stories focusing on health and technology elicited increases in situational interest or

engagement with those issues, respectively.

Similarly, recent research by Retzbach and Maier (2015) demonstrated that participants exposed to media reports presenting scientific findings of nanotechnology lead to increased interest in the topic. These findings reflect research in the related field of audience mobilization, which suggests that interest in scientific issues is an essential aspect of the public engagement with science, and an important prerequisite for science-related actions (Powell et al., 20110). Thus, the current work posits:

*H*2: The amount of attention to media coverage of scientific topics will be positively associated with interest in science.

Media theorists have long contended that mass media serve as socializing agents (e.g., Goffman, 1974). More contemporary research conducted in the field of human-computer interaction (HCI) suggests humans socialize with media in a fashion akin to human social actors (e.g., Nass & Moon, 2000; Reeves & Nass, 1996). The current study posits differentiation between mediated communication and interpersonal communication might be needless in understanding factors that may culminate in the illusion of knowing. Formally stated, this study predicts:

*H*3: The frequency of interpersonal communication about scientific topics will be positively associated with interest in science.

Hypothesized Mediation Model

Lastly, based on prior research that has demonstrated a positive association between media use and personal interest (e.g., Besley, 2010) and Parks' (2001) study, which found personal involvement

interacts with antecedents to knowledge such as media exposure, the current study poses two hypotheses relating to the mediating role of personal interest in explaining the illusion of knowing. As illustrated in Figure 1, the current work posits that the effect of communication (both interpersonal and mediated) on the illusion of knowing will occur indirectly through a personal interest in science. Formally stated:

*H*4: Interest in science will mediate the relationship between the amount of attention to media coverage of scientific topics and the illusion of knowing.

*H*5: Interest in science will mediate the relationship between the frequency of interpersonal communication about scientific topics and the illusion of knowing.

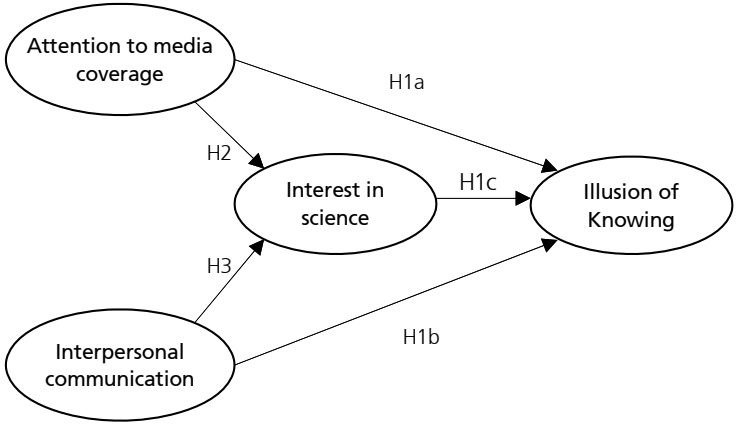

Figure 1. Hypothesized mediation model of the illusion of knowing

Methods

Sample

The sample for the current study (N = 346) was comprised of South Korean undergraduate students who were enrolled at large universities. In December 2013, a paper survey was conducted. A total of 354 Korean undergraduate students participated. The sample was recruited from several communication-related courses at two universities located in the Seoul metropolitan area. The students received extra credit for participating in the survey. Some responses were not completed, and others showed inappropriately repetitive answers. After excluding such incomplete and unsuitable responses, a total of 346 respondents were analyzed. Respondents were 21 years old on average, ranging from 19 to 26. One hundred sixty one (46.5%) students were male.

Measures

The illusion of knowing is defined as the difference between factual scientific knowledge and perceived scientific knowledge (Park, 2001). *Factual scientific knowledge* was measured through the use of an additive index of six dichotomous items (1 = False, 2 = True) asking participants whether (a) "The center of the Earth is very hot" (True), (b) "The continents have been moving their location for millions of years and will continue to move" (True), (c) "The Earth goes around the Sun" (True), (d) "The universe began with a huge explosion" (True), (e) "The cloning of living things produces genetically identical copies" (True), and (f) "Human beings, as we know them today, developed from earlier species of animals" (True). I recoded the correct answer into "1" and the

wrong answer into "0." Factual scientific knowledge was measured as the scores of summed six items (M = 5.51, SD = .79). Next, *perceived scientific knowledge* was measured by using a single item (1 = "strongly disagree," 7 = "strongly agree"): "Overall I think I know science, technology, and medicine" (M = 3.27, SD = 1.40). Finally, to measure the illusion of knowing, the z-transformed scores of factual scientific knowledge were subtracted from the z-transformed scores of perceived scientific knowledge. Its mean score is zero because the illusion of knowing was calculated form z-transformed scores and the standard deviation is 1.31, ranging from -2.25 to 4.80. In this operationalization, a midpoint score (or a zero point) is closer to an ideal, while low and high scores are likely both potentially problematic.

Attention to media coverage consisted of three types of science media coverage (Chang & Shim, 2013). Attention to science issues in newspapers, television, and the Internet, respectively, was measured by asking respondents to indicate how much attention on a 7-point scale (1 = "Never," 7 = "Daily") they paid to the following item when they read the newspaper, they watched television, and they used the Internet: "Stories about science, technology, and medicine." Then, I summed these three items (newspapers, television, and the Internet) and created the variable *attention to media coverage* (M = 3.08, SD = 1.24, α = .75).

Interpersonal communication was measured by asking respondents to indicate how often talking about the following two statements with family or friend on a 7-point scale (1 = "Never," 7 = "Daily"): (a) "Stories about science, technology, and medicine," and (b) "Stories about the social or ethical implications of science, technology, and medicine" (M = 2.84, SD = 1.26, α = .88). That is, interpersonal communication was assessed as the frequency of talking about science stories.

Interest in science was measured by using a single item on a 7-point scale (1 = "strongly disagree," 7 = "strongly agree"): "I am interested in science, technology, and medicine" (M = 3.70, SD = 1.52). Measures of attention to media coverage, interpersonal communication, and interest in science were borrowed from prior studies (Chang & Shim, 2013; Oh, 2013).

Analysis

Hayes and Preacher's (2013) bootstrapping procedure [as implemented in PROCESS; (Hayes, 2013)] was used to test the study's hypothesized direct and indirect effects. Using this analytical approach, any direct or indirect effect can be interpreted as statistically significant if the corresponding bias-corrected bootstrap-confidence interval does not contain zero (Hayes, 2009). Five thousand bootstrap samples were used to generate the 95% confidence intervals employed in tests of the study's predictions. Because a single intervening variable (interest in science) was posited to mediate the effects of attention given to media coverage of scientific topics (H4) and interpersonal communication about science (H5), mediation was assessed using two separate models, which tested the unique direct and indirect effects of each predictor variable. In each model, one of the independent variables was entered as the predictor, while the remaining independent variable, gender, and political stance were entered as covariates. These statistical controls were employed to improve the precision of the analysis, as each of the covariates in the model accounted for statistically significant variance in the primary dependent measure. All statistical analyses were generated with SPSS Version 22.0 computer-based statistical software.

Results

Hypothesis 1 (a-c) posited that the amount of attention given to media coverage about science and interpersonal communication about science would be positively associated with the illusion of knowing. As shown in Figure 2, the unmediated paths leading from attention to media coverage (coefficient = .13, *SE* = .07, $p < .1$) to the illusion of knowing was marginally and statistically significant. The unmediated paths leading from interpersonal communication (coefficient = .22, *SE* = .06, $p < .001$) to the illusion of knowing was positive and statistically significant. The coefficient for the path leading from interest in science to the illusion of knowing was also positive (coefficient = .21, *SE* = .05, $p < .001$), indicating statistical significance. Thus, H1a, H1b, and

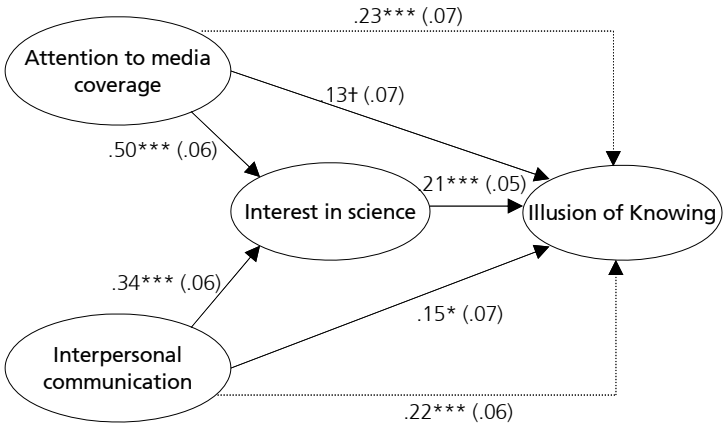

Figure 2. Mediation model with path coefficients

Note: Unstandardized path coefficients are reported with standard errors shown in parentheses. †$p < .1$, *$p < .05$. **$p < .01$. ***$p < .001$. Dotted lines denote the effect of independent variables on the illusion of knowing when interest in science is not included as a mediating variable.

H1c were supported. These findings indicated that media use, interpersonal communication, and interest in science might increase the illusion of knowing.

Hypothesis 2 posited that the amount of attention given to media coverage of scientific topics would be positively associated with interest in science. This hypothesized relationship was also supported, as indicated by the unstandardized path coefficient leading from attention to media to interest in science (coefficient = .50, *SE* = .07, $p < .001$). Similarly, the statistically significant path leading from interpersonal communication to interest in science (coefficient = .34, *SE* = .06, $p < .01$) offered support of hypothesis 3, which predicted interpersonal communication about scientific topics would be positively associated with interest.

Results from the first mediation analysis revealed a statistically significant positive indirect effect of attention to media coverage on the illusion of knowing through personal interest in science, coefficient = .10, *SE* = .03, 95% CI [.05, .16]. Thus, H4 was supported. Similarly, analysis of the second mediation model also confirmed there was a statistically significant positive indirect effect of interpersonal communication through personal interest in science, coefficient = .07, *SE* = .02, 95% CI [.03, .13]. Thus, H5 was also supported. Table 1 summarizes the total, direct, and indirect effects of media use and interpersonal communication on the illusion of knowing through interest in science.

Table 1. Direct and indirect effects of media use and interpersonal communication on the illusion of knowing through interest in science (N = 346).

	Attention to media coverage		Interpersonal communication	
	Coefficient (SE)	CI	Coefficient (SE)	CI
Indirect effects (Via interest in science)	.10 (.03)	.05 to .16	.07 (.02)	.03 to .12
Direct effects	.13 (.07)	-.01 to .27	.15 (.07)	.03 to .28
Total effects	.23 (.07)	.07 to .36	.22 (.06)	.09 to .35

Note. CIs are bias-corrected 95% confidence intervals for the indirect effects (Bootstrap *N* = 10,000).

Discussion

This study is one of the first to explore the illusion of knowing in the context of science communication. Specifically, the current study examined the influence of media use and interpersonal communication as antecedent variables to the illusion of knowing. Findings revealed that both of these types of communicative actions were positive predictors of the illusion of knowing as consistent with previous research (e.g., Park, 2001). In addition, the current study found that personal interest in science influences the illusion of knowing and also mediates the effect of media use and interpersonal communication on the overestimation of knowledge about scientific issues.

This analysis revealed two major findings. First, communicative forces such as media use and interpersonal communication may increase the illusion of knowing. The assurance function of the media (Graber, 2015; Salwen & Driscoll, 1995) can be discussed as one of the potential factors that can cause scientific knowledge misperception. Specifically, results suggest that individuals who are more likely to use media and talk with others about science issues probably feel well informed

or secure about their knowledge of scientific issues. In turn, they can overestimate the depth of their knowledge and therefore perceive they know more about science than they actually do (i.e., the illusion of knowing). These findings may reinforce the traditionally hypothesized antecedents to the illusion of knowing rooted in political communication (Park, 2001), adding to the body of empirical support for the theorized relationships that serve as the underpinnings of the concept. From a practical standpoint, given the importance of scientific literacy to enable the public to participate more intelligently in policy discussions surrounding science and increase public support for science (Laugksch, 2000; Scheufele & Lewenstein, 2005), it is more desirable to decrease this illusion of knowing in a science- and technology-dominated society. Previous research suggests that science information reported in media is often unclear or inaccurate (Davidson, 2000; Foster et al., 2014; Hoffman-Goetz, Shannon, & Clarke, 2003; Yeaton, Smith, & Rogers, 1990). The media presentation about science issues seems to be similar in South Korea. Examining five newspapers and three TV networks between 2011 and 2016, for example, Lee et al. (2016) found that most of news coverage lacked scientific facts in reporting the scandal of toxic humidifiers. Content analyzing 1,501 news stories from 2004 to 2013, Yang (2015) also found that many articles tended to describe food safety with stigma expressions such as labeling, grouping, and peril. That is, the Korean media were more likely to sensualize the issue rather than to provide accurate science information. Science issues have been presented in a manner that is designed to "sell" research in exciting terms (Davidson, 2000). Thus, it is not surprising that increased media attention to scientific information contributes to one's illusion of knowing.

Second, the current study found evidence suggesting a

theoretical extension of prior research within this paradigm. With findings suggesting that personal interest in science also may influence the illusion of knowing while mediating the effect of communication channels on misperceptions related to knowledge about science, the current study adds to scholarly understanding of the underlying mechanisms that contribute to biased knowledge perceptions. That is, beyond the communicative forces driving the illusion of knowing, inter-individual characteristics can govern the degree to which communication activities may affect the illusion of knowing. Communication forces such as media use and interpersonal talking may be useful for those who are interested in science want to gain more information about science. As mentioned above, however, what if such communication forces failed to convey accurate information? Thus, the findings of this study may suggest that personal interest or need for cognition potentially increase misperception according to specific circumstances. Meanwhile, the intervening role of personal interest in explaining the relationship between communication and the illusion of knowing can have conceptual linkages with micro-level theoretical perspectives (e.g., uses and gratifications theory) for explaining media effects (Rubin, 2002). This finding, thus, can reinforce the importance of understanding individual differences in order for mass communication scholars to develop a robust theoretical understanding media effects.

The illusion of knowing can be explained as the relationship between factual and perceived knowledge. So, which type of knowledge is the more influential to account for the illusion of knowing? To find out this question, the additional analysis was examined. Table 2 shows the correlations between factual knowledge, perceived knowledge, and the communication variables. Interestingly, the relationships between factual

knowledge and the communication variables were not statistically significant. However, the correlations between perceived knowledge and the communication variables were significant. These findings revealed that media use and interpersonal communication played a key role in acquiring perceived scientific knowledge. Accordingly, media use and interpersonal communication can mislead the perceived knowledge. It is necessary to pay more attention to the role of perceived knowledge, and then the relationships between perceived knowledge and the communication variables should be further explored.

Table 2. Correlations between factual knowledge, perceived knowledge, media attention, and interpersonal communication

	1	2	3	4	5
1. Factual knowledge	-				
2. Perceived knowledge	.15**	-			
3. Newspapers	.01	.39**	-		
4. TV	.03	.45**	.46**	-	
5. Internet	.07	.46**	.35**	.67**	-
6. Interpersonal communication	.05	.51**	.46**	.49**	.50**

** $p < .01$

Study findings should be carefully interpreted because this study has several limitations. First, data for this study came from surveys of college students. Thus, it is hard to generalize the findings beyond the college setting. It is important to note, however, that the current study controlled for educational level, as education was a major predictor of the illusion of knowing (Park, 2001). Future studies should examine the relationships between media use, interpersonal communication, interest in science, and the illusion of knowing by using the general public sample.

Second, the data collected are not sufficient to determine a

causal relationship because this study used a cross-sectional data set and less sophisticated research design. For example, people who are interested in science are more likely to use science media and discuss science with others. On the contrary of the purpose of the current study, the findings can indicate that those who are not likely to use media about science or are less interested in science may have better scientific knowledge. The point of the current study is that communication forces and personal interest suggest the possibility of the illusion of knowing. Thus, future studies should also investigate the relationships in a longitudinal design such as a panel study. At the same time, more sophisticated research design should be used in order to find out the more accurate mechanisms of the illusion of knowing.

Third, some variables can be problematic in terms of measurement. In particular, the six questions to measure factual scientific knowledge do not seem to cover the three areas – science, technology, and medicine – of perceived knowledge measurement. Thus, future studies should develop and test suitable question items to measure both factual and perceived scientific knowledge.

Fourth, the theoretical model that this study puts should be retested. In this study, interest in science was used as the mediating variable. However, it is also reasonable to assume that interest in science should come before the communication variables, although a few scholars explored interest in science as the outcome of exposure to science news (Retzbach & Maire, 2015). That is, interest in science may precede the communication forces including media use and interpersonal discussion. In addition, the net effect on the illusion of knowing can be neutral because interest in science could increase both perceived and factual knowledge according to previous studies (Park, 2001; Takahashi & Tandoc, 2016). Thus, researchers can criticize the

theoretical model of this study for the unsettled causality. In order to make clear and develop the illusion of knowing phenomenon, it is necessary to analyze whether media use and interpersonal communication can mediate the relationship between interest in science and the illusion of knowing.

With these limitations in mind, the current study offers a meaningful analysis of the illusion of knowing phenomenon in the context of science communication. The findings suggest important implications for theory and practice. This study contributes to science communication research by exploring the illusion of knowing about science issues. The findings of the mediating role of interest in science may provide conceptual connections with a theoretical view for clarifying media effects. Additionally, people are more likely to use social media to obtain health and science information (Southwell, 2013). Thus, researchers need to test whether social media use can influence the illusion of knowing. As the findings indicated that increased media attention contributes to one's illusion of knowing regarding scientific information, future studies should further examine this relationship in an effort to determine how media might play a more positive role, in effect, decreasing a consumer's illusion of knowing and increasing overall scientific literacy.

In particular, scientific literacy is important in that it can influence positively or negatively the attitudes toward science or the process of policy decisions. Thus, although the current study did not examine it, the relationship between scientific literacy and the attitude of the public to science should be answered in future studies. Ultimately, perception as well-informed (i.e., the illusion of knowing) should be avoided when individuals, organizations, or governments make their decisions. Thus, the public perception in science communication can be explained and discussed in a similar dimension with the areas of politics or advertising.

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