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# The influence of social media on knowledge gaps about science and technology among Chinese audiences

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**The influence of social media use on knowledge gaps about science and technology  
among Chinese audiences**

by

**Xi Chen**

A thesis submitted to the graduate faculty  
in partial fulfillment of the requirements for the degree of  
MASTER OF SCIENCE

Major: Journalism and Mass Communication

Program of Study Committee:  
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Iowa State University  
Ames, Iowa  
2013

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## ABSTRACT

While scholars have begun to examine the influence of the Internet on knowledge gaps, there is little research that explores the unique effect of the social media. This study begins to fill this research gap by examining the influence of social media on knowledge gaps about science and technology among Chinese audiences. This study focuses on the use of Guokr, a start-up social media site that combines the characteristics of blogs and social networks. Guokr's main objectives are to make science interesting and help audiences to know the truth. The results of a survey of Chinese students from China and the U.S. suggest that the use of Guokr positively correlates with participants' motivation and overall science knowledge and negatively correlates with education level. Use of more general social media had no interactive effect with Guokr use, motivation, education and other demographic variables (gender, education, major, residence, and household) upon overall science knowledge. The results suggest that social media influence knowledge gaps in a similar manner as the Internet in general by widening the size of gaps in knowledge about science and technology.

**KEYWORDS:** knowledge gap, social media, Guokr, science communication

## CHAPTER 1 INTRODUCTION AND STATEMENT OF THE PROBLEM

According to Snow (2009), “the media globalization age is the age of the World Wide Web, direct broadcast satellites, 24-hour cable news channels, global email, and digital telephony” (p. 18). Statistics regarding Internet use in North America alone seem to bear this out. The Internet Usage and Population Statistics for North America indicate that Internet penetration in the U.S. stood at 78.2% in 2011. Compared to 2000 figures, the growth rate was 156.9%.

Internet use has intensified with the advent of the social media. Andreas and Haenlein (2010) define the social media as “a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of user-generated content” (p. 61). Social media takes diverse forms. Andreas and Haenlein (2010) divide them into six types: “collaborative projects (e.g., Wikipedia), blogs and micro blogs (e.g., Twitter), content communities (e.g., YouTube), social networking sites (e.g., Facebook), virtual game worlds (e.g., World of Warcraft), and virtual social worlds (e.g., Second Life)” (p. 60). All of these have the ability to turn one-way communication into an interactive dialogue.

According to a national survey of social media usage conducted by the Pew Research Center for the People and the Press in 2012, 68% of Americans have used social media channels like Facebook, Google Plus or LinkedIn in the past two years. This figure was up 8% from just the year before, suggesting a continuous upward trend in use and popularity. People use these sites to keep in touch with friends, family and casual acquaintances. Advertisers use them to promote their products and services.

Social networking sites like Facebook and Twitter provide a useful forum in which people can express opinions and receive information.

Nowhere has Internet use expanded more significantly than in China. According to Internet World Statistics, China had only a 1.7% Internet penetration rate in 2000. In 2010, this jumped to 31.6%, so that today, China has more than 500 million Internet users (China Internet Networking Information Center, 2012). About 40% of Chinese online adults create blogs and publish web pages, compared with only 21% of American Internet users (Forrester Research of Chinese Social Techno Graphics, 2010). When it comes to social networks, 71.8% of social network service (SNS) users reported using large-scale SNSs (such as Renren and Kaixin001) on a regular basis, while 27.9% reported using industry- or interest-specific SNS (China Social Network Service Report, 2010). In 2010, 35.7% of SNS users reported using SNS every day, while 21.9% said they use SNS once or twice a week. About 21% reported using SNS once every two to three days (Marbridge Consulting, 2010).

While the increase in social media use is well documented, its social impact remains unclear. Tichenor, Donohue and Olien (1970) proposed the knowledge gap hypothesis, which states that people with high socioeconomic status are more likely to have access to information and acquire knowledge at a faster rate than those with lower socioeconomic status, thus resulting in a gap in knowledge between the rich and the poor. “There are two main aspects to the knowledge gap hypothesis. On the one hand, it is concerned with the general distribution of aggregate information in society between [and among] social classes. On the other hand, it is related to specific subjects or topics on



which some are better informed than others” (McQuail, 2009, p. 498). According to Bonfadelli (2002), gaps can be produced in five different forms—gaps in terms of information supply, information use, gaps in access to information technologies, gaps in information processing, and gaps in the resulting knowledge.

Given their popularity, one wonders, therefore, about the role of the social media in widening or narrowing knowledge gaps. As Bonfadelli (2002) points out, “traditional research about the knowledge gap hypothesis is always mentioned in connection with the social consequences of the information society, which lack theoretical background or specific empirical evidence” (p. 66). Indeed, he goes on to suggest that instead of potentially narrowing knowledge gaps as has been assumed with the advent of the information society, the high Internet use could instead widen the knowledge gaps between and among people. This may happen because people who are highly educated are more likely to use the Internet to find more useful information while the less educated may concentrate their use on entertainment functions. Likewise, there is fragmentation of audiences and disintegration of agendas and shared knowledge, suggesting that individual motivations drive much of knowledge acquisition. While this may hold true for Internet use, social media might reverse at least some of these trends by reforming certain audiences and creating new agendas of knowledge that can be shared, at least within smaller groups. However, the impact of the social media as unique from that of the Internet has not been studied with regard to knowledge gaps.

Therefore, this study intends to fill this research gap by focusing on the use of Guokr, a social networking site that aims to provide the best science and science-based

information to Chinese audiences. Guokr, a Chinese term that means “nut shell,” originated from the book *The Universe in a Nutshell* by renowned astrophysicist Stephen Hawking. Guokr proclaims that its main objective is to seek the truth. As a science-based website, Guokr exhibits complex characteristics of both social media and blogs. First, it offers blog services for people who have professional knowledge about a special field. Moreover, users could log in with their account and interact with other users. Guokr Web has four main parts: (1) Theme sites (2) Group (3) Guokr Daren, and (4) Ask & Answer. People who register for Guokr can ask questions which the editors answer. The profiles of Guokr users indicate that many have master’s and doctoral degrees. Experts in specific fields can apply to become a Guokr “daren” who may be given a verified account to post articles directly (other users can only post articles in Guokr Group). The more professional articles are posted, the more followers a Daren can have. After articles are posted, Guokr users could discuss, comment or ask questions. Guokr, therefore, offers daren a platform for the popularization of science.

Guokr is supported by a group of science graduates from various universities. The original purpose of the site is to make science interesting and easy to understand. Due to the caliber of Guokr’s supporting team, the site is able to help solve problems with scientific underpinnings. Support team members aptly call themselves “rumor breakers” as an acknowledgment of their expertise. In the Guokr website, there are 16 main subjects frequently discussed, including sex, psychology, health, facts, logos, beauty, technology, and pets. Science articles related to each field are updated almost every day by editors or users who are verified as Guokr daren.

Guokr is linked to, and is therefore accessible, within Sina Weibo, one of the most influential websites in China that provides microblogging services to over 300 million users. Sina Weibo, one of the most popular web portals, was launched by the SINA Corporation in 2009. Based on the latest data from Data Center of China Internet, 88.81% of total Chinese netizens own a Weibo account. Among all Weibo users, 87.67% have their account on Sina Weibo, which now generates over 100 million posts every day (China Internet Watch, 2012). Similar to Twitter, Sina Weibo has made available multiple tools to attract users.

Accessible within Sina Weibo, Guokr registered a total of 607,897 followers as of November 24, 2012. This figure does not include those who subscribe to or follow other sub-themes. Many see this as a useful development because plenty of science-related rumors are transmitted through Sina Weibo every day, which attract more followers. Users generally want to check the veracity of rumors or commonly held beliefs, such as the commonly held notion that women should not wash their hair during their monthly periods lest they contract cancer. There were also reports that caution men from marrying non-virgins because their children will look like the man their wife first had sex with. Those who keep late hours are also rumored to be smarter than those who go to bed and get up early. Guokr Fact, the most followed Guokr theme in Sina Weibo, attempts to clarify such rumors. One can therefore surmise that those who do not read Guokr Fact may be more prone to believe these inaccurate scientific claims.

This categorization of science-related content in Sina Weibo and Guokr offers an ideal opportunity to examine the influence of the social media on knowledge gaps.

Specifically, do the increased availability, selectivity and connectivity of information within the social media influence gaps in science knowledge? The findings of this study are expected to extend the existing scholarship on knowledge gaps and the Internet to include the growing area of social media. Undoubtedly, social media provide an unprecedented platform for people to communicate. How such communication influences knowledge acquisition and the gaps in science knowledge between and among groups are therefore important concerns of mass media scholars and those who formulate social policies that aim to enhance a citizenry's science literacy.

## CHAPTER 2 LITERATURE REVIEW AND THEORETICAL FRAMEWORK

This study explores Guokr's influence on knowledge gaps about science and technology. This chapter discusses the propositions of the knowledge gap theory (the study's theoretical framework), and postulates the theory's applicability in determining the effects of the use of social media on audiences.

### 2.1 The Knowledge Gap Theory

Tichenor, Donohue and Olien (1970) originally advanced the "knowledge gap hypothesis" to illustrate how differences in socioeconomic status among audience members can generate knowledge gaps between and among segments of society. They explain:

As the infusion of mass media information into a social system increases, segments of the population with higher socioeconomic status tend to acquire this information at a faster rate than the lower status segments, so that the gap in knowledge between these segments tends to increase rather than decrease (pp. 159-160).

The knowledge gap hypothesis has been tested in both short-term and long-term studies. After reviewing prior works, Tichenor, Donohue and Olien (1970) submit that their theory can be re-stated in two ways. First, over time, the acquisition of knowledge about a heavily publicized topic will proceed at a faster rate among better-educated people than among those with less education. Second, at a given point in time, there should be a higher correlation between acquisitions of knowledge about topics highly

publicized in the media than about topics less highly publicized.

According to Ettema and Kline (1977), the literature to date on the causes of knowledge gap focuses on two categories of causal factors: (1) audience-related factors such as differences in communication skills, motivation, and media behavior between those with high and low socioeconomic status (e.g., selective exposure and attention to the mass media, selective retention and acceptance of messages received from the mass media, social contacts), which are held to be the causes of widening gaps, and (2) message-related “ceiling effects,” which are held to be the causes of narrowing knowledge gaps (p. 183).

There are two main aspects of the knowledge gap hypothesis. On the one hand, it assumes that knowledge would be distributed between and among social classes. On the other hand, for specific subjects or topics, some people may be better informed than others (McQuail, 2010). The first gap “is likely to have roots in fundamental social inequalities which the media alone cannot modify” (p. 489). For the second, “there are many possibilities for opening and closing gaps, and it is likely that the media do close some and open others. A number of factors can be named as relevant to the direction of media effect” (p. 489).

Most early inquiries about knowledge gap focused on the relationship between education levels as a proxy for socioeconomic status and levels of knowledge (e.g., Brantgarde, 1983; Wanta & Elliott, 1955). However, a number of studies also addressed the roles of motivational factors (Gaziano, 1983, 1997; Gaziano & Gaziano, 1996; Viswanath & Finnegan, 1996). Kwak (1999) summarized the motivational variables

investigated in prior studies to include degree of concern (Chew & Palmer, 1994; Ettema, Brown & Luepker, 1983; Griffin, 1990; Lovrich & Pierce, 1984; Viswanath et al., 1993), need for information (Gantz, 1978; Horstmann, 1991), issue interest (Genova & Greenberg, 1979; McLeod & Perse, 1994), issue-related demographic/ethnic characteristics (Ettema et al., 1983; Gandy & El Wylly, 1985), and personality factors (Simmons & Garda, 1982). People's behavioral involvement in issue-related activities (e.g., engaging in political campaigns and interpersonal communication, and attending related lectures), in particular, has been demonstrated to be strongly related to knowledge acquisition (Bailey, 1971; Gandy & El Wylly, 1985; Genova & Greenberg, 1979; Lovrich & Pierce, 1984; Nowak, 1977).

Sharpening this focus on motivational factors, Kawk (1999) categorized knowledge gap studies into three different models based on the relationship between socioeconomic characteristics and motivation. The first is the causal association model, which posits motivational variables as being causally influenced by people's socioeconomic characteristics, typically operationalized as education level (Ferdin, Monnett, & Kosicki, 1994; McLeod & Perse, 1994). Thus, according to Kawk (1999), "the effects of education and other socioeconomic variables on the knowledge gap are theorized to be mediated by motivational factors, such as issue interest and issue involvement" (p. 387).

The second is the rival explanation model, which posits education and motivational variables as competing sources of knowledge acquisition with varying effects (Kawk, 1999). Even though some studies have found that motivational variables

were more influential than education in acquiring knowledge (Chew & Palmer, 1994; Ettema et al., 1983; Genova & Greenberg, 1979; Lovrich & Pierce, 1984), there is no conclusion yet regarding which motivational variable had more impact. According to Bonfadelli (2002), “knowledge inequalities based on educational deficits can be altered or reversed—at least partly—by factors like personal relevance or interest” (p.69). Likewise, Ettema and Kline (1977) emphasized that the difference between interest and motivation could account for differences in knowledge gain.

The third is the motivation-contingency model, which posits that the socioeconomic-based knowledge gap is contingent on one’s level of issue-related motivational variables and that knowledge gaps between and among socioeconomic groups may widen or narrow in particular circumstances. That is, for people with high levels of motivation, the degree of education-based knowledge gap would be lower compared with the gap among those with low levels of motivation. Following this model, Kawk (1999) suggests that the knowledge gap hypothesis can be re-stated as follows:

As the infusion of mass media information into a social system increases, segments of the population motivated to acquire that information and/or for which that information is functional tend to acquire the information at a faster rate than those not motivated or for which it is not functional, so that the gap in knowledge between high and low SES groups will decrease among those who are motivated or for whom the information is functional; the gap between SES groups will increase among those who are not motivated or for whom the information is not functional (p. 389).



In addition to motivation, Tichenor, Donohue and Olien (1970) also suggest that knowledge gaps can be influenced by the intensity of media coverage about a topic. Specifically, the increased intensity of coverage of a single topic can reduce knowledge gaps, but an increase in overall information, such as in pluralistic communities with many information sources, may increase knowledge gaps.

The foundational axioms of knowledge gap were originally proposed to explain the traditional media's effects on audiences. With the advent of the new media, it can be surmised that the influence and relevance of motivational factors, intensity of information consumed, and nature or composition of communities and their available information sources (i.e., pluralistic or otherwise) may have increased.

## **2.2 New Media and Knowledge Gap**

As the communication landscape continues to change, especially in terms of the intensity and availability of communication channels and content, scholars have begun to re-examine how knowledge gaps occur in the new information society.

Advances in communication technology may serve to exacerbate knowledge gaps as more educated people find greater access to and use the Internet and the new media more actively, especially if more educated audiences direct their Internet use toward knowledge acquisition while less educated audiences use it more for entertainment purposes (Bonfadelli, 2002). Wei (2012) found that Internet use differs by users' socioeconomic and demographic backgrounds. Specifically, he concluded that females, older, poorer and less educated people show less Internet activity in general and

that a gender gap in Internet use also exists on specific issues such as political topics.

Bonfadelli (2002) identifies four main differences in the development of knowledge gaps among people who use the traditional media and those who are exposed more to the Internet. These differences fall within the areas of (1) information supply, (2) fragmentation of audiences, (3) information seeking, and (4) disintegration of agendas and shared knowledge. According to Bonfadelli (2002), different media environments cater to different social segments, which determine the extent of information supply. He predicted that this kind of gap would be strengthened by the tendency to further divide audiences into various segments. Thus, as a result of the differential diffusion of new media like the Internet, information supply gaps are likely to increase. Further, the unequal use of information derived from the media would promote the formation of knowledge gaps into the next level—gaps may occur as a result of different information processing or personal preferences. Gaps also may widen due to the skills needed to use the Internet and people's attitudes toward the Internet. For example, the same information may be processed in different ways because of differences in gratifications that may be derived from the media (e.g., information-oriented vs. entertainment-oriented).

Kim (2008) tested the knowledge gap hypothesis in South Korea by examining how the traditional news media and the Internet affect political learning. His findings support the notion that Internet use increases the gap in political knowledge between and among social classes. Nie and Erbring (2000) found that Internet use increased gaps due to differences in the supply and access of information, but not the use of information.

In summary, the Internet offers audiences new access to information, but its use may result in increased knowledge gaps due to differences in access and motivation. According to Bonfadelli (2002), “in comparison to the old media, the supply of information by the Internet is not structured by journalists and therefore heterogeneous and potentially unlimited” (p.72). Thus, compared with the traditional media, the Internet promotes individualized information seeking and further fragments audiences, which can cause increased disintegration of individual agendas and decreased amount of shared knowledge (Bonfadelli, 2002).

### **2.3 Social Media and Knowledge Gaps**

While previous studies have examined the influence of the Internet on knowledge gaps, there is little research that examines the unique influences specifically of the social media. It is likely that while some aspects of the social media may affect audiences in the same way that the Internet affects people in general, other factors may produce more unique results and may influence knowledge gaps differently.

Like most Internet content, social media use is heavily dependent upon personal motivations. Therefore, in line with previous findings on the impact of the Internet on knowledge gaps, individuals with a greater motivation to seek information on a particular topic should exhibit an increase of knowledge over individuals who have less of such motivation. Similarly, the influence of education and gender on seeking information about science and technology would likely mirror Internet use in general. Thus, in the context of this study, it can be hypothesized that:

H1: People who have greater motivation to know more about science and technology will use Guokr more frequently than people with lower levels of motivation.

H2: People with higher levels of education use Guokr more frequently than those with lower levels of education.

H3: Male students will use Guokr more frequently than female students.

H4: People who use Guokr will be more knowledgeable about science and technology issues than those who do not.

While knowledge gaps due to differences in motivation are expected from exposure to the Internet as well as the social media, the unique aspect of connectivity associated with the social media may influence the size of this gap. Kaplan and Haenlein (2010) found that the social media build connectivity among users because they allow people to create individual profiles and upload personal videos, photos and articles online, among other functions. According to De Latt (2011), “social network research has shown that having an extended network is crucial for personal and professional development” (p. 2). Because the social media build new connections not only between these sites and their users, but also between users and their friends, they may reverse the knowledge gap-widening outcomes of Internet use. Specifically, the social media offer a new information forum by forming a pool of shared knowledge among followers and their friends. Active audiences are motivated to interact more frequently with other users and participate more in online communities. Therefore, these communities may be more likely to share information, possibly narrowing the knowledge gap due to differences in individual motivation. At the same time, however, the increased overall intensity of

information consumption and greater differences in interest among these selective communities may also tend to widen the gaps. Because the two possible directions are plausible, the influence of the social media on motivation-induced knowledge gaps will be examined with a research question:

RQ1: How will the extent of social media use influence the size of gaps in knowledge about science and technology caused by differences in use of Guokr?

RQ2: How will the extent of social media use influence the size of gaps in knowledge about science and technology caused by differences in motivation?

RQ3: How will the extent of social media use influence the size of gaps in knowledge about science and technology caused by differences in education?

RQ4: How will the extent of social media use influence the size of gaps in knowledge about science and technology caused by differences in demographic characteristics?

## CHAPTER 3 METHODS

### 3.1 Protocol and Sample

To gather data for this study, an online survey of college students and netizens was conducted. The survey was posted on the Bulletin Board System of 20 universities and colleges in Beijing. These are: Peking University, Renmin University of China, Tsing Hua University, the University of Technology and Science Beijing, the Beijing University of Chemical Technology, the Beijing University of Posts and Telecommunications, China Agricultural University, Beijing Union Medical College, Beijing Normal University, Beijing Foreign Studies University, Beijing Language and Culture University, North China Electric Power University, Communications University of China, Central University of Finance and Economics, University of International Business and Economics, China University of Political Science and Law, Beijing JiaoTong University, Beijing University of Aeronautics and Astronautics, Beijing Institute of Technology, and the Minzu University of China. These universities were chosen because they are known for the quality of the programs they offer and they represent diverse areas of specialization.

Beijing, the nation's capital, was chosen as the study's local because it is the seat of higher education in the country, and is thus the home of a number of renowned and distinguished colleges and universities. The headquarters of Guokr Interactive Technology and Communication Corporation are also located in the city. The well-known nonprofit organization Scientific Squirrel (Guokr's predecessor) regularly

holds weekend lectures about science and technology topics in Beijing and Shanghai, events that are widely attended by college students. Thus, it was expected that college students in Beijing would be more aware and willing to participate in an online survey about the role of Guokr in enhancing people's knowledge about science and technology.

The survey also was posted on the Guokr website to recruit more Guokr users. Because early response rates were lower than desired, the survey was also sent to all Chinese students at Iowa State University via email. The survey questionnaire was distributed in Chinese.

The survey was conducted over a one-month period, between February and March 2013. To encourage participation, the names and email addresses of those who returned a completed questionnaire was entered in a drawing for a chance to win a cash prize of 50 RMB. This award was given to ten randomly selected qualified participants.

The final number of participants was 377 of which 53.7% was male with an average age of 22.14 ( $SD = 4.40$ ).

### 3.2 Variables and their Measure

*Science knowledge.* This variable was measured by the students' acceptance or rejection of science-related rumors and facts they wish to verify posted on Sina Weibo. These rumors are shared widely, which Guokr actively tries to debunk. Most of the rumor items used were chosen from a book published by Guokr, titled *Rumor Breakers*. Science knowledge was operationalized as having two dimensions: (1) the truth status of the answer and (2) the strength of response. Respondents were asked to answer 20 items,

half of which were true. The responses to each item were on a 1-5 Likert scale bounded by “strongly agree” to “strongly disagree.” The strength of each response was coded by the distance from the midpoint of the scale. For instance, a response of “5” in the correct direction would receive a strength of “+2” because it is two units away from the midpoint of the scale (3). Likewise, a response of 1 would receive a strength of “-2” because, while equally far from the midpoint, it was in the incorrect direction. Science knowledge was calculated by summing the strength of all responses in which positive strengths represent correct answers and negative strengths represent incorrect answers. Cronbach’s alpha reliability analysis was conducted ( $N=20, \alpha =.53$ ) and five questions were excluded improve the reliability ( $N=15, \alpha =.72$ ). Thus, the final science knowledge score of each respondent was computed by adding up the strength of the answers to the 15 questions, creating a range from -30 to 30 ( $M=6.11, SD=9.37$ ).

*Motivation.* There are multiple motivational factors described in the literature as having a potential influence on knowledge gaps. In this study, motivation was seen as an aggregate of (1) the extent to which people see the applicability of science and technology in their lives and (2) the level of their interest in science and technology issues, regardless of perceived applicability. Even though these factors may motivate people to learn about science and technology for different reasons, the influence of any form of motivation on knowledge gaps is expected to follow the same direction. That is, these factors will lead to the narrowing of knowledge gaps. Therefore, motivation was measured by averaging the answers to six questions asking participants for the extent to which they agree with the following statements: (1) I enjoy learning about science and



technology, (2) I feel I can benefit personally from reading articles about science and technology, (3) If given a choice, I would rather read about other topics than about science and technology, (4) I often apply what I learn about science and technology in my daily life, (5) Science and technology have little influence on my life, (6) I am curious about science and technology issues. The response options to these Likert scale items ranged from 1-5 (strongly agree to strongly disagree). Questions 1, 2, 4, and 6 were reverse coded so that greater values represent greater motivation and the answers to all six questions were summed ( $M=23.66$ ,  $SD=3.32$ ,  $\alpha =.76$ ).

*Use of social media.* The respondents' use of general social media was measured by asking them to rate how frequently they use Sina Weibo on a four-point scale where 1=never, 2=occasionally, 3=frequently, 4=everyday ( $M=2.75$ ,  $SD=1.01$ ).

*Use of Guokr.* The respondents' use of Guokr was measured by asking respondents to rate how frequently they use Guokr on a four-point scale where 1=never, 2=occasionally, 3=frequently, 4=everyday ( $M=2.40$ ,  $SD=1.02$ ).

*Demographic characteristics.* Education was measured by asking the respondents if they had: (1) some high school, (2) graduated high school, (3) some college, (4) graduated college, (5) a master's degree, or a (6) PhD degree. This variable was treated as a continuous measure ( $M=3.52$ ,  $SD=1.32$ ). Participants were also asked if their major field of study was science and technology-related or not (59.4% science-related) and if they primarily lived in a rural or urban area (85.7% urban). Household income was measured by asking participants to specify whether their total household income ranged from (1) less than 25,000 RMB, (2) 25,000-49,999 RMB, (3) 50,000-99,999 RMB, (4) 100,000-149,999 RMB (5)

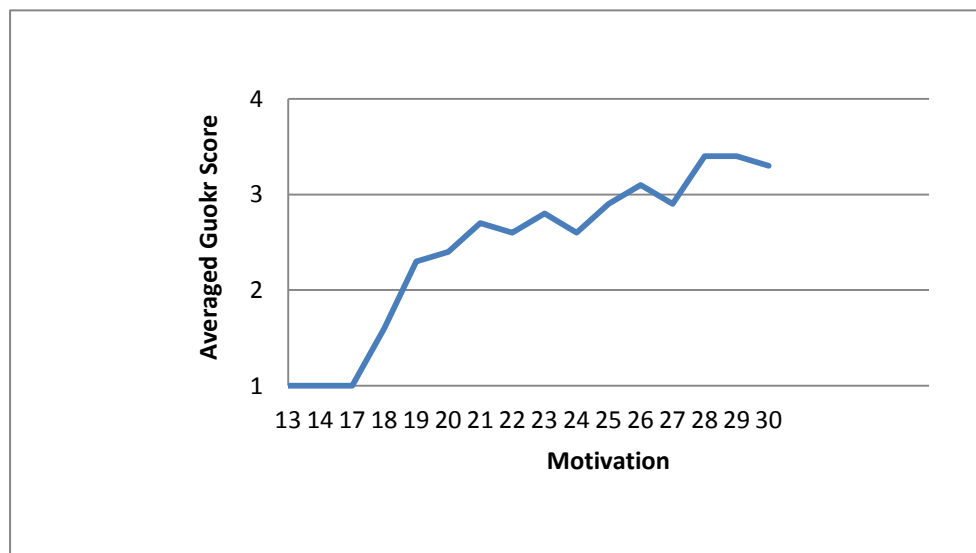
150,000-199,999 RMB, (6) 200,000-249,999 RMB, or (7) more than 250,000 RMB. This variable was treated as a continuous measure ( $M=3.38$ ,  $SD=1.77$ ).

## CHAPTER 4 RESULTS

The first three hypotheses predicted the effects of motivation, education and gender on Guokr use. The fourth hypothesis predicted greater science knowledge associated with increased Guokr use. Regression analysis was used to test the four hypotheses.

Hypothesis 1 predicted that people who have greater motivation to learn about science and technology will use Guokr more frequently than those with lower levels of motivation. Guokr use was regressed on motivation and the linear relationship was significant in the positive direction ( $\beta=.35$ ,  $t(212)=5.41$ ,  $p<.01$ ). Figure 1 displays the averaged Guokr use score for each value of motivation collected. Because increased motivation to learn about science and technology was associated with increased Guokr use, Hypothesis 1 was supported.

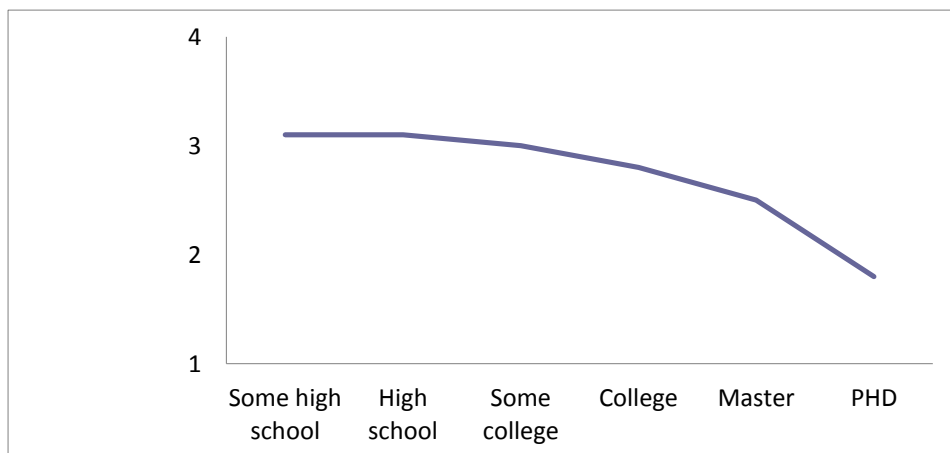
**Figure 1. The relationship between motivation and Guokr use**



Hypothesis 2 predicted that people with higher levels of education would use Guokr more frequently than those with lower levels of education. As mentioned in the methods section, even though education was measured categorically, the categories were arranged in

an increasing direction enabling the treatment of education as a continuous variable. Guokr use was regressed on education and the linear relationship was significant but in the negative direction ( $\beta=-.22, t(214)=-3.34, p<.01$ ). Figure 2 displays the averaged Guokr use score for each level of education. Because Guokr use decreases with increased education, Hypothesis 2 was not supported.

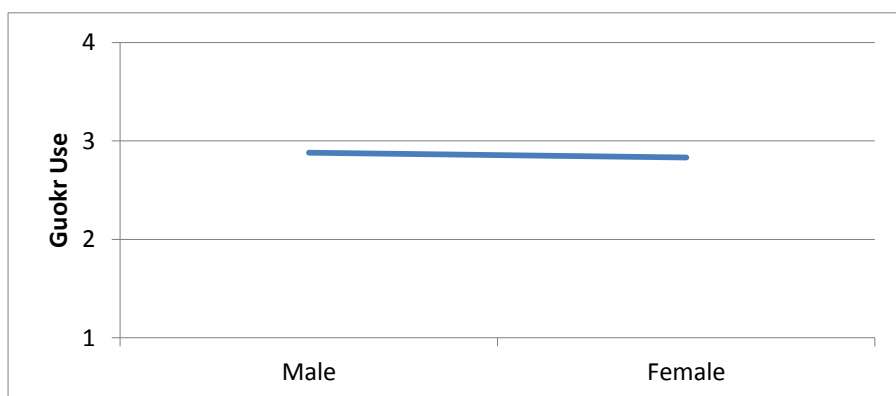
**Figure 2. The relationship between education and Guokr use**



Hypothesis 3 predicted that males would use Guokr more frequently than females.

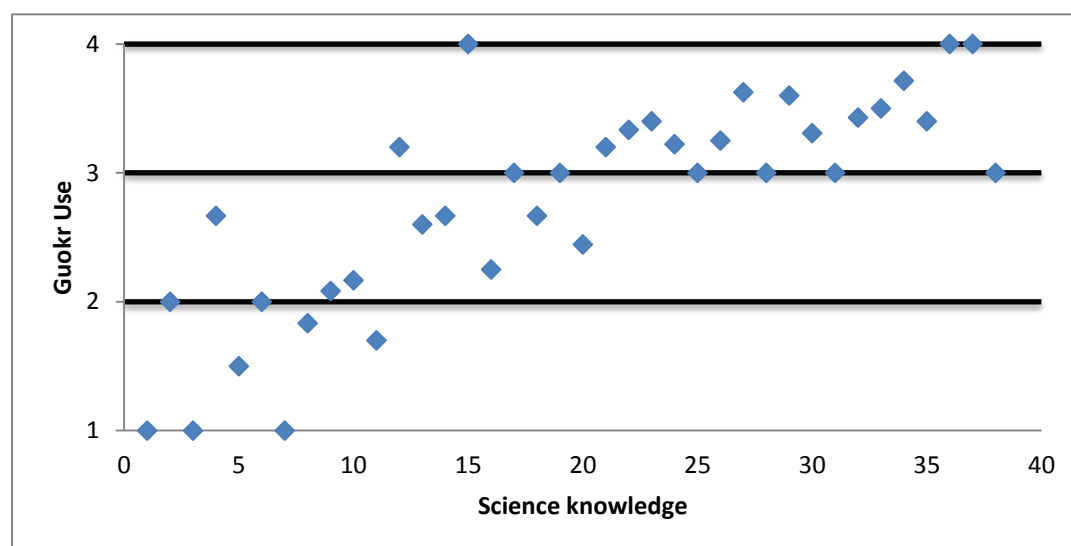
Gender was entered as a dummy variable and regressed on Guokr use. The linear relationship was not significant ( $\beta=-.03, t(214)=-.41, p=.69$ ) as shown in Figure 3. Thus, male respondents' Guokr use ( $M=2.88, SD=1.02$ ) did not significantly differ from that of female respondents ( $M=2.83, SD=1.03$ ). Hypothesis 3 was not supported.

**Figure 3. The relationship between gender and Guokr use**



H4 predicted that people who use Guokr more frequently would be more knowledgeable about science and technology than those who do not. Guokr use was regressed on the science and technology knowledge score. The linear relationship was significant in the positive direction ( $\beta=.55$ ,  $t(217)=9.79$ ,  $p<.01$ ) as indicated in the scatterplot shown in Figure 4. Thus, those who use Guokr more were more knowledgeable about science and technology issues. Hypothesis 4 was thus supported.

**Figure 4. The relationship between Guokr use and science knowledge**



The four research questions asked whether the amount of general social media use would influence the size of the knowledge gaps caused by use of Guokr, motivation, education, and demographics. To examine these questions, hierarchical Ordinary-Least-Squares (OLS) regression was used. OLS regression analyzes groups of variables in separate blocks to allow an assessment of the relative contribution of each group as they enter the model. As blocks are added to the model, the effects of blocks already present in the model are partialled out, allowing for a measure of the unique amount of variance accounted for by the current block beyond the effects of previous blocks.

In the following regressions, science and technology knowledge served as the

dependent variable. All demographic measures were entered in the first block. The second block adds motivation. The third block adds the media variables of Guokr use and social media use. The fourth block adds an interaction term between social media use and the relevant variable of interest. All interaction terms were created as a product between the relevant variables after centering. No problems of multi-collinearity were observed. In such an analysis, the results of the previous four hypotheses should hold while the testing of the interaction term allows for an exploration of the influence of social media on the size of existing knowledge gaps.

The first research question asked if the amount of social media use influences the difference in knowledge related to exposure to Guokr, and so the relevant interaction is between social media use and Guokr use. The results of the OLS regression are presented in Table 1. In the final model, gender remained a significant predictor in the first block ( $\beta = -.18$ ,  $t(160) = -2.10$ ,  $p < .05$ ), which accounted for 7.5% of the total variance. Motivation remained a significant predictor in the second block ( $\beta = .38$ ,  $t(159) = 5.12$ ,  $p < .01$ ), which accounted for 13.1% of the total variance. Guokr use remained a significant predictor in the third block ( $\beta = .45$ ,  $t(157) = 5.97$ ,  $p < .01$ ), which accounted for 14.8% of the total variance. Social media use by itself had no significant relationship ( $\beta = .01$ ,  $t(157) = .12$ ,  $p = .91$ ) with science and technology knowledge. The interaction between Guokr use and social media use was not significant ( $\beta = -.48$ ,  $t(156) = -.84$ ,  $p = .41$ ). Thus, in response to the first research question, there is no evidence to suggest that social media use influences the knowledge gap caused by Guokr use.

**Table 1. OLS regression analysis of influence of social media use on knowledge gaps caused by Guokr use**

Variable	Step		Final Model
	B	$\Delta R^2$	B
<i>Step 1:</i>			
Education	-.111		-.009
Age	.057		.015
Major	-.071		.025
Residence	-.057		-.013
Gender	-.175*		-.143*
Income	-.084		-.037
		7.5%*	
<i>Step 2:</i>			
Motivation	.379*		.179*
		13.1%*	
<i>Step 3:</i>			
Guokr Use	.449*		.449*
Sine Weibo Use	.008		.010
		14.8%*	
<i>Step 4:</i>			
Sine Weibo Use x Guokr Use	-.054		-.054
		< 0.01%	
Total R <sup>2</sup>	35.7%*		

$N = 167$ ,  $B =$  standardized regression coefficient,  $\Delta R^2 =$  incremental change in  $R^2$ ,  $*p < 0.05$ .

The second research question asked if the amount of social media use influences the difference in knowledge related to motivation, and so the relevant interaction is between social media use and motivation. The results of the OLS regression are presented in Table 2. In the final model, gender remains a significant predictor in the first block ( $\beta = -.18$ ,  $t(160) = -2.1$ ,  $p < .05$ ), which accounted for 7.5% of the total variance. Motivation also remained a significant predictor in the second block ( $\beta = .38$ ,  $t(159) = 5.12$ ,  $p < .01$ ), which accounted for 13.1% of the total variance. Guokr use still was a significant predictor in the third block ( $\beta = .45$ ,  $t(157) = 5.97$ ,  $p < .01$ ), which accounted for 14.8% of the total variance. Social media use by itself had no significant relationship with science knowledge ( $\beta = .01$ ,  $t(157) = .15$ ,  $p = .87$ ). The interaction between motivation and social media use was not significant ( $\beta = -.05$ ,  $t$

(156)=-.256,  $p=.80$ ). Thus, in response to the second research question, the results did not support the notion that social media use influences knowledge gaps caused by motivation.

**Table 2. OLS regression analysis of influence of social media use on knowledge gaps caused by motivation**

Variable	Step		Final Model
	B	$\Delta R^2$	B
<i>Step 1:</i>			
Education	-.111		-.012
Age	.057		.020
Major	-.071		.030
Residence	-.057		-.016
Gender	-.175*		-.147*
Income	-.084		-.039
		7.5%*	
<i>Step 2:</i>			
Motivation	.379*		.182*
		13.1%*	
<i>Step 3:</i>			
Guokr Use	.449*		.449*
Sine Weibo Use	.008		.011
		14.8%*	
<i>Step 4:</i>			
Sine Weibo Use x Motivation	-.017		.798
		< 0.01%	
Total $R^2$		35.7%*	

$N = 213$ ,  $B =$  standardized regression coefficient,  $\Delta R^2 =$  incremental change in  $R^2$ , \* $p < 0.05$ .

The third research question asked if the amount of social media use influences the difference in science and technology knowledge related to education, and so the relevant interaction is between social media use and motivation. The results of the OLS regression are presented in Table 3. The results show that gender is a significant predictor in the first block ( $\beta = -.18$ ,  $t(160) = -2.10$ ,  $p < .05$ ), which accounted for 7.5% of the total variance. Motivation remained a significant predictor in the second block ( $\beta = .38$ ,  $t(159) = 5.12$ ,  $p < .01$ ), which accounted for 13.1% of the total variance. Guokr use remained a significant predictor in the



third block ( $\beta=.45$ ,  $t(157)=5.97$ ,  $p<.01$ ), which accounted for 14.8% of the total variance.

Social media use by itself had no significant relationship with science and technology

knowledge ( $\beta=.01$ ,  $t(156)=.15$ ,  $p=.88$ ). The interaction between education and social media

use was not significant ( $\beta=.017$ ,  $t(156)=.25$ ,  $p=.80$ ). Thus, in response to the third research

question, the results did not suggest that social media use influences knowledge gaps caused

by education.

**Table 3. OLS regression analysis of influence of social media use on knowledge gaps due to education**

Variable	Step		Final Model
	B	$\Delta R^2$	B
<i>Step 1:</i>			
Education	-.111		-.011
Age	.057		.022
Major	-.071		.027
Residence	-.057		-.017
Gender	-.175*		-.143*
Income	-.084		-.040
		7.5%*	
<i>Step 2:</i>			
Motivation	.379*		.182*
		13.1%*	
<i>Step 3:</i>			
Guokr Use	.449*		.449*
Sine Weibo Use	.008		.011
		14.8%*	
<i>Step 4:</i>			
Sine Weibo Use x			
Education	.017		.017
		< 0.01%	
Total R <sup>2</sup>	35.7%*		

$N = 167$ ,  $B =$  standardized regression coefficient,  $\Delta R^2 =$  incremental change in  $R^2$ , \* $p < 0.05$ .

The last research question asked if the amount of social media use influences differences in knowledge related to other demographic variables, and so the relevant interaction is between social media use and gender, major, residence and household income.

The results of the OLS regression are presented in Table 4. None of the interactions were

significant. Thus, in response to research question 4, there is no evidence to support the idea that social media use influences knowledge gaps caused by differences in demographic variables.

**Table 4. OLS regression analysis of influence of social media use on knowledge gaps caused by demographic variables**

Variable	Step		Final Model
	B	$\Delta R^2$	B
<i>Step 1:</i>			
Education	-.111		-.008
Age	.057		.012
Major	-.071		.029
Residence	-.057		-.007
Gender	-.175*		-.142*
Income	-.084		-.039
		7.5%*	
<i>Step 2:</i>			
Motivation	.379*		.182*
		13.1%*	
<i>Step 3:</i>			
Guokr Use	.449*		.449*
Sine Weibo Use	.008		.011
		14.8%*	
<i>Step 4:</i>			
Sine Weibo Use x			
sex	.365		.365
Sine Weibo Use x			
major	.280		.280
Sine Weibo Use x			
Residence	-.213		-.213
Sine Weibo Use x			
Household	-.076		-.076
		< 0.01%	
Total R <sup>2</sup>	35.7%*		

$N = 167$ ,  $B =$  standardized regression coefficient,  $\Delta R^2 =$  incremental change in  $R^2$ , \* $p < 0.05$ .

## CHAPTER 5 DISCUSSION AND CONCLUSIONS

This study primarily investigated how social media use influences knowledge gaps about science and technology. It was hypothesized that because the social media offer a new information forum that allows the creation of a pool of shared knowledge among followers and their friends, knowledge gaps within these communities may develop differently from those resulting from exposure to more individualized Internet platforms in general. The results suggest that the increased connectivity afforded by the social media do not alter the relationship between Internet use and knowledge gaps.

Specifically, individuals motivated to engage in science and technology issues were heavier users of Guokr and had greater knowledge about science and technology topics. This was expected from the literature about Internet use and knowledge gaps. However, the use of the social media in general, which was interpreted as a measure of how connected an individual was to the shared knowledge forum of their contacts, had no influence upon the size of this gap. It may be that these social media knowledge pools are themselves created around existing motivations, which serve to reinforce the role of motivation upon knowledge acquisition. Possibly, knowledge pools created around other factors, such as geographical location, more pressing issues, or family membership, would result in more diverse pools of shared knowledge, resulting in different social media influences. However, data from this study fail to suggest any difference between Internet use and social media use on knowledge gaps.

The relationship between Guokr use and education was significant, but against the hypothesized direction. This may be because people with greater levels of education consider

social media to be an unreliable source of information. What's more, it's possible that the more educated may weigh the risks of social media addiction and thus they may be more willing to engage in other online activities which they consider more meaningful and less risky. On the other hand, people with greater levels of education may also be less dependent on Guokr for their own science knowledge, which may explain the lower levels of use. Similar to what was found with motivation, social media use had no interaction with education and gender, suggesting little influence of social media use on these relationships.

The results of OLS regressions allow a direct examination of the predictors of knowledge. The demographic variables predicted 7.5% of the variance in science and technology knowledge, with gender displaying the largest contribution throughout all four regressions. The results also link males with greater science knowledge, which matches previous findings. Motivation predicted an additional 13.1%, while Guokr use and social media use predicted an additional 14.8%, implicating both with the widening of knowledge gaps. This result also is consistent with previous findings.

In summary, the findings support the argument that the use of Guokr widens the size of gaps in knowledge about science and technology and that social media use, in general, does little to close this gap. However, the direction of the correlations hint that social media use may influence knowledge gaps in an indirect way. Even though Guokr use widens the knowledge gap, people who are highly educated used Guokr less frequently than others. The weak association between respondents' education level and their science and technology knowledge may be caused by an interaction between education and Guokr use. Because Guokr use correlates positively with greater knowledge, but negatively with education levels,

it may be countering knowledge gaps caused by education by increasing the knowledge levels of the less educated.

While this data provides insight into the relationships between social media use and knowledge gaps, this study has several limitations. First, although the measure of science and technology knowledge is based on people's understanding of common rumors found and addressed in the media platforms under study, capturing an individual's "science literacy" is controversial methodologically (Brossard & Shanahan, 2006). It is possible that this measure represents a form of science knowledge tailored following Guokr content, which may not be representative of other science and related topics disseminated through other venues and contexts. Second, as Bonfadelli (2002) suggested, the advent of the Internet may widen knowledge gaps because people who are highly educated tend to use the Internet more as a tool for seeking useful information whereas individuals with lower education levels may use it more for entertainment. The study's questionnaire did not ask why individuals participate in or use the social media, so this relationship and its interactions cannot be examined using the collected data.

Overall, this study contributes to the literature on knowledge gaps within the new media environment. Even though the findings show that social media use generally does not affect the size of knowledge gaps, it still suggests that certain social media outlets, specifically Guokr, can assist in knowledge acquisition. As a new social media forum, Guokr offers access to science and technology content, which has proven very influential in mainland China. After a 2008 scandal involving the death of six infants due to contaminated milk powder, the safety of the food supply has emerged as one of the critical challenges in the

country. Rumors related to this topic continue to abound on the Internet, which have caused people to lose confidence on the ability of regulatory agencies to safeguard public health. Guokr may have alleviated some of the public fear by posting science-based information on its own website as well as on Sina Weibo. Guokr's growing popularity suggests its growing influence. Sina Weibo reports that Guokr has tripled its visitors count since February 26, 2012. Thus, Guokr may represent a new and successful model of communicating science and technology to broad audiences.

While this study exclusively examined gaps in science and technology knowledge in general, future studies could endeavor to apply this study's mode of analysis to examine other knowledge domains as well as specific issues, such as food safety or the protection of the environment. Since this study has already shown that exposure to Guokr correlates with increased science knowledge, focusing more on food safety issues could be uniquely meaningful in mainland China. For instance, comparing how both rumors and "rumor-breaking" content are shared across social media platforms could provide an interesting supplement to this line of inquiry.

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## APPENDIX

### Questionnaire

**I. Please indicate how strongly you agree or disagree with the following statements.**

1. I enjoy learning about science and technology.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

2. I feel I can benefit personally from reading articles about science and technology.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

3. If given a choice, I would rather read about other topics than about science and technology.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

4. I often apply what I learn about science and technology in my daily life.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

5. Science and technology have little influence on my life.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

6. I am curious about science and technology issues.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

7. I believe that success depends on how hard you work.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

**II. Please indicate how strongly you agree or disagree that the following statements are true.**

8. Milk contains nutritious substances, including something called “tryptophan,” which produces serotonin and melatonin both of which induce sleep.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

9. Smoking can increase the risk of getting coronary heart disease or other cerebrovascular disease.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

10. Coffee may prevent some medications from working.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

11. Olive oil is good for health but not for cooking when it is overheated.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

12. Instant noodles are not good for health. A bag of instant noodles need liver detoxification 32 days.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

13. Women who are pregnant could also keep doing moderate workouts.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

14. When giving birth, a woman feels up to 57 DEL units of pain, 12 times more than what a human body can bear. This is similar to 20 bones getting fractured at the same time.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

15. Women should not drink bottled water in their car during summer because heated plastic produce certain chemicals that cause breast cancer.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

16. When your cell phone battery is low, do not make a call because the level of radiation the phone emits is 1,000 times than usual.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

17. Drinking lots of water could help relive hangover.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

18. Citizens of India consume the most betel nut in the world, the reason why the country has the highest rates of oral cancer in the world.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

19. Females who always washed hair or did heavy work during their menstrual period

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

20. Pregnant woman who keep cats at home may get chance to have their babies aborted. This is due to the parasite *Toxoplasma gondii*, which may be carried by cat. It is also true that toxoplasmosis is one of several infections that may cause miscarriage.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

21. Using condom during sex could effectively reduce risk of HIV infection by 70%-80%.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

22. Cold water inhibits drug absorption.



1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

23. Alcoholic drinks taken with Cephalosporin or other antibiotics can cause heart failure.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

24. There is no proof suggested that taking high-speed rail will do harm for health.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

25. Having an “acid environment” in the body can encourage cancer cells to grow.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

26. Taking banana with milk would lead to diarrhea.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

27. Wearing contact lens may do harm to the corneal epithelium. It may also cause corneal ulcers and infection.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

### III. Please indicate how much you use the social media.

1. How many micro-blog accounts do you have (such as Sina Weibo, Tencent Weibo,

Sohu Weibo, Wangyi Weibo, Fanfou)?

- a. 0
- b. 1
- c. 2
- d. 3
- e. 4
- f. 5 or more

2. How often do you use Sina Weibo?

- a. Never
- b. Occasionally
- c. Frequently
- d. Everyday

3. How many people do you follow on Weibo?

- a. under 100
- b. 100-300
- c. 300-500
- d. More than 500

4. How many followers do you have on Weibo?

- a. under 100
- b. 100-300
- c. 300-500
- d. More than 500

5. How often do you share something you've read with others using social networking sites like Renren, Kaixin, SinaWeibo?

- a. Never
- b. Occasionally
- c. Frequently
- d. Everyday

6. Have you heard about the social media site Guokr?

- a. Yes
- b. No

7. How often do you use Guokr?

- a. Never (Please skip to Section IV).
- b. Occasionally
- c. Frequently
- d. Everyday

8. How often do you ask questions in the Ask & Answer part of Guokr?

- a. Never
- b. Occasionally

c. Frequently

d. Everyday

9. How often do you answer questions in the Ask & Answer part of Guokr?

a. Never

b. Occasionally

c. Frequently

d. Everyday

10. How often do you share something you've read from Guokr with others using social networking sites like Renren, Kaixin, SinaWeibo?

a. Never

b. Occasionally

c. Frequently

d. Everyday

11. If you are a Sina Weibo user, please circle the Guokr accounts you regularly follow:

a. Guokr site

b. Guokr Fact

c. Guokr Natural

d. Guokr Sex

e. Guokr Health

f. Guokr DIY (do it by yourself)

g. Guokr Science Blog

h. Guokr Psychology

- i. Guokr Science and Business
- j. Guokr Ask & Answer
- k. Guokr Creative Technology
- l. Guokr Crime
- m. Guokr Beauty

**IV. Please tell us a little about you.**

1. Please tell us your education background.

- a. some high school
- b. graduated high school
- c. some college
- d. graduated college
- e. a master degree
- f. a PhD degree

2. How old are you? \_\_\_\_\_

3. In what general area are you majoring?

- a. A science and technology field
- b. Some area other than a science and technology field

4. Before going to college, where did you complete your previous study?

- a. A mostly urban area
- b. A mostly rural area

5. What is your gender?

- a. Male

b. Female

6. What was your household income before taxes in 2012?

a. Less than 25,000 RMB

b. 25, 000-49,999 RMB

c. 50, 000-99,999 RMB

d. 100, 000-199,999 RMB

e. 200, 000-249,999 RMB

f. More than 250,000 RMB

**Thank you very much for participating in this study!**

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