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Engaging scientists in science communication: The effect of social proof and meaning

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ABSTRACT

Science communication helps the general public understand science breakthroughs, making them support evidence-based decision making. Therefore, science communication is of paramount importance for issues that closely relate to the public, such as sustainability, climate change, and environmental behaviors. The degree of scientists' involvement in science communication, however, is often inadequate in China. This article considers scientist engagement as a two-stage process consisting of participation and effort and then explores the causal effects of social factors in this process. Based on a field experiment with Chinese scientists, we find that, as social proof, information of peers' engagement significantly increases scientists' participation, but not their real efforts made in science communication; in-group meaning, which emphasizes the benefits of scientist communication to the science community, does not induce more participation but significantly increases average efforts of participants. A combination of social proof and in-group meaning can lead to greatest efforts of scientists to communicate with the general public.

1. Introduction

Environmental and sustainability challenges call for more effective science communication nowadays. Public support for climate action depends on the way that scientific messages are framed and communicated (Spence and Pidgeon, 2010) and public perception of consensus among scientists (Ding et al., 2011; Lewandowsky et al., 2013). Sustainable development requires the design of communication interface where universities play an important role (Adom ßent, 2013). Science communication can help the public follow science advancement and increase both their own action and support for science-based decision making that tackle climate change and sustainability issues. For developing countries like China, other issues also worth science communication, such as food safety (Mou and Lin, 2014), air pollution, and "Not In My Backyard" attitude toward industrial development. Here, scientist communication helps to eliminate misrepresented information, reduce public anxiety, and mobilize policy support.

Scientist involvement in science communication, however, is not always sufficient and effective. Climate scientists, for example, are considered not able to well communicate IPCC's Fifth Assessment Report (Hollin and Pearce, 2015). While China observed increasing public demand for scientific knowledge and generous government funding of science and technology projects, scientist engagement in science communication is still insufficient, with the scientific community being characterized as "unenthusiastic scientists" (Wu and Qiu, 2012; Zhang, 2015). Therefore, it is important to investigate how to motivate scientists to participate and exert more efforts in science communication.

This article is based on a field experiment with scientists at tier-one Chinese universities, observing their participation decisions and effort-making behaviors in science communication. We find that both social proof and in-group meaning to the scientist community promote scientist engagement in science communication, but their effects apply to different stages of scientist engagement. A

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combination of the two strategies best facilitates scientists' communication with the public.

This article contributes to the literature in four ways. First, the current sustainability communication research focuses mainly on the detailed means and strategies for sustainability education (for example, Hoveskog et al., 2017; Kapitulčinová et al., 2017), without much attention to the motivations and efforts of scientists in broader communication activities. Second, the study provides a structural view of science communication process. An in-depth understanding of the process calls for a focus on both participation and the amount of effort that a scientist put into action. Third, by investigating the effect of social proof and meaning on scientists' two-stage public engagement process, the study shifts the attention of science communication research from individual scientists and organizational level factors to social factors with a specific focus on two significant others: peers and beneficial groups.

Last but not least, this article establishes the causal relationship between social proof, meaning, and the science communication process. The field experiment method used in this research overcomes many of the issues associated with survey methods. Field experiments establish clear causal effects and are a major source of knowledge creation in the social sciences (Falk and Heckman, 2009). Our findings based on the field experiment generate important policy implications: the inexpensive, easy-to-implement measures that we adopted are an efficient instrument to facilitate science communication in developing countries like China; they help to consolidate support for sustainability and climate policies and to mitigate irrational environmental concerns.

2. The process of scientist engagement in science communication

We refer to science communication more formally as public engagement in our research. Public engagement is one of the social responsibilities of scientists, representing their communication activities to engage in dialogue and interaction with members of the public outside of a classroom setting (Bauer and Jensen, 2011; Poliakoff and Webb, 2007). Public engagement is expected to produce one or more of the following personal responses to science: awareness, enjoyment, interest, opinion forming, and understanding (Burns, O'Connor and Stocklmayer, 2003). It encompasses a range of activities, including public lectures, media interviews, and public debates. When scientists engage in such activities and communicate scientific knowledge to the public, they may aid people in reaching better decisions on health, happiness, and their own lives. These activities can also create favorable attitudes toward science among policymakers as well as help to generate excitement among young people who may have not considered a career in science (Treise and Weigold, 2002).

Extensive research has sought to explore the factors motivating scientists to participate in science communication. Among these are individual level factors, including academic status, discipline, perceived norms, and gender (Dunwoody et al., 2009; Poliakoff and Webb, 2007; Tsfati et al., 2011), as well as organizational level support (Marcinkowski et al., 2014; Neresini and Bucchi, 2010). These factors significantly predict a scientist's science communication intention (Besley, 2014; Poliakoff and Webb, 2007) or self-reported actual science communication behaviors (Besley et al., 2012; Dudo, 2012; Marcinkowski et al., 2014).

Previous research has focused solely on participation intentions and frequency of self-reported behaviors. However, the intention to participate or a self-reported behavior does not necessarily translate to effective communication. Effective communication requires scientists not only to be motivated to participate, but also to exert labor and cognitive efforts (Bracha and Fershtman, 2013). These efforts could help scientists understand the information demanded by the public and the most effective way to communicate science information (e.g. choosing the most appropriate media, Illes et al., 2010). Thus, this article not only examines a scientist's decision to participate, but also incorporates his/her choice on the amount of efforts to be put in these activities.

In short, this article aims to contribute to the science communication literature by considering scientists' public engagement in science communication as a process that includes participation and effort making. Thereby, the article seeks to advance understandings of the factors that motivate scientists to engage in science communication in a more refined way.

3. Social factors that promote scientist public engagement

This article focuses on two social factors that may influence scientists' public engagement process, namely, social proof and meaning. Social proof refers to the act of presenting individuals with responses of others in a given situation. Individuals have a tendency to seek social proof and "view a behavior as correct in a given situation to the degree to which one sees others performing it" (Cialdini, 1993: 95). Labor or a set of tasks is viewed as meaningful to the extent that (a) it is recognized and/or (b) has a purpose (Ariely et al., 2008). Thus, in this study we focus on how information of the behavior of scientists' peers (i.e. social proof) and benefits that their actions bring to other groups (i.e. meaning) influence their decision-making process. Both peers and beneficial groups are a scientist's "significant others."

3.1. Social proof

As a type of social proof, informing a scientist of other scientists' participation in public engagement may increase his or her intention to participate. One of the impediments of scientists' public engagement is the fear to be viewed negatively by others (Ecklund et al., 2012; Gascoigne and Metcalfe, 1997; Johnson et al., 2014). For instance, physicists view science communication a possible threat to reputation (Johnson et al., 2014). Meanwhile, according to a survey conducted by the Royal Society (2005), 20% of scientists worried that, by engaging in public activities, they would be viewed negatively by their peers. According to the principle of social proof, people look at the responses of others to determine what constitutes an appropriate action (Armitage and Conner, 2001; Asch, 1956; Cialdini and Goldstein, 2004), especially when they face uncertainty in decision making (Rao et al., 2001). Moreover, the presence of social proof is found to be more influential when people learn the behavior of their affinity group (Cialdini et al., 1999). In this way, social proof of peers' participation may mitigate scientists' concerns that they will be viewed negatively and make them recognize the value of such activity. In addition, social proof may increase participation simply because scientists imitate their peers' action. Therefore, we propose that scientists would have a higher intention to participate when knowing their peers's participation in public engagement.

The above hypothesis is supported by previous research that found injunctive normative perceptions (whether peers endorse a particular behavior) and descriptive norms (majority of peers conduct such behavior) as predictors of scientists' intention to participate in public engagement (Besley, 2014; Dudo, 2012; Besley, Dudo and Storksdieck, 2015). It should be noted, however, that social proof is different from social norms. Norms emphasize what the "majority" think as right and follow and are usually associated with perceived social pressure to perform or not to perform a behavior (Ajzen, 1991). Thus, social proof is a weaker intervention compared with norms.