

Experts' Goals and Constraints When Discussing Vaccines With Laypeople on a *Facebook* Group

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Abstract: Science education and science communication scholars have dedicated considerable attention to the fact that laypeople must rely on experts to make decisions in everyday life. Direct communication between experts and non-experts has been facilitated by social media. However, little attention has been given to the processes and outcomes of these communication events, and particularly, to the goals and constraints of the experts. Here, we characterize experts' considerations for answering science- and health-related questions on a questions-and-answers (Q&A) *Facebook* group dedicated to vaccines. Results indicate that experts have a diverse set of goals and constraints, including disseminating knowledge, defending science and calming fears. Constraints include maintaining collegiality and avoiding provision of medical advice. In light of the findings, we propose a concept of experts' "bounded engagement with the public."

Introduction

Recently, the scholarly community has dedicated increasing attention to the ways science literacy (SL) manifests itself in everyday life. SL has been loosely defined as the knowledge useful or valuable for individuals "using science in their lives, interacting with science information, and making decisions related to science" (National Academies of Sciences Engineering and Medicine, 2016, p. 3), and as a property of communities and societies as well. Since individuals have a necessarily "bounded understanding of science" (Bromme & Goldman, 2014, p. 60), they must rely on scientific experts, such as scientists and healthcare professionals, to cope with the demands of everyday life in a technologically advanced society.

Based on several strands of evidence, Feinstein (2011) has characterized SL as the ability to "interact with sources of scientific expertise in ways that help [one] achieve [one's] own goals" (p. 180). He also asserted that this is necessarily done from an "*outsider's*" perspective. Using similar reasoning, scholars have proposed that science education must focus on teaching students how to be intellectually dependent on "*insider*" experts and how to integrate scientific knowledge when they face a specific practical problem, such as a personal health dilemma or a community's environmental concern (e.g., Aikenhead, 2006; Norris, 1995; Weeth Feinstein, Allen, & Jenkins, 2013).

The sparse research on the usefulness of science literacy in everyday life has focused on lay perspectives, such as those of elderly people planning their heating budgets (Layton, Jenkins, Macgill, & Davey, 1993), or those of parents of children with special needs, such as Down's syndrome (Layton et al., 1993), autism (Weeth Feinstein, 2014) or hearing impairments (Shauli & Baram-Tsabari, 2016). By contrast, less is known about the *expert* side of lay-expert interactions, science-related or otherwise, especially in online environments, such as social media platforms and questions-and-answers (Q&A) services (Brossard & Scheufele, 2013; Shah, Oh, & Oh, 2009; Stilgoe, Lock, & Wilsdon, 2014). Moreover, existing studies on lay interactions with experts have focused on collective contexts of shared policymaking, while non-policy-related dialogue has remained "under-theorized and under-researched" (Davies, McCallie, Simonsson, Lehr, & Duensing, 2009, p. 338). This dialogue can promote learning among both experts and laypeople, in the social constructivist and socio-cultural senses of the word (Davies, McCallie, Simonsson, Lehr, & Duensing, 2009).

Hence, in this study, we explore dialogue on a controversial, everyday personal health issue in an online community of scientific experts and non-experts, from the perspective of scientific insiders. This is part of a larger study, which will incorporate experiences of non-expert "*outsiders*" as well. Specifically, we characterize the considerations guiding participation of experts in science and health in a Q&A *Facebook* group dedicated to vaccines.

Literature review

Public communication of scientific experts and health professionals with laypeople

Scientific experts often view their public communication as a one-way transmission of knowledge, meant to educate knowledge-deficient publics to various ends, e.g., to assuage fears of new technologies (Burchell, 2015; Simis, Madden, Cacciatore, & Yeo, 2016). For example, in Cook, Pieri and Robbins (2004), scientists

developing genetically modified crops justified this technology by communicating about it within a narrow evidentiary perspective, rather than including ethical or political perspectives. Accordingly, they focused their communication efforts on simplifying scientific information for non-expert audiences. This perception is in line with the "deficit" model of science communication, which views public lack of scientific knowledge as the cause of disagreements on socio-scientific topics (Trench, 2008). Deficit-model thinking tends to guide most expert communication of science *online* as well. In the USA, a survey among members of the American Association for the Advancement of Science (AAAS) found that respondents typically prioritized "deficit-like" goals higher than "dialogue-like" goals for their public communication online (Dudo & Besley, 2016). Similarly, Chinese scientists who communicate publicly about science online prefer delivering lectures over public dialogue on controversial topics, to avoid trouble with their institutions and to avoid offending other scientists (Jia, Wang, Miao, & Zhu, 2017). Additionally, English-speaking science bloggers tend to perceive their communication roles primarily as "explainers" and "civic educators" rather than "conveners" who connect scientists with non-scientists (Jarreau, 2015).

By contrast, some scientists favor a two-way, more symmetrical exchange, especially in policymaking contexts (Burchell, 2015; Simis et al., 2016). These perceptions are in line with the "dialogue" and "participation" models of science communication (Trench, 2008). For example, in Burchell, Franklin and Holden (2009), 30 UK biomedical scientists with experience in public engagement were reported to perceive members of the public as legitimate and capable interlocutors in policy debates relating to science and health.

In health contexts, there is limited research on online dialogue between laypeople and health providers in public settings, such as online health communities. Instead, most research focuses on interactions among patients (Vennik, Adams, Faber, & Putters, 2014). However, several case studies provide a glimpse into some expert perspectives of online communication with laypeople. Firstly, health professionals participating in a Slovenian online health community noted that they enjoyed sharing medical knowledge and dispelling misconceptions and stigmas about diseases, yet they also reported difficulties managing ethical aspects, and often felt overloaded by the number and complexity of questions (Atanasova, Kamin, & Petrič, 2017). Secondly, a content analysis of a Dutch infertility forum showed that health professionals often respond to patients' informational questions and utterances reflecting concern (Aarts et al., 2015). In the USA, experts on WebMD online health communities typically provide answers with clinical expertise (90% of answers), refer them to their doctors (16.7% of answers) and attempt to build rapport with them in various ways, including expressing empathy and encouragement (5.8% of answers) (Huh, McDonald, Hartzler, & Pratt, 2013).

Overall, the available evidence has an important implication for science literacy: Even though 72% of U.S. internet users report seeking health information online (Pew Research Center, 2013) and 87% report seeking scientific information online (Pew Research Center, 2006), there is little evidence that scientific experts or health professionals routinely try to attend to lay authentic needs and desires in their public communication. Hence, there is little evidence that laypeople have opportunities to interact directly with such experts online and co-construct knowledge with them.

Motivations and objectives of answerers on online Q&A services

Several aspects of Q&A services, such as *Quora* and *Yahoo! Answers*, have been studied, including the types of questions asked by asker demographics (Baram-Tsabari, Sethi, Bry, & Yarden, 2006), asker motivations (Morris, Teevan, & Panovich, 2010) and answer quality (Harper, Raban, Rafaeli, & Konstan, 2008). However, few studies have explored Q&A services from the answerer's perspective (Oh, 2012; Shah et al., 2009). The existing studies on answerers are mostly based on questionnaires and user activity data. On *Yahoo! Answers*, answerers who produced health-related content reported that their main motivations were altruism, enjoyment and a sense of efficacy (Oh, 2012). Harper et al. (2008) observed that in at least one case, a large, active community of both researchers and volunteer users contributed to the quantity and quality of answers. Quantitative data on a Chinese social Q&A service, such as following accounts and "upvotes", suggest that answerers were motivated by peer recognition and social learning (Jin, Li, Zhong, & Zhai, 2015). Additionally, several correlations were found between reported motivations and reported answering strategies. For example, questionnaire data suggests that answerers motivated by efficacy tend to select difficult questions, and a learning motivation correlates with searching for additional information when creating answers (Oh, 2011).

Vaccine hesitancy

We chose to investigate public communication of scientific experts in the context of the public controversy surrounding vaccines, because of the pervasiveness of the phenomenon: Health authorities recommend that all children be vaccinated against several infectious diseases, with only rare exceptions. Health authorities regard routine childhood vaccines as a safe and effective way to prevent and even eradicate disease, yet "[a]t the needle

point, [vaccination] enters the intense social world in which parents and carers seek to help their children flourish" (Leach & Fairhead, 2007, p. 2). Although vaccination coverage rates are high in high-income countries, many parents in these countries hesitate to vaccinate children under their care. In fact, 17% of adults in the World Health Organization's European region consider vaccines unsafe, compared with 13% worldwide (Larson et al., 2016). "Vaccine hesitancy" is a complex decision-making process, that depends, among other variables, on trust in health authorities and in mainstream medicine (Peretti-Watel, Ward, Schulz, Verger, & Larson, 2015). Although scholars have recognized the potential of social media for vaccine promotion (Stockwell & Fiks, 2013; Wilson, Atkinson, & Deeks, 2014), few studies have documented vaccine-related discourse online. While there is some research on question topics sent to expert-based Q&A services (García-Basteiro et al., 2012) and of online discussions about vaccines (Fadda, Allam, & Schulz, 2015; Nicholson & Leask, 2012), none of these studies focused on scientific experts' participation in these discussions. A content analysis of the Israeli *Facebook* group "Parents Talk about the Polio Vaccine" indicated that experts tended to base their claims on ideas relating to the nature of science and to methods of scientific inquiry more often than non-experts. Additionally, claims, even those made by experts, were seldom supported by evidence (Orr & Baram-Tsabari, 2017; Orr, Baram-Tsabari, & Landsman, 2016).

Research question

What considerations guide experts' participation in health and science in a vaccine-related Q&A group on social media?

Research field

We conducted this study on the Hebrew-language *Facebook* group *Medabbrim Al Hissunim* ("Talking about Vaccines"; hereafter *TaV*), founded in October 2013. *TaV* had over 28,000 members in October 2017. On the group, askers may pose vaccine-related questions and receive answers from community members at no cost. Most askers are mothers of infants. Answerers are often, but not always, experts in science and medicine, including physicians, nurses and scientists, as well as physicians-in-training and scientists-in-training. A list of expert names and professional titles is available through the group description. According to group rules, non-experts in science and medicine are permitted to answer too, but only if their answers reflect "the evidence-based scientific consensus." Some non-expert answerers are very active as well. Hence, the group can be considered a hybrid between a "community-based" Q&A service and an "expert-based" Q&A service (Shah, 2017). *TaV* has a "public" privacy setting, meaning that its content is visible to non-members. It is operated by a small, volunteer-based Israeli non-profit organization named *MiDa'at* (derived from the Hebrew term *Haskama MiDa'at*, "informed consent"). The organization advocates compliance with the vaccination schedule recommended by national public health officials. *MiDa'at* and *TaV* were founded in the wake of Israel's 2013 Polio crisis, continuing and expanding the activity which took place in a previously established pro-vaccine *Facebook* group, described in Rubin et al. (2016), Orr et al. (2016) and Orr et al. (2017).

Methodology

Interviews were conducted with ten *TaV* answerers as part of a larger multiple case study. Two were physicians; one specialized in family medicine and the other was a pediatrician. Another answerer was a physician-in-training. Two answerers were nurses, and five had completed graduate-level research training in biological or medical sciences, or were currently in such training (Table 1). Snowball sampling was used, with "snowball criteria" of being an expert in science or health with at least six months' experience answering questions on the group.

Table 1: Demographic details of interviewees

	Pseudonym	Gender	Professional Background	Interview Length (Minutes)
1.	Dan	Man	Physician-in-training	105
2.	Hila	Woman	Ph.D. student in a biological/medical field	37
3.	Matan	Man	Physician	48
4.	Vered	Woman	Nurse	39
5.	Yokhi	Woman	Physician	74
6.	Ma'ayan	Woman	Nurse	69
7.	Shlomo	Man	Ph.D. in a biological/medical field	37

8.	Tomer	Man	Ph.D. in a biological/medical field	57
9.	Shira	Woman	M.Sc. student in a biological/medical field	29
10.	Abraham	Man	M.Sc. in a biological/medical field and combat medic	61

Approximately 30- to 60-minute-long interviews were conducted with each participant, using a two-part protocol. The first part of the interview was a semi-structured interview focusing on the interviewee's motivations for participating in *TaV* and on their perceptions of askers. Some questions were: "In your opinion, what prompts askers to ask questions in the group?" and "How do you think that askers decide whether to trust you?". The second part was a modified "stimulated recall interview" (Lyle, 2003; Shubert & Meredith, 2015), which can also be considered a modified "reconstruction interview" (Reich & Barnoy, 2016). In this part, study participants were given print-outs of five to six *TaV* threads they had participated in during the 6 months preceding the interview. They were then asked to read each print-out and explain how they interpreted each question and what considerations they had when composing their answer(s). Interviews were conducted at the participants' homes, workplaces or universities, at each one's preference. The interview with Hila was transcribed by the first author and all others were transcribed by a professional service. All transcripts were coded inductively in MAXQDA by the first author. Approval was obtained from the authors' institutional review board (approval number 2016 – 19) and from the *MiDa'at* board of directors.

Results

Experts used a diverse set of considerations in their online communication about vaccines. Goals included disseminating knowledge about the vaccines and the diseases they help prevent, defending science against unfounded rumors and conspiracy theories, and calming fears of parents. At the same time, answerers were mindful of two salient constraints: maintaining collegiality with their health professional peers and avoiding provision of medical advice for individuals, even though askers' questions are often phrased in individual terms (Table 2).

Table 2: Goals and constraints of *TaV* experts

Theme	Prevalence	Example quote
Disseminating knowledge (Goal)	High	"[The mother] asked, 'does a two- or three-week delay in the vaccines for four-month-olds hurt the efficacy of the vaccine in any way'. I answered that there was no problem at all in terms of efficacy. The only consequences had to do with delaying the protection that vaccines give." (Hila)
Defending science (Goal)	Medium	"I wrote that one of the rumors that annoyed me the most [...] was about immunological memory. [...] People keep saying as if it were a fact: 'Infants have no immunological memory. Obviously.' And that's so wrong. It's so easy to disprove." (Hila) In response to a mother who asked whether MMRV, a live attenuated vaccine, provided only community immunity, rather than protecting the vaccinated child. The mother asked the same question in an anti-vax Facebook group: "So I took this mix-up that she made and made a snide remark: Pay attention to the people giving you answers elsewhere. 'Whoever told you that [...] doesn't know what they're talking about. Really, I suggest you always ask whoever's giving you answers about their education and training and what they're basing their answer upon.'" (Dan)
Calming fears (Goal)	Medium	In response to a mother who observed her child talking less often, and suspected that vaccination caused a decline in language development: "I started from the point: 'You did the right thing.' Because she wrote that she may have done damage with the vaccine. 'On the contrary, you did the right thing. You protected your child. Vaccines have nothing to do with language development.'" (Dan) "A lot of the time, [if askers are in emotional turmoil] I don't answer. I let [other] parents respond from their perspective as parents. And if I do, many times I say: 'Look, I'm doing a PhD in [a biomedical field –

		redacted], I took many classes, I read a lot of papers and I vaccinate my children.' Sometimes that helps too. It reassures." (Hila)
Maintaining collegiality (Constraint)	Medium	"If there's a measles outbreak [in Europe] and people say, 'the nurse wouldn't give a vaccine,' you know, I [maintain] collegial[ity] to the [staff of the] well-baby clinics. [...] I give the rationale and why we act the way we do, and what the rules say and who guides us." (Vered) "Someone I know who lives in [town – redacted] asked a question [on TaV] about a vaccine for her one-year-old child, who had a very very long fever, and we sent her to a doctor and the doctor told her things. [...] I was tempted to ask who the doctor was who told her this nonsense, because he said it was from the vaccine even though the child had sores in the mouth and all the signs of foot and mouth disease, that can cause a really long fever, but it clearly wasn't an adverse reaction to the vaccine. [...SO WHAT DID YOU DO?] Nothing. [...] It's none of my business. I need to let her professionals do their work even if I think they're wrong." (Yokhi)
Avoiding provision of medical advice (Constraint)	Medium	"Somebody once told me – one of our supervisors here [at the well-baby clinic] – 'Be careful when you answer [on TaV] because they can sue you. So that made me think more, because, in fact, I don't give individual answers anymore. [...] I don't give individual advice, I write my answer more generally.'" (Vered)

Discussion

Experts exhibit a complex set of goals and constraints in their communication with askers on *TaV*. In some ways, findings evoke previous research on public communication of science by scientific experts, but in other ways, they diverge from the literature. For example, answerers report taking a defensive stance against anti-vax activists, like the "defending science" motivation reported by many scientists communicating online. On the other hand, they exhibit a caring and nurturing form of science communication, offering health information and social support for vaccine hesitant parents who specifically ask for it. *TaV* can be considered a community for on-demand dissemination of scientific information. This communication is a modified form of the deficit model, characterized by being guided by the publics' genuine information needs. This, arguably, makes it more "legitimate" than other dissemination activities (Trench, 2008, p. 130), which have been characterized as "top-down," "hierarchical," "linear, pedagogical and paternalistic" (Bucchi & Trench, 2014, pp. 3-4).

However, the constraints also deserve further reflection. Just as there is discussion of publics' "bounded understanding of science" (Bromme & Goldman, 2014), we propose to introduce the concept of experts' "bounded engagement with the public". Even the most well-intentioned experts are bounded by their own knowledge (including knowledge of the askers' specific context) and by social constraints, such as the relationships that experts must maintain with their peers.

Further research on co-construction of scientific and health knowledge in online communities can take several directions. Firstly, whether answerers achieve their goals vis-à-vis askers remains to be examined empirically through research with askers. Do dissemination efforts result in knowledge gains? Do answerers' efforts to calm askers truly work? Secondly, further research could characterize the competencies needed for experts for meaningful dialogue with laypeople. Do experts learn these competencies "on the job" or do they draw on skills learned beforehand? To what extent can these competencies be taught, and what are some effective ways to do so? Thirdly, the concept of experts' "bounded engagement with the public" raises questions about the nature of that engagement. What kind of lay questions do experts think they can reasonably answer, and how does that compare with laypeople's expectations? Research into these questions can advance understanding of science literacy on the community level, both within technologically-enhanced environments and outside of them. It can also advance the understanding of co-construction of knowledge in online communities.

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