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IN THIS ISSUE

The Multipurpose Tool of Social Media: Applications for Scientists, Science Communicators, and Educators

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Abstract

Social media has become the fastest way to disseminate new information, share personal experiences, and discuss scientific reports in an open-access setting. It acts as an aggregator of news and reports, a platform for education, a means of public outreach, and a tool for scientific research. Each social media service offers unique communication benefits. This review discusses how scientists are using social media to inform and learn from social media communities, concentrating on microbiology and infectious disease.

Introduction

The term "social media" describes any of a number of networks, hosted through the Internet, that allow interaction between network members. The value of the network is in its breadth and the ability of users to assemble large communities with members from distant locales that would otherwise not be able to interact. In that sense, social media serves us like an international, all-access water cooler. Certainly, most readers are likely familiar with social media websites such as Facebook, Twitter, and Instagram. These websites allow posts within designated parameters that can be hosted and shared by user accounts. LinkedIn, Tumblr, and Snapchat (currently only a smartphone app) are additional platforms, and each outlet varies in its content, focus, ability to add images or links, and character limits.

There are social aspects of communities formed around Reddit and other forums that promote sharing and discussion among users. These communities include the targeted Clinical Microbiology Network (clinmicronet), which allows users (primarily doctoral-level scientists who are clinical microbiologists) to pose questions to the group at large, and respondents can self-select based on their expertise, time, and willingness. The American Society for Microbiology hosts clinmicronet and divC, a similar site for both doctoral- and non-doctoral-level clinical microbiologists). Reddit communities, known as subreddits, include r/microbiology and r/medlabprofessionals, among other science-oriented subreddits, and are used to pose questions, notifications, and observations related to their titles. However, these forums differ from above-mentioned platforms in that users do not maintain an active individual feed, access is exclusive rather than open, or both. This article focuses on social media that allow universal access and in which individual users curate a home page (also called a wall), as well as interact with other users.

The reasons to use social media vary among users, and these reasons partially determine the level of user activity. The passive user utilizes social media feeds to aggregate news, both by following news outlets directly and by seeing items shared within one's social network. A 2016 Pew Research Study shows that 62% of American adults get news from social media, up from 49% in a 2012 study [1]. Subscribing to scientific journal feeds, society feeds, and science journalists provides up-to-date information on the latest conference, education, and research publication

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news. The active user posts his or her ideas, articles of interest, or responses to other users for a variety of reasons. The type of activity is often dictated in part by the format of the platform.

Structure Dictates Function: Different Social Media Platform Styles

Each social media platform (in this case, application or website for interaction) varies in its ease of link sharing, image uploading, and character limits. These characteristics reach different audiences and convey different types of information.

The most widely known and used social media platform by far is Facebook: 79% of online Americans have an account, and 76% of those with accounts check in daily [2]. Personal accounts represent the individual, who can form networks with other individuals, requiring both parties to mutually agree to "friend" one another; most scientists use Facebook for personal communication and to share science with friends and family [3]. Not only does Facebook have the highest proportion of American adult users, it also has the highest proportion who use the site for news (44% of adults) [4]. For this reason, many professional outlets maintain an active Facebook fan page. Fan pages differ from personal accounts in that individual users can like/follow a fan page unidirectionally to receive updates from that account without being followed by the fan page.

Fan pages allow all interested individuals to learn about a topic or organization. While the American Society for Microbiology has 47,000 worldwide members, its active Facebook fan page reaches over 280,000, drawing a much broader audience than its membership [5]. Followers learn microbiology facts; view images from ASM's annual Agar Art contest; and receive links to books, reports, and blogs on microbiology topics. The page is also a major source of news about ASM events, resources, and opportunities. ASM uses the large reach of its Facebook site to promote upcoming conferences, journal publications, and fellowship availability. These promotions are an effective way to engage an audience: social media, especially Facebook, can promote continuing medical education options more effectively than email [6].

Many ASM Facebook fan posts lead readers away from Facebook, where they can read a blog post, sign up for a conference, or submit a fellowship application. However, the community on Facebook is also engaged with the content on the fan page. Followers comment or ask questions about the scientific content of posts, and these questions are often answered by other fans. A popular Facebook post in 2016, titled "Assessing Gram Stain Error Rates," promoted a blog about a *Journal of Clinical Microbiology* article [7] reporting a higher-than-expected error rate among clinical microbiology laboratories. The post was widely shared and commented on by microbiologists of all training levels. The topic popularity was in part due to the ubiquity of the technique among all levels of microbiologists, as students, technicians/technologists, and researchers are familiar with the protocol. This accessibility is important to engage a wide audience; introductory microbiology students are unlikely to be ASM members, but their experience with the Gram stain during laboratory courses allows them to feel part of the community.

Instagram is one of the most visually appealing platforms, originally based entirely on images during its launch in 2010 and expanding to video in 2013. Each image or video is accompanied by a caption, and hashtags are often used to guide people to key search words. Captions have 2,200-character limits but require the reader to "open" the caption beyond the first three lines.

The compelling images of Instagram make it a great platform for educational outreach. New York University graduate student Sally Warring posts videos at @pondlife_pondlife of microscopy images taken from water samples near her New York City neighborhood [8]. Each image or short video taken with her iPhone is accompanied by a short description of the world of diatoms, algae, and dinoflagellates. With a following of over 45,000, Warring attracts many people by the images and the short stories she tells about her microbes, which allows her to teach an international audience about environmental microbes.

Instagram typically has less user engagement than Facebook, in that there is less commentary discussion on most images. Many followers "like" a post, but very few comment, and many comments are tagging a friend (by writing @ and the account name) to ensure a friend sees the image. The lower engagement may be due to its smartphone-friendly interface. Users can access their accounts to view images on a computer, but posting photos is restricted to use of the Instagram app on one's smartphone. Additionally, Instagram does not convert hyperlinks, and normally, only a single link can be referenced in an account summary, making promotion of other websites using Instagram more cumbersome than Facebook.

Twitter is a medium that promotes short-form posts with a limit of 140 characters per post (or "tweet"). Shortened links count toward the character count, but Twitter changed its parameters in September 2016 to allow photo and video attachments outside the limit. While 24% of online Americans are estimated to have a Twitter account [2], few systematic studies of the scholarly use of social media, including Twitter, exist. A 2012 study of 8,826 scholars from 5 universities showed that 1 in 40 scholars (faculty, postdoctoral students, or graduate students) were active Twitter users [9]. A 2016 study of 587 academics recruited using Twitter showed that Twitter, Facebook, and LinkedIn predominate among academic scientists' use of social media [3] and that most scientist Twitter users consider fellow scientists to be their major audience [3].

Despite this, personal twitter accounts are used for a variety of non-exclusive purposes. Because both journalists and scientific journals promote science stories through their own accounts, Twitter can be a great listening device that facilitates quick news aggregation. Feeds can be organized by creating lists, which can filter feeds by topic if one is using Twitter to follow mainstream science news, science communication specialists, and tuberculosis researchers simultaneously. Additionally, users can subscribe