

COMMENTARY – Professional Development

# Social networks as a tool for science communication and public engagement: focus on Twitter

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One sentence summary: Twitter is strongly recommended for researchers and faculties to share and communicate science to society, enhance their visibility, and as a tool for teaching and learning.

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## ABSTRACT

Social networks have been used to teach and engage people about the importance of science. The integration of social networks in the daily routines of faculties and scientists is strongly recommended to increase their personal brand, improve their skills, enhance their visibility, share and communicate science to society, promote scientific culture, and even as a tool for teaching and learning. Here we review the use of Twitter in science and comment on our previous experience of using this social network as a platform for a Massive Online Open Course (MOOC) in Spain and Latin America. We propose to extend this strategy to a pan-European Microbiology MOOC in the near future.

**Keywords:** social networks; Twitter; science communication; open access

## INTRODUCTION

Currently, most people are users of social networks like YouTube, Facebook, Twitter or Instagram and have incorporated them into their daily lives, often unconsciously, as powerful engines for capturing information. Besides the reward of immediate feedback, they have the advantage of incurring no costs, which makes them available for the younger population. Social networks are already being exploited for learning, discovering, searching, storing and, above all, sharing knowledge, demonstrating that they are an efficient vehicle for social learning that could be added as a competent tool for formal learning. Many people, particularly the younger generations, consider conventional communication channels like E-mail as too formal, rather adopting more dynamic platforms that urge an immediate reply. Thus, the cyberspace offers nowadays new paths for science communication that support both active social learning and collaborative teaching.

## TWITTER IN SCIENCE

Twitter is among the most popular social networks, integrating a community of over 500 million users around the world. It consists of a 'microblogging' service that allows the sharing of short messages as well as including images, videos and hyperlinks to other sites, etc. Twitter is meant to produce, exchange and spread concise statements, making it one of the best platforms to share information in a very quick, efficient and collaborative way. When you share information on Twitter it works as an international publication, designed by yourself, online and free, that gives you information in real time, updated constantly. For all these reasons, Twitter has become an important communication channel for stakeholder groups in science. Today, major academic publishers and the most important scientific journals have a Twitter account (Table 1) and use it to post their latest table of contents, editorial pieces, news or publications. Also, several scientific societies and research centers use social media platforms such as Twitter to promote upcoming conferences,

**Table 1.** Twitter accounts in microbiology science.<sup>a</sup>

Organization	Twitter account
Science	@sciencemagazine
News from Science	@NewsfromScience
Nature	@NatureNews
Nature Microbiology	@NatureMicrobiol
Nature Reviews Microbiology	@NatureRevMicro
Nature Research	@nresearchnews
PNAS	@PNASNews
PLOS	@PLOS
PLOS ONE	@PLOSONE
PLOS Biology	@PLOSbiology
PLOS Pathogens	@PLOSPathogens
mBio	@mbiojournal
Microbes and Infection	@MicrobesInfect
Trends in Microbiology	@TrendsMicrobiol
BioMed Central	@BioMedCentral
Elsevier	@ElsevierConnect
Elsevier News	@ElsevierNews
Elsevier Microbiology	@MicrobeTweets
Wiley Libraries	@WileyLibINFO
Wiley Open Access	@WileyOpenAccess
Springer Open	@SpringerOpen
American Society for Microbiology	@ASMmicrobiology
ASM News	@ASMnewsroom
MicrobeWorld	@MicrobeWorld
microBIO	@microBIOblog
FEMS	@FEMSTweets
Spanish Society for Microbiology	@SEMmicrobiologia
Microbiology Society	@MicrobioSoc
Society for Applied Microbiology	@SfAMtweets
Microbial Resource Research Infrastructure	@MIRRIlive
Microbiome Live News	@metagenomics
CDC Global Health	@CDCGlobal
European Centre for Disease Prevention and Control	@ECDCEU
Global Biodefense	@GlobalBioD
Spanish National Research Council	@CSIC
Centre National de la Recherche Scientifique	@CNRS
Institut Pasteur	@institutpasteur
Biotechnology and Biological Sciences Research Council	@BBSRC
EMBO	@EMBOcomm
EMBO Press	@EMBOPress
EMBL	@embl
Infectious Diseases	@InfectiousDz
Small World Initiative	@Team_SWI
Small World Initiative Spain	@SWISpain

<sup>a</sup>The list is not exhaustive; it is only an example of some Twitter accounts related to microbiology.

journal publications, links to books, reports or blogs on science topics, and news about society events, resources and opportunities. In this regard, Twitter can be used not only for communication with society members but also to share science with a much broader audience than its membership. Every day more scientists use Twitter for personal communication and to generate research ideas, discuss scientific results or extend the relationship between researchers (Ke, Ahn and Sugimoto 2017). In addition, Twitter users can subscribe to scientific journals or society feeds to get up-to-date information on the latest research publication or scientific news. The application of social networks,

and specifically of Twitter, to enhance the visibility of our professional activities has been strongly recommended for researchers and faculties (Fuller and Allen 2016; Tripathy et al. 2017).

Altmetrics and webometrics from Twitter can also be used as a measure of public interest or concern about health-related events. Emergency organizations can collect valuable information and monitor social media before, during and after an outbreak. For example, Twitter has been used to predict and detect influenza epidemics in the USA (Signorini, Segre and Polgreen 2011) and Korea (Woo et al. 2017), to understand how people react to Zika virus outbreaks in real time (Fu et al. 2016; Miller et al. 2017), and for the early detection and monitoring of dengue epidemics (Marques-Toledo et al. 2017). In this regard, Twitter may support and extend the capacity of traditional public health surveillance systems for detecting, controlling and fighting infectious diseases or outbreaks (Al-Surimi et al. 2017). The value of monitoring social media like Twitter has also been explored to encourage the use of antimicrobial stewardship program resources and to promote antimicrobial awareness among internal medicine residents (Pisano et al. 2016), or even to prepare for a potential bioterrorist or agroterrorist incident (Sjöberg et al. 2013). Twitter can also be used to understand public sentiment about vaccination programs (Becker et al. 2016), and to educate society and counteract viral misconduct by non-scientifically motivated actors, which are skeptical and hostile to vaccination and highly active on the Internet (Rosselli, Martini and Bragazzi 2016).

In addition, Twitter has been used in teaching and learning, and as a platform to communicate science to society (Thompson 2015). Recently, Twitter has been successfully used as a pedagogical tool in an assessment to enhance the educational experience and increase student engagement with staff and course content in several science and medical education programs (Mckay et al. 2014; Diug, Kendal and Ilic 2016; Gonzalez and Gadbury-Amyot 2016). However, despite the general recommendation for the use of Twitter in academic environments, there are yet scarce examples available in the literature of its use in science communication.

## WHY EVERY MICROBIOLOGIST SHOULD BE ON SOCIAL NETWORKS

It is still a challenge for faculties and scientists to integrate social networks in their daily academic and research routines. However, in our experience several benefits can be achieved with their use.

### Personal brand

Many users utilize social media to increase their personal brand. They are a great tool for faculties to communicate about their research and to write and debate about relevant research issues (Wolf 2017). When you publish a scientific paper you can reach ideally a few hundred people, but if you use social media to announce and share your publication the number of potential readers increases significantly. Social networks can be a window display of your research and publications, which allows you to enhance your online visibility worldwide. Also, following colleagues with similar interests can extend your professional relationship. In addition, social networks are a great equalizer that allows scientists at any stage of their career path to connect with other scientists, removing the barrier of status.

## Improve your skills

Sharing via Twitter short and coherent messages improves your written expression skills by using richer and more accurate language, which can also have a positive impact in your teaching skills. At the same time, interacting in social networks with other scientists and colleagues can help you to learn new topics about your own discipline or others. Networking and exchanging ideas can be a source of inspiration, help you to increase your critical spirit, be more creative and wake up your curiosity.

## Public engagement

Promoting public engagement with science is part of a scientist's professional responsibility and scientists should find ways to communicate their scientific results to the society that supports them (Smith 2015). Social networks have the potential to transform dialogue between science and society. An increasing number of people use social networks for science news sourcing, so it is important that scientists adapt to this new mode of communication. Scientists can use social networks to extend their audience, communicate about science and technology outside the classroom, and encourage young people to choose science as a career. The more information society has the more free and less easily manipulated it is, so the presence of scientists in social networks will be a source of public opinion. Finally, another good reason to be in social networks is that it is funny and enjoyable.

## A CASE STUDY: THE #microMOOCSEM EXPERIENCE

During 2016–17 we had the initiative of using Twitter as a lesson delivery method to teach an entire course of General Microbiology (López-Goñi et al. 2017). A group of members of the Spanish Society for Microbiology (SEM, Sociedad Española de Microbiología), from 20 different Universities or Research Centers located in Spain, USA or UK, were engaged as teachers. Each lesson was related to a particular microbiology topics (microbial diversity, biotechnology, AIDS, microbiome, vaccines or antibiotic resistance). Lectures were divided into 30–40 tweet-size statements with associated links, related web pages, blogs, slides, news, and especially images and videos. Each tweet was written using simple and concise language, meant to communicate science to a general audience outside the academic environment. Lectures were aggregated with the hashtag #microMOOCSEM: 'micro' acknowledges both the subject under focus, Microbiology, and the fact that it is conceived for the small 140-character format; 'MOOC' stands for Massive Online Open Course and 'SEM' for the scientific society. Tweets were programmed by using the application TweetDeck (<https://tweetdeck.twitter.com/>) to be posted at a frequency of one tweet per minute. Students were encouraged to follow the lectures through their mobile devices or computers, either live or later, following the hashtag #microMOOCSEM. After each class was posted, tweets were compiled and stored on-line by using the open tool Storify (<https://storify.com/>), so that they could be consulted any time after the class was over. Some classes reached over 260 000 impressions and 3700 retweets. During the time that the course was active, the Twitter account of the SEM received more than 4 million impressions (number of times that other Twitter users visualized a particular tweet) and over 175 000 visits (number of times that other Twitter users visited your profile page). A second edition, under the motto 'break walls and build bridges',

was emitted with the hashtag #microMOOCSEM2. On this occasion we involved professors from Spain and Latin America and 58% of the followers were located outside of Spain. These experiences demonstrated that MOOCs via Twitter were highly dynamic, interactive and accessible to great audiences, providing a valuable tool for social learning and communicating science. They are also a good example of the benefits that engaging with Twitter bring to a researcher. Now it is time for a pan-European microMOOC course.

## CONCLUSIONS

Social networks are optimal platforms for bridging the gap between research, education and science popularization. They can be an online dynamic display for research lines and publications, allowing an enhancement of the visibility of our science worldwide. Twitter microbiology courses have been an excellent way to make science open and accessible to all readers free of charge. This is also a call for all of you who are interested in joining as a Twitter professor in a pan-European Microbiology MOOC.

**Conflict of interest.** None declared.

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