2018

Chemists Atwitter

Raychelle Burks
St. Edwards University, rburks@stedwards.edu

Stephani Page
University of North Carolina–Chapel Hill

Kiyomi D. Deards
University of Nebraska-Lincoln, kdeards2@unl.edu

Joan Barnes
University of Nebraska-Lincoln, jbarnes3@unl.edu

Chemists Atwitter

Raychelle Burks,[1] Stephani Page,[2] Kiyomi D. Deards,[3] and Joan Barnes[4]

1 Department of Chemistry, St. Edwards University, 3001 S. Congress Avenue, Austin, Texas 78704; Twitter: **@DrRubidium**

2 Dohlman Lab, Department of Pharmacology, School of Medicine, University of North Carolina–Chapel Hill, Chapel Hill, North Carolina 27599; Twitter: **@ThePurplePage**

3 Research and Instructional Services Department, Love Library, University of Nebraska–Lincoln, P.O. Box 884100, Lincoln, Nebraska 68588-4100; Twitter: **@KiyomiD**

4 User Experience Department, Love Library, University of Nebraska–Lincoln, P.O. Box 884100, Lincoln, Nebraska 68588-4100; Twitter: **@UNL_Lib**

Corresponding author — Raychelle Burks, email rburks@stedwards.edu

Abstract

Twitter can be used to promote chemists, their work, and their events to other scientists and the general public. From checklists to timelines; how to use Twitter successfully as an individual or institution is discussed. This chapter includes: examples of how the authors have used Twitter, how to find and use common subject tags, tags most used when Tweeting about chemistry and science, and a discussion about measuring success. Knowing when and how to Tweet will help chemists communicate successfully with their peers and the general public in 280 characters or less.

Introduction

Social media now dominates the way that billions of people communicate for personal, professional, and humanitarian purposes. With rapidly increasing access to the web and mobile computing devices, the World Health Organization (WHO) dubbed social media "a great information equalizer" being "instant and borderless," continuing that social media is "... an opportunity for health professionals to explore, listen and engage" (1). One could easily transform this statement to be applicable to chemistry — social media is an opportunity for chemists and chemistry educators to explore, listen, and engage.

Why Twitter?

Jack Dorsey, a co-founder of Twitter, sent out the first tweet on March 21, 2006 (2). Since then, people have asked, "Why Twitter?" (3). In general, the benefits of Twitter are often said to include its dominance in the area of breaking news, potential for high engagement, and succinct messages due to the platform's character limit of 280 character, formerly 140 characters (4, 5). The reasons scientists use Twitter follow these general categories and include the following: rapid information acquisition and dissemination, discussions on new research and projects, networking and collaborating with peers within and across disciplines, outreach to non-scientists including the general public, policymakers, and members of the media (6–11). "Creating a personal brand and developing a social strategy to communicate your science are critical building blocks for maintaining professionalism across new form of media," asserts Jennifer Maclachlan, Chair of the ACS Committee on Public Relations & Communications (12). In this chapter, we will present how-tos, tips, and suggestions for using Twitter, both as an individual and as an institution.

Getting Set-Up

Both individual and institutional accounts can take a variety of forms and it is important for individuals and institutions to consider the identity that they want to shape. Individuals may wish to have a strictly professional account; sharing and discussing only work products and projects, research, discipline-related news items, and joining and/or monitoring conversations relevant to their professional areas of interest. Other individual Twitter users may wish to mix professional with a more general lifestyle bend. Institutional accounts tend to lean toward the strictly professional.

A "strictly professional" account does not mean that personality, humor, empathy, etc. is forbidden. As with everyday professional and personal conversations one must consider: the situation, the broader context, the audience, the communication goals, then select your speech to suit. Institutions often have a public relations strategy in place. These communications policies and professionals will shape and inform the institutional social media presence. Individuals have

many educational resources at their disposal. Resources include: institutional guidelines; professional society training, best practices, and resources. There is also a wealth of popular and scholarly resources. In addition, individuals can strategically evaluate and model their actions based on select Twitter accounts of chemists provided in a variety of lists (13–15).

Every Twitter account has a profile, which consists of the following basic features: username, biography/description, profile image, and header image.

The first step of starting a new Twitter account is determining a username. Institutions may have a rule or guideline in place for usernames, requiring reference to the institution and program/unit/department. For example, the official Twitter account for the University of Nebraska - Lincoln Department of Chemistry is @UNLChemistry. Individual chemists who use Twitter tend to take three routes in choosing a handle: a) using their name, ex. @SibrinaCollins, @DrQualls; b) using some reference to science, ex. @ChemJobber, @biochembelle, @DrRubidium; c) or some combination of the two, ex. @DrBoyd_Chemist. Twitter allows users to change their handle at will, but requires usernames be less than 15 characters (16).

When selecting a username, chemists should distinguish themselves. It is a good idea to search Twitter for one's desired handle to see if there is a strikingly similar username for another account. For instance, consider a chemist named "Jamal Smith" that goes with username strategy 'a)' and desires the user name "@jsmith17". In searching Twitter, they may find there already exists a "@jsmith18", "@jsmith71, and "@jsmith177". Given the plethora of similar usernames, it is a best to go back to the Twitter username drawing board. Avoid simply adding more numbers (e.g. @jsmith171117). Such handles are considered poorly named and can be associated with fake or bot Twitter accounts used by that spammers (17, 18). If this strategy does not work, it is best to use strategy 'b)' or 'c)'. Jamal Smith happens to be a spectroscopist. Jamal may select usernames "@specsmith" or "@specjamal", employing username strategy 'c)'.

Armed with a username it is time to tackle the biography/description portion of the profile. A Twitter biography/description includes three main parts: profile name, biography/description text, and a URL field. There is a 160 character limit for biography/description text (19). As with usernames, institutions may have guidelines. An example

of institutional guidelines is mandating a strictly informational description. The University of Minnesota Chemistry Department Twitter account, @UMNChemistry, has "Chemistry Department" in the name field (20). "The official Twitter page of the Department of Chemistry in the College of Science & Engineering at the University of Minnesota" is in the biography/description field (20). The department's website (chem.umn.edu) is listed as their URL (20).

Many individuals on Twitter use their first and last name for their profile name, but this is not a requirement and a user can select their profile name. If avoiding the use of one's full name, we recommend creating a profile name by applying the username creation strategies detailed above (21–23).

The 160 character biography text limit is a benefit rather than a limitation (24). A Twitter bio is not a curriculum vitae, resume, or biosketch. A Twitter biography is like an elevator pitch. People use this space to identify their specific discipline along with other related work or personal interests. Because of the character limit, some users stick to one to three sentences. They may also skip complete sentences for a collection of descriptive phrases, or use a mix of complete sentences and descriptive phrases. Our spectroscopist, Jamal Smith, has a mixed style biography. "Lightsmith that studies how atoms are connected. Staff scientist. Coffee lover. Comic book fan." This bio is light-hearted and shows personality, but highlights Jamal's scientific expertise. Social media is used to reach scientists and nonscientists. Creating a well-rounded profile that highlights our interests and personality enables us to connect with our discipline-specific peers, and those with whom we share mutual interests.

The URL is optional for non-verified Twitter accounts, but posting a URL can be a good way to connect other users with their lab website, online CV, a personal blog, LinkedIn profile, etc.

Twitter is a highly visual medium. This starts with your profile. Your profile will have two different images, your profile image and your header. Your profile image is a small image that represents you on each tweet or direct message (DM) you send. The header is the landscape orientated long image at the top of your profile page. Twitter recommends that profile images be 400x400 pixels, while header images should be 1500x500 pixels (19). A profile picture may be a picture of you, but it could be an image that you think represents you or your work. Our top tips for your profile or header images are that

they be of high quality, conform to the required dimensions, and fit the themes outlined in your bio (25–27). They should be images you would be happy to have splashed on the six o'clock news.

If you use stock images or images floating around the web, beware of image ownership and copyright. There are a variety of free stock images sights with agreeable copyright terms. One easy way to find images is to use a Creative Commons search, selecting the boxes "use for commercial purposes" and "modify, adapt, or build upon" boxes next to the statement "I want something that I can …" that is adjacent to the search query box. One way around copyright confusion is to use an image you have created! The average smartphone can take high quality images. Photos you have taken will likely showcase your interests and personality best. What types of images do chemists use for their profile and header? All sorts! Take a spin about chemistry Twitter for inspiration — but do not take too long in posting your own profile and header image. Twitter accounts with the stand-in egg image instead of a personalized profile image are often judged to be spam/bot/fake accounts, which are often blocked by individual Twitter users and add-on programs geared to blocking spam/bot/fake accounts (28).

Get Tweeting

Whether a new or continuing Twitter user, a good place to start is the Twitter Help Center pages *Using Twitter* and *The Twitter glossary* (29, 30). When we jumped into chemistry, we had to learn terminology and basic tasks. The same goes for Twitter. Fear not, many chemists will find it easier than nomenclature! Beyond terminology and basic tasks, new users are often wondering … "What should I/we tweet?"

Institutional

Institutional tweeting in this context is broadly defined as working on behalf of a larger group or organization. Examples of these groups include: departments, programs, projects, and campus units such as libraries and research centers, along with professional organizations, corporations, philanthropic organizations, and government agencies.

Institutions tweet about: notable employees and alumni; scientific advances developed at the institutions; new initiatives and programs; institutional history, upcoming events, successful events, and services they offer. They do this as part of their public relations strategy, specifically to be where their users are. By occupying social media space, institutions can present their goals, people, programs, projects, and events to their community and wider public, plus monitor what others are saying about them.

One example of using Twitter by an organization to promote chemistry related content is the University of Nebraska-Lincoln Libraries (UNL Libraries). Social media supports the overall communication plan of UNL Libraries by sharing content about their services, resources, and events. As an example, we will focus on the UNL Libraries program *SciPop Talks!,* which is an interactive speaker series co-sponsored by the UNL chemistry department (31). *SciPop Talks!* features scientists who give short interactive presentations on diverse topics such as alien biochemistry and the chemistry of Harry Potter (31). Promotion of *SciPop Talks!,* as well as other events at the UNL Libraries, social media channels on Facebook, Twitter, and Instagram, as well as a blog, are used in addition to more traditional media methods (31). The UNL Libraries social media accounts are managed and maintained by the Community Engagement Librarian (co-author J. Barnes) and her student employees (called "peer guides") (31, 32). Having a single social media manager, or an in sync team, is especially important so that a there is consistency in branding, general style and tone. Having a team, rather than one person, allows for multiple point persons who can be contacted with questions, concerns, and aggregate content.

It may be appealing to have multiple people responsible for tweeting from an institution account, but it is imperative to have a single person manage a social media team, employing policies and guidelines well-known to the team. UNL Libraries initially created a decentralized tweeting system composed of volunteers which lasted two years. The lack of consistent postings and branding led to a more centralized coordination of social media channels under the Community Engagement Librarian, who worked with peer guides to help write, post, and monitor the UNL Libraries social media accounts (32). Returning to our *SciPop Talks!* example, peer guides write tweets about *SciPop Talks!,* which are reviewed by the Community Engagement Librarian prior to posting. Besides contributing tweet text, peer guides

serve as a tweet reviewers to ensure that tweets are written for a general audience, striking the desired balance between being informative and fun. Hashtag research (see **Hashing it out**) is conducted by peer guides. The UNL Libraries team uses a content calendar spreadsheet arranged by date for managing all tweets and Twitter related content, with the spreadsheet serving as an offline record of the institutional Twitter account (32).

The UNL Libraries provides training to all peer guides tasked with social media responsibilities. Peer guide training includes outlining responsibilities, defining social media engagement, clearly stating expectations surrounding the Libraries' brand and voice, and other timely social media related issues. Peer guides are given a procedure manual that contains detailed instructions related to social media tasks and the use of various software used to create and monitor marketing communications (e.g. Hootsuite). All peer guides with access to the social media accounts read and sign a social media contract. The contract helps them fully understand the responsibilities of representing the UNL Libraries' voice online. The University Libraries' social media contract is a version of a contract developed by Tyler Thomas, the social media specialist and content creator working in University of Nebraska-Lincoln's Communications Office. Thomas developed a similar contract for use with other students assigned to campus social media (32).

Returning to our *SciPop Talks!* example, peer guides assist with Twitter in two main ways — promotion of the speaker series and real time live-tweeting each presentation. Promotion of the spring series of *SciPop Talks!* actually begins in the Fall, with a special talk scheduled near Halloween (31). A preview of the series is shared in the form of a print and digital flyer. The peer guides promote the series talk line-up starting at the beginning of the Spring semester. Heavy rotation of promotion on social media starts two weeks before the first talk. The frequency of promotional posts on Twitter usually begins several days in a row before each talk. Promotional images include posters created by the UNL Libraries' graphic designer. Beyond promotion, live-tweeting is a key task peer guides perform. By live-tweeting interesting facts and points discussed by each speaker, the peer guide is bringing the UNL Libraries audience to the event — even if they are thousands of miles away! The peer guides also respond to tweeting audience members or tweeps following the speaker series hashtag

#scipoptalks (see **Hashing it out** below). During the first year of Sci-Pop Talks, the live-tweeting added a richness of content to the UNL Libraries' Twitter account. Some posts from the talks went semi-viral. Audience members as far away as Turnin, Italy followed the tweets. Live-tweeting provides another way for institutions to engage with their immediate communities and a wider audience.

Twitter presents a special challenge for people or organizations trying to communicate because of the limitations of *any* form of communication. UNL Libraries' experience is no different than any other institution. The UNL Libraries' goal, as is the goal of many Twitter users, is to use Twitter to inform, engage, and interact. Through the years of Twitter account administration, the UNL Libraries developed the Twitter checklist below that enumerates several things to consider when using Twitter as an institution.

Checklist of Things to Consider

- What is your purpose?
- What should you tweet?
- How often will you tweet?
- Who will tweet from your account?
- Who will monitor the account?
- What are your guidelines for tweeting?
- Do you have an image to attach to your tweet?
- How will you respond if someone is offended or dislikes what you are tweeting about?
- How will you use twitter for special events?
- Will you live tweet to allow people to follow and engage your events?
- Will you complete real time Q&As on Twitter
- Who will be the interview subject(s)?
- How many people will participate? (need at least 2)
- Who will be the Twitter moderator to ask questions?
- Who will track real time questions from followers?

Individuals

Individual chemists often utilize Twitter as a professional resource. The benefits of Twitter echo the benefits of scientific conferences and meetings; opportunities are present for networking, sharing one's science, learning more about the science of others, sharpening communication skills, and fraternizing around similar goals and experiences. The personal and professional motivations to use Twitter often overlap. Using Twitter to network, for example, can serve the purpose of building relationships that can advance one's career while building support systems for encouragement and guidance.

There are tools to enhance an individual's experience with Twitter. Lists allow an individual account to curate, categorize, share, and access other Twitter accounts of interest (33). Moments allow an individual account to create and share stories (34).

As detailed earlier in this chapter, institutions and organizations benefit from using Twitter to live-tweet their events, host Twitter Q&As, or host open chats. Individuals on Twitter capitalize on the opportunities to follow events that they are unable to attend for various reasons. For example, chemists from all over the world were able to follow the first ACS Asia Pacific International Chapters Conference through Twitter. Similarly, Twitter Q&As allow individuals to follow interviews of other chemists. Q&As provide opportunities for individuals to be interviewed about their work, education, and/or broader interests. Open twitter chats can be used for science outreach and engagement, conversations on different chemistry disciplines, and networking in general. Using Twitter to network has led to multiple Twitter communities coalescing around disciplines, identities, special interests, and much more.

Whether you are following live tweets of events or Q&As, engaging in open chats, or participating in a Twitter community, you are sure to use hashtags. For individuals, particularly those new to Twitter, hashtags are one of the most efficient ways to find other chemists. Chemists who wished to follow the ACS Asia Pacific International Chapters Conference through Twitter could search the hashtag #ACS_APICC. Several public engagement hashtags are used to connect chemists directly to individuals in the lay public.

Hashing It Out

Hashtags, or "tags" for short, are words or phrases starting with a # symbol (e.g. #FridayFeeling) that function as keywords on Twitter (35). Hashtags allow people to find, follow, and track specific topics, content, and events of interest. Hashtags are not case sensitive, but are often mixed case for style. Examples of hashtags popular with chemists are listed below.

- #Chemistry
- #ChemEd
- #SciComm – Science Communication
- #SciPol or #SciencePolicy
- #ScienceEd or #scied
- #STEM – Science, Technology, Engineering, Math/Medicine
- #STEAM – Science, Technology, Engineering, Arts, Math/Medicine. Note: this hashtag may also be used for in reference to the STEAM online gaming platform, or steam engine powered related content
- #RealTimeChem
- #BLACKandSTEM (created and curated by co-author S. Page)
- #LatinxInSTEM
- #NativeSci

Individuals and institutions involved in the chemical enterprise will often tag tweets using the hashtags above for the purpose of contributing to ongoing conversations and engaging with hashtag's community. This is one way to network, inform, collaborate, and generally amplify one's personal or institutional brand. Following a particular tag, such as #scied, #RealTimeChem, or #scipol, can help one stay up-to-date on current events of relevance to their careers and related interests. Professional event hashtags also allow chemists to virtually attend when they are unable to attend in-person.

When you are tweeting as an individual or for an institution, you should carefully select which hashtags you will use based on individual or institutional goals. Never use a hashtag without investigating it first. This is as simple as clicking on the tag and scanning the top

content, plus googling the tag. This type of investigation is also key when created tags for conversations, events, and program you — or your institution — are originating. Checking to see if a hashtag is in use is critical to avoiding political faux paus, some hashtags might seem innocent to you but may have negative connotations that your group would want to avoid being associated with. Even if the association is not negative, it may simply be so unrelated to your content that you or your institution would be best served using another hashtag.

In order to track and publicize a specific conversation, event, or program, it is a good idea to use both a unique hashtag and/or a well-known hashtag. As an example, chapter authors Burks, Deards, and Barnes co-organize *SciPop Talks!*, an informal science education talk series at the intersection of science and pop culture. Our unique tag is #scipoptalks and pop culture tags related to each specific talk's pop culture tie-in were used. The tags #HarryPotter and #Hogwarts were included in tweets about Dr. Rebecca Lai's chemistry of Harry Potter talks, and #GoT was used for co-author Dr. Raychelle Burks' tweets about the chemistry of *Game of Thrones*. By targeting related and popular hashtags, you can expand the reach of your local event and more people who are not involved are likely to see your tweets. While this may seem unlikely at first, the authors once received a phone call asking for an event to be recorded by a scientist half-way around the world who saw a tweet about our speaker on Twitter and really wanted to view the talk. This interest helped us secure funding to record, edit, and subtitle select talks, and lead to other outreach collaborations.

As with #scipoptalks, your event title may make a suitable hashtag. Keep the following four things in mind as you brainstorm possible hashtags:

- Short hashtags (10 characters or less) leave more space for content within a tweet
- Hashtags should be easy to remember
- Hashtags should be reusable from year to year or easily modified with the addition of a year or location so that people associate it with you, your program or institution. Ex. #Sci-PopTalks, #ACSNOLA, and #SfN17
- Investigate hashtags before publicly adopting.

As mentioned previously, investigating tags is key. It is also a good policy to ask a diverse selection of coworkers if they can think of any negative connotations associated with the hashtag. If a hashtag gives your respondents pause, then that hashtag should no longer be under consideration. Once you have chosen your unique hashtag, it is important to start using it as soon as possible and encourage others to use it. This serves three functions — staking claim to the tag, consistency in branding, and easy tracking of your content by yourself and others.

Suggested Timeline for Live Tweeting/Advertising an Event

1. Answer the question: Is this as small or large event?
    a. Small Event
        i. Start tweeting about your event at least 2 weeks in advance
        ii. Tweet information about your event at least 2-4 times a week
    b. Large Event
        i. If registration is required, tweet registration information/links 2-3 times per week
        ii. Move to step 2
2. For the months leading up to your event, tweet out information at least 2-3 times per month.
3. Within 4 weeks of your event, increase tweeting to once a week.
4. Within 2 weeks of your event, increase tweeting to twice a week.
5. Within 1 week of your event, increase tweeting to advertise event.
    a. Tweet at least three times during the week.
    b. Tweet the day before the event.
    c. Tweet out reminders the day of the event.
6. Live tweet your event (see Live Tweeting Checklist above).
7. Create a moment from tweets about your event to capture interactions (34).
    a. Tweet out the link to your moment so people can continue to access details of your event

Handling Feedback

Even with good intentions we can make communication missteps and end up causing offense and harm. Institutions usually have policies in place about how to handle both criticism and praise received via social media, email, website comment boards, etc. For individuals and institutions, the recommended steps for handling online missteps resembles those for handling offline missteps: be sincere, be brief, and do not forget the lesson learned (21, 22).

As chemists, we can experience pushback on posts that we think of as widely accepted facts by the scientific community. These areas of pushback are often discussed by professional organizations. These organizations often provide suggested talking points, communication strategies, and materials to members and/or the general public. The American Chemical Society(ACS) has issued a position statement on global climate change and developed the *ACS Climate Science Toolkit* (23, 36). Consulting such resources can help when broaching chemistry topics that routinely see similar push back to climate change. Many professional societies offer online and in-person communication training, including on social media strategies. Chemists can take advantage of these opportunities, often offered at no cost to the individual. Evaluating and modeling select chemists' Twitter accounts will provide examples of a variety of strategies for crafting one's personal style and approach to tweeting (13–15).

In addition to missteps and scientific push back, individuals from traditionally underrepresented and marginalized groups are routinely targeted for online harassment (37–45). The groups include but are not limited to: people of color, women, LGBTQIA, differently abled people, and religious groups (37–45). This type of harassment is categorized as trolling. According to Merriam-Webster, to troll is "to antagonize (others) online by deliberately posting inflammatory, irrelevant, or offensive comments or other disruptive content" (46). Individuals and institutions should have a "troll policy", i.e. a policy on handling trolling. Remember, trolling is *not* negative feedback. Trolling goes above and beyond criticism, and can include adult language, slurs, and threats of bodily injury or death. A popular piece of advice for dealing with trolling is "Don't feed the trolls" (47). This advice warns against engaging people who are trying to force you to react to

their attacks, because your reaction is typically what they are seeking (47). Another school of thought discusses how "don't feed the troll" places the responsibility for trolling and trolls of the recipient of the attacks and silence the recipient (48). Instead of being silent, an individual or institution may choose active informed resistance in the form of a response tweet.

Whether one ignores trolling or not, an individual or institution should have their own troll policy which allows for flexibility to meet goals and immediate social media needs. Online communication requires thoughtful consideration. As with negative feedback, institutions will develop a trolling policy that conforms to the overall communication and harassment policies of the institution, but is cognizant of the unique realities of social media. For individuals, developing a troll policy may seem a daunting task. Consider this: What is your policy for dealing with hecklers at a talk? What is a strategy for in-person trolling that you are familiar with that conforms to your personal needs and overall communication goals? Do you know someone offline or online who has effective consistent strategies? Adopting and revising existing successful strategies to the online environment is a good starting place.

Twitter provides additional options for dealing with trolls in the form of blocking and muting accounts (49, 50). When blocked, a troll cannot view your tweets or follow your account within Twitter (49). If you were following the account, blocking also unfollows that account (49). Muting an account removes the account's tweets from your timeline, but the account can still follow your account (50).

Reporting the behavior of trolls, especially if they are making threatening statements, is important. You can even report trolls displaying antagonizing other accounts. The violations that you can report to Twitter, and how to report different violations, are listed in the Twitter Help Center's *Twitter Rules and policies* (51).

Putting It All Together: Defining Success Using Twitter

How does one define success? Many self- and team-help books, blogs, and workshops have tackled this topic. Like many others, we think success comes down to goals, tasks, and metrics. Did you accomplish tasks in furtherance of your goals? If your goal with Twitter

is to engage with our professional peers, selected communities, and the general public, how do you measure that? Are your tweets about your work, programs, projects, and events getting through to the Twitter communities you want to reach? To begin to answer these questions, you can consult your Twitter analytics provided by Twitter (52). Twitter makes analytics available through your profile drop down menu option "Analytics" and a bar chart icon for the Twitter phone app. Twitter tracks number of users who: saw a particular tweet as "impressions"; interacted with a tweet as "engagements"; accessed content in a tweet and much more! On the main analytics page is a chart of the last 28 days, but you can review data from previous months as well.

The Twitter definition of the term "impressions" is the number of times the users saw the tweet or hashtag on Twitter. That number is usually significantly higher than engagement and increases the likelihood of an interaction. While more people may see a tweet, but not engage, that tweet may still make an impression. Engagement is the measure of user interaction with a tweet through synthesizing data on:

- Number of re-tweets (sharing of tweets through twitter)
- Number of likes
- Number of replies
- Number of times links or hashtags were accessed
- Number of times a tweet was expanded

When evaluating the success of a tweet or twitter campaign (e.g. live-tweet), you could use each tweet's impressions and/or engagements as a measure of success. Engagements include retweets, replies, account follows, tweet expansion, etc. and each is evaluated by twitter. You could evaluate each type of engagement and impression, along with changes in follower count, using any or all as success metrics (52). If you created a hashtag, one could utilize the tag-related analytics for success metrics. Analytics also includes a quantification of your "reach" — the number of accounts (whether they follow you or not) who can see your tweets. Your account's analytics page is a treasure trove of data and charts that can be incorporated into post-event reports, annual social media account reviews, etc. Did you create a buzz? Twitter analytics is a good place to see if you got Twitter talking!

Success can be further defined by considering the purpose behind your tweets during a certain time period. Returning to our example of *SciPop Talks!*, the goal is informal science education with an emphasis on popular culture. Success in this case is not only defined by the number of impressions and engagements, but also the types of accounts engaging and reading the tweets. When accounts of non-scientists and pop culture enthusiasts are measurably engaging and learning from tweets, that is an indicator of success for *SciPop Talks!* Twitter analytics are not just for institutions. All of the information above can provide you with valuable insight into how other Twitter users are interacting with your tweets and which tweets are creating a stir. If you tweet a link to your latest publication or your latest project announcement, you can track that tweet's impressions and engagements to see if this content is attracting attention, driving conversation, and attracting followers. If these were your goals, analytics will help determine if you have succeeded.

Twitter analytics not only provide measures of success, they provide points of reflection as you refine your Twitter strategies in order to meet your publicity and engagement goals. Examine your Twitter history: Which content was popular? What fell flat? You may be surprised! However, reviewing of analytics allows you to refine and tailor your message. Much like giving a practice talk, getting feedback, and tweaking your presentations for your desired impact — you should learn and evolve your Twitter strategies. As with other forms of communication, Twitter takes consideration, work, review, and revision. Much like developing an engaging speaking style and becoming an effective communicator, working at Twitter has its benefits.

References

1. McNab, C. What Social Media Offers to Health Professionals and Citizens. *Bull. W. H. O.* **2009**, *8*7, 566; DOI: 10.2471/BLT.09.066712.

2. Sabin, L. Happy Birthday Twitter: First Ever Tweet was Sent Nine Years Ago Today. *Independent [Online]*, March 21, 2015. http://www.independent.co.uk/life-style/gadgets-and-tech/news/happy-birthday-twitter-first-ever-tweet-was-sent-nine-years-ago-today-10124686.html (accessed Jan. 27, 2018).

3. McMillan, G. Why Twitter? *Time* [Online], November 11, 2011. http://techland.time.com/2011/11/17/why-twitter/ (accessed Jan. 27, 2018).

4. Hamburger, E. 12 Reasons You Absolutely Need to be on Twitter. *Business Insider* [Online], June 28, 2011. http://www.businessinsider.com/bestreasons-to-use-twitter-2011-6?op=1/#ver-check-a-news-website-again-find-twitter-aggregators-instead-1 (accessed Jan. 27, 2018).

5. Glaser, A. How to Use Twitter: Critical Tips for New Users. *Wired* [Online], May 6, 2016. https://www.wired.com/2016/05/twitter-onboarding-tips-for-new-users/ (accessed Jan. 27, 2018).

6. Ke, Q.; Ahn, Y.; Sugimoto, C. R. A Systematic Identification and Analysis of Scientists On Twitter. *PLoS ONE* **2017**, *12*, e0175368; DOI: 10.1371/journal.pone.0175368.

7. McHeyzer-Williams, L. J.; McHeyzer-Williams, M. G. Our Year on Twitter: Science in #SocialMedia. *Trends Immunol.* **2016**, *37*, 260–265.

8. Van Eperen, L.; Marincola, F. M. How scientists use social media to communicate their research. *J. Transl. Med.* **2011**, *9*, 199; DOI: 10.1186/1479-5876-9-199.

9. Van Noorden, R. Online Collaboration: Scientists and the Social Network. *Nature* **2014**, *512*, 126–129.

10. Darling, E. S.; Shiffman, D.; Côté, I.; Drew, J. A. The Role of Twitter in the Life Cycle of a Scientific Publication. *Ideas in Ecology and Evolution.* **2013**, *6*, 32–43.

11. Bik, H. M.; Goldstein, M. C. An Introduction to Social Media for Scientists. *PLoS Biol.* **2013**, *11*, e1001535 EP; DOI: 10.1371/journal.pbio.1001535

12. Maclachlan, J. L. Using Branding and Social Media for Effective Science Communication. *Chem. Eng. News* **2016**, *94*, 39. https://cen.acs.org/articles/94/i30/Using-branding-social-media-effective.html?type=paidArticleContent (accessed Jan. 27, 2018).

13. Wolf, L. K. 20 Chemists Worth Following On Twitter. *Chem. Eng. News.* **2014**, *92*; https://cen.acs.org/articles/92/i39/20-Chemists-Worth-Following-Twitter.html (accessed Jan. 27, 2018).

14. Cantrill, S. 100 Chemists On Twitter. *Chemical Connections* [Online], September 22, 2014. https://stuartcantrill.com/2014/09/22/100-chemists-on-twitter/ (accessed Jan. 27, 2018).

15. Cantrill, S. Another 100 Chemists On Twitter. *Chemical Connections* [Online], November 14, 2016. https://stuartcantrill.com/2016/11/14/another-100-chemists-on-twitter/ (accessed Jan. 27, 2018).

16. Twitter. Signing Up With Twitter. https://support.twitter.com/articles/100990 (accessed Jan. 27, 2018).

17. Zarrella, D. "Picking a Twitter Username? Don't Use Numbers or Underscores". *HubSpot* [Online], July 28, 2017. https://blog.hubspot.com/blog/tabid/6307/bid/4684/picking-a-twitter-username-don-t-use-numbers-or-underscores.aspx (accessed Jan. 27, 2018).

18. Corliss, R. Twitter Handles Dos and Don'ts (and eBook!). *HubSpot* [Online], July 28, 2017. https://blog.hubspot.com/blog/tabid/6307/bid/4495/twitter-handles-dos-and-donts-and-ebook.aspx (accessed Jan. 27, 2018).

19. Twitter. How to customize your profile. https://support.twitter.com/articles/127871 (accessed Jan. 27, 2018)

20. University of Minnesota Chemistry Department. Chemistry Department. Twitter. https://twitter.com/umnchemistry (accessed Jan. 27, 2018)

21. Lilleston, R. How to Atone for Your Social Media Sins. *AARP* [Online], June 20, 2017. https://www.aarp.org/home-family/personal-technology/info-2017/apologizing-on-social-media-fd.html (accessed Jan. 27, 2018).

22. Syme, C. How to Nail the Social Media Apology. *CASE* [Online], August 22, 2013. https://blog.case.org/2013/08/22/the-social-media-apology/ (accessed Jan. 27, 2018).

23. American Chemical Society. Global Climate Change. https://www.acs.org/content/acs/en/policy/publicpolicies/sustainability/globalclimatechange.html (accessed Jan. 27, 2018).

24. Turner, A. How To Write A Rockstar Twitter Bio. *Mashable* [Online], October 23, 2013. http://mashable.com/2013/10/23/write-twitter-bio/#jYeimVmdKiqX (accessed Jan. 27, 2018).

25. Silverman, M. 5 Tips For Creating The Perfect Profile Pic. *Mashable* [Online], April 12, 2010. http://mashable.com/2010/04/12/profile-picturetips/#p9nEuIuzKmqf (accessed Jan. 27, 2018).

26. Erickson, C. 4 Quick Tips For A Better Twitter Header. *Mashable* [Online], September 9, 2012. http://mashable.com/2012/09/19/twitter-header-tips/#5E39rPrZRSqw (accessed Jan. 27, 2018).

27. Cousins. C. How To Create A Twitter Header Photo: Examples And Best Practices. *Design Shack* [Online], July 15, 2015. https://designshack.net/articles/graphics/how-to-create-a-twitter-header-photo-examples-and-bestpractices/ (accessed Jan. 27, 2018).

28. Laasby, G. Blocking Fake Twitter Followers And Spam Accounts Just Got Easier. *Milwaukee-Wisconsin Journal Sentinel* [Online], December 2, 2014. http://archive.jsonline.com/blogs/news/280303802.html (accessed Jan. 27, 2018).

29. Twitter. Using Twitter. https://support.twitter.com/categories/281 (accessed Jan. 27, 2018)

30. Twitter. Glossary. https://help.twitter.com/en/glossary (accessed Jan. 27, 2018)

31. Burks, R.; Deards, K. D.; DeFrain, E. Where Science Intersects Pop Culture: An Informal Science Education Outreach Program. *J. Chem. Educ.* **2017**, *94*, 1918–1924.

32. Barnes, J. M. Student To Student Marketing And Engagement: A Case Study Of The University Of Nebraska-Lincoln Libraries Peer Guides. In *Students Lead The Library: The Importance Of Student Contributions To The Academic Library*; Arnold-Garza, S., Tomlinson C., Ed.; Association of College and Research Libraries: Chicago, IL, 2017; pp 129–146. http://digitalcommons.unl.edu/libraryscience/343/ (accessed Jan. 27, 2018).

33. Twitter. Using Twitter Lists. https://support.twitter.com/articles/76460# (accessed Jan. 27, 2018).

34. Twitter. Creating A Moment. https://support.twitter.com/articles/20174961# (accessed Jan. 27, 2018).

35. Twitter. Using Hashtags On Twitter. https://support.twitter.com/articles/49309 (accessed Jan. 27, 2018).

36. American Chemical Society. ACS Climate Science Toolkit. https://www.acs.org/content/acs/en/climatescience/about.html (accessed Jan. 27, 2018).

37. Lampen, C. Women And Minority Journalists Field More Abuse From Internet Trolls, Study Finds. *Mic* [Online], April 12, 2016. https://mic.com/articles/140579/women-and-minority-journalists-field-more-abuse-from-internet-trolls-study-finds (accessed Jan. 27, 2018).

38. Gardiner, B.; Mansfield, M.; Anderson, I.; Holder, J.; Louter, D.; Ulmanu, M. The Dark Side Of Guardian Comments. *The Guardian* [Online], April 12, 2016. https://www.theguardian.com/technology/2016/apr/12/the-dark-side-of-guardian-comments (accessed Jan. 27, 2018).

39. Duggan, M. 1 in 4 Black Americans Have Faced Online Harassment Because Of Their Race Or Ethnicity. *Pew Research Center* [Online], July 25, 2017. http://www.pewresearch.org/fact-tank/2017/07/25/1-in-4-black-americans-have-faced-online-harassment-because-of-their-race-or-ethnicity/ (accessed Jan. 27, 2018).

40. Davis, A. Reclaim Your Domain Dear R29 Readers: For Some People Everything Is About Race. *Refinery29* [Online], March 22, 2017. http://www.refinery29.com/2017/03/146379/racist-internet-trolls-womenresponse-panel (accessed Jan. 27, 2018).

41. Rashid, N. The Emergence of the White Troll with a Black Face. *NPR* [Online], March 21, 2017. http://www.npr.org/sections/codeswitch/2017/03/21/520522240/the-emergence-of-the-white-troll-behind-a-black-face (accessed Jan. 27, 2018).

42. Brinkhurst-Cuff, C.; Kwenortey, E.; Togoh, I.; Adu, A. Our Stories Need to be Told - Life as a Black Female Journalist Starting Out. *The Guardian* [Online], May 12, 2016. https://www.theguardian.com/commentisfree/2016/may/12/black-female-journalists-young-women-online-trolling (accessed Jan. 27, 2018).

43. House With No Steps. Online Trolls Targeting People with a Disability. *House With No Steps* [Online], October 26, 2016. https://www.hwns.com.au/cmblog/postDetails.aspx?articleid=1240&folderid=440 (accessed Jan. 27, 2018).

44. Chemaly, S. There's No Comparing Male and Female Harassment Online. *Time* [Online], September 9, 2014. http://time.com/3305466/male-female-harassment-online/ (accessed Jan. 27, 2018).

45. Ramanathan K. Study: LGBT Youth Face High Levels of Cyberbullying. *ThinkProgress* [Online], July 11, 2013. https://thinkprogress.org/study-lgbt-youth-face-high-levels-of-cyberbullying-93931ef9fa63/ (accessed Jan. 27, 2018).

46. Merriam Webster Troll Definition Page. https://www.merriam-webster.com/dictionary/trolling (accessed Jan. 27, 2018).

47. March, E. Don't Feed The Trolls Is Good Advice Here's The Evidence. *The Conversation* [Online], October 6, 2016. http://theconversation.com/dont-feed-the-trolls-really-is-good-advice-heres-the-evidence-63657 (accessed Jan. 27, 2018).

48. Phillips, W. Don't Feed the Trolls? It's Not That Simple. *The Daily Dot* [Online], June 10, 2013. https://www.dailydot.com/via/phillips-dont-feed-trolls-antisocial-web/ (accessed Jan. 27, 2018).

49. Twitter. How to Block Accounts on Twitter. https://support.twitter.com/articles/117063# (accessed Jan. 27, 2018).

50. Twitter. How to Mute Accounts on Twitter. https://support.twitter.com/articles/20171399 (accessed Jan. 27, 2018).

51. Twitter. Twitter Rules and Policies. https://support.twitter.com/categories/284# (accessed Jan. 27, 2018).

52. Twitter. About Your Activity Dashboard. https://support.twitter.com/articles/20171990 (accessed Jan. 27, 2018).