



Science communication on X (formerly Twitter): A picture is worth a thousand characters?

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Abstract

X (formerly Twitter), a microblogging social media platform, is being used by scientists and researchers to disseminate their research findings and promote the visibility of their work to the public. Tweets can be posted with text messages, images, hyperlinks, or a combination of these features. Importantly, for the majority of users, the text must be limited to 280 characters. In this perspective, this study aimed to observe if adding an image is able to increase outreach for scientific communication on X. Therefore, the characteristics of tweets posted with the hashtag #SciComm (short for science communication) for a period of one year (28 May 2020 to 28 May 2021) were analyzed with the X analytics tool Symplur Signals. The conducted analysis revealed that when a science communication (#SciComm-containing) tweet is accompanied by an image added by the user, there is on average a 529% increase in the number of retweets, and adding a hyperlink is similarly effective in increasing the number of retweets. However,

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combining both an image and hyperlink in the same tweet did not yield an additive effect. Hence, for increased visibility, researchers may consider adding images or hyperlinks (e.g., to research publications or popular science articles) while communicating science to the public on X.

Keywords

Social media, science communication, social media research

Background

X (formerly Twitter) is a social media platform frequently used by scientists for communication with their peers and with the public [1, 2]. It is used by academics and academic establishments for a variety of purposes, including education, collaboration, crowdsourcing, the survey of opinions, and the promotion of research work to the general public and policy makers [3–8]. The major feature of X is the sharing of short text messages (“tweets”; limit of 280 characters for most users, with the exception of the newly introduced X Premium subscribers to whom 25,000 characters limit currently applies) which can be supplemented with pictures, hyperlinks (e.g., to scientific articles), and hashtags that are used for tagging and grouping thematically related tweets by different users. The hashtag #SciComm is in particular broadly used for tagging tweets with relevance to science communication [9].

Along with the dissemination of research work to other social media users and discussing ideas, scientists utilize X to promote themselves and their publications. Importantly, the social media activity of academics helps to build a higher Altmetric score of shared publications and has the potential to increase the number of citations of the posted articles [10]. The latter is beneficial for the career development of academic researchers [4]. Therefore, strategies that might increase the visibility of posted tweets are of very high interest to researchers. In the spirit of the broadly known adage “a picture is worth a thousand words”, there has been a long-standing general interest in whether the inclusion of images would increase the visibility of science-related tweets. Notably, a previous study with a focus on academic communication on social media networks indicated that higher education institutions (Swiss universities in particular) utilized fewer pictures when posting on X (with 29% of the analyzed posts containing a picture) than on Instagram (86%) or Facebook (40%) [11]. Nevertheless, some positive effects have been previously observed for tweets featuring images with a 35% boost in retweets of tweets with images that were shared by verified X accounts in the context of government matters, music, news, sports, and television [12]. A similar effect was also observed by Li and Xie [13], who reported that the inclusion of an image in tweets related to air travel increases the number of retweets by 119%. Along the same line, on another big social media platform, Facebook, it was demonstrated that posts by the accounts of Shanghai ranking’s top 50 universities that contained pictures received 35% more likes and 46% more shares [14], and the evaluation of 35 public pages of scientists from Taiwan also revealed that including an infographic or a data visualization with the posts yielded more likes [incidence rate ratio (IRR) = 1.46; 95% confidence interval (CI) = 1.21, 1.76] and more shares (IRR = 2.26; 95% CI = 1.68, 3.02) [15]. However, the effect of adding an image to tweets from the specific domain of science communication has remained uninvestigated so far.

In this context, this study aimed to observe the pattern of usage of the hashtag #SciComm on X for a period of one year (28 May 2020 to 28 May 2021) to determine if the inclusion of two key tweet elements, links and images, increases the visibility of the tweets shared with this hashtag.

Methods

The number of shared tweets with the hashtag #SciComm, the number of users, and the impressions (number of views) generated by those tweets from 28 May 2020 to 28 May 2021 were analyzed with Symplur Signals [7, 16]. Other hashtags that were most often co-occurring with #SciComm, and most frequent words used in the #SciComm tweets were also identified.

Observations

Analysis of the #SciComm-containing tweets during the study period revealed a total of 656,992 tweets that were posted by 176,863 X users and generated 3,025,701,984 impressions (Figure 1).

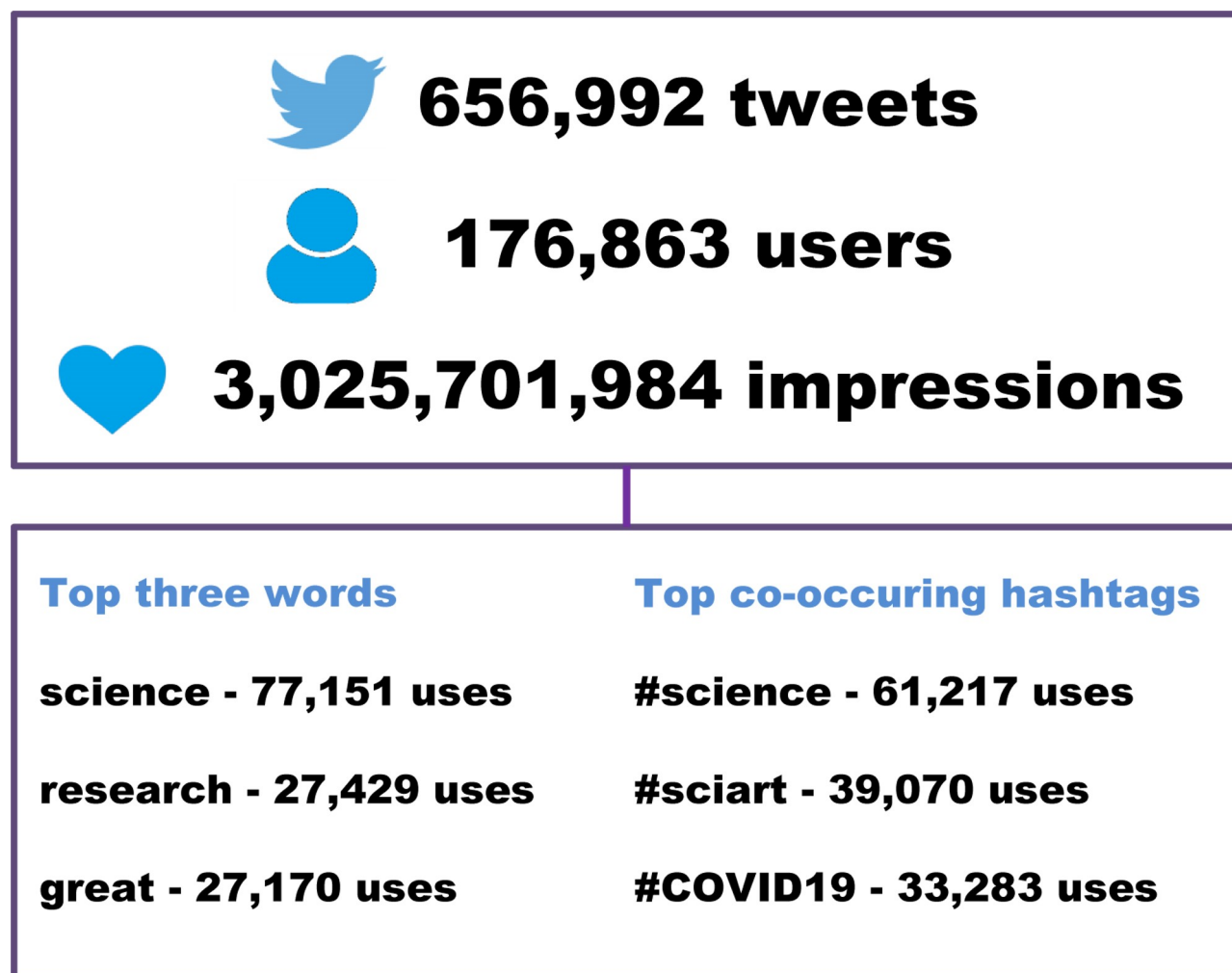


Figure 1. Number of tweets, involved users, and impressions generated with the hashtag #SciComm between 28 May 2020 and 28 May 2021. COVID19: coronavirus disease 2019

The most used co-occurring hashtags in the #SciComm tweets were related to science (#science) and science art (#sciart). The hashtag #COVID19 ranked third in the group of the most often co-occurring hashtags with 33,283 uses, which reflects the high engagement of the #SciComm online community with COVID-19, representing one of the greatest recent global healthcare challenges [17].

The most used word was “science” followed by “research”. More interestingly, “great” was the third most often used word with 27,170 occurrences, indicating a positive sentiment or referral to higher extent, amount, intensity, ability, quality, or eminence associated with the #SciComm tweets (Figure 1).

A tweet with only text has an average of 0.7 retweets (Figure 2a). When the tweet is accompanied by an image, there is a sharp rise (approximately 529% increase) in the number of retweets (with images 4.4; without images 0.7). However, adding hyperlinks along with the images did not further increase the retweets (529% increase with images *versus* 350% increase with images and links). A similar pattern was found when examining the average number of impressions per tweet as shown in Figure 2b.

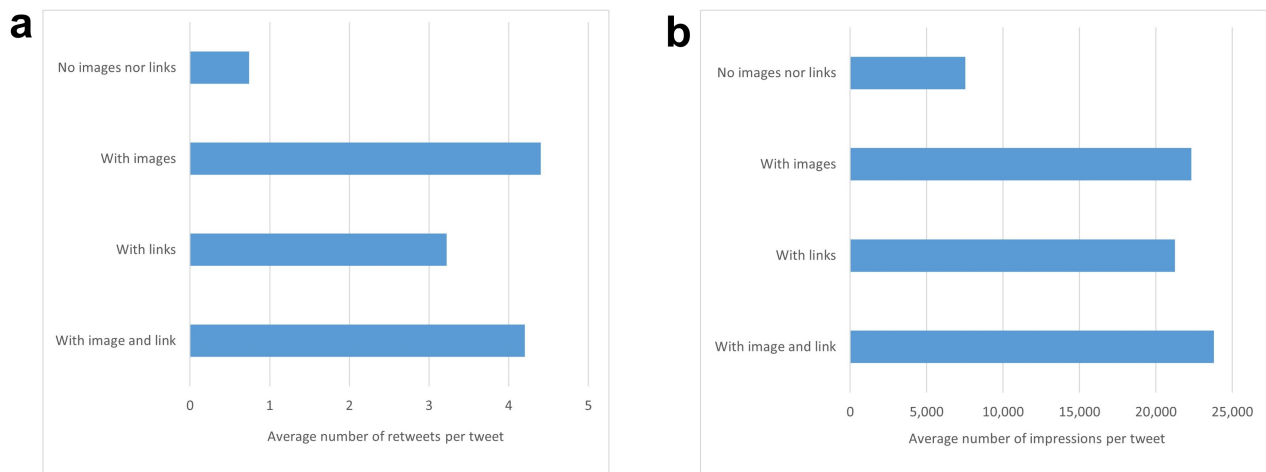


Figure 2. Average number of retweets and impressions per tweet

Limitations

The tool used for the evaluation of the data (Symplur Signals) represents a third-party product and its use is associated with some limitations. Thus, the export of the full tweets dataset for additional analysis outside of the product interface was not possible. Due to this, rigorous “external” statistical evaluation was not possible that would have provided effect sizes and CIs for the described observations. Therefore, the readers should be mindful that the presented outcomes describe findings that would have been more insightful if a method of evaluation allowing thorough statistical evaluation would have been used. Along this line, the described outcomes should be rather viewed as “observational evidence” confined to the use of one specific science communication hashtag (#SciComm) on X, for a specific time period (28 May 2020 to 28 May 2021).

Discussion

In this work, it was found that science communication (#SciComm-containing) discussions were frequent on X, yielding 656,992 tweets in one year period (from 28 May 2020 to 28 May 2021) that were posted by 176,863 X users and generated 3,025,701,984 impressions.

Content analysis of the shared tweets yielded no big surprises, with the top three (Figure 1) most used co-occurring hashtags and frequently used words in the #SciComm tweets being related to science (#science, #sciart, science, research) or COVID-19 (#COVID19) that is known to have been a major theme of online discussions during the course of the pandemic [18, 19]. More unexpected was the observation that “great” was the third most often used word in the #SciComm tweets (with 27,170 occurrences), indicating a positive sentiment or referral to higher extent, amount, intensity, ability, quality, or eminence associated with the #SciComm tweets. While, the word “great” has several meanings and can be used as adjective, noun, or adverb, its frequency of mentioning in the #SciComm tweets is interesting to note, and can possibly indicate that users were sharing posts on topics that they appreciate or that are associated with positive/elevating developments.

Interestingly, previous research revealed a 35% boost in retweets of tweets with images that were shared by verified X accounts in the context of government matters, music, news, sports, and television [12], and a 119% boost in retweets when images were added to tweets related to air traveling [13]. On this background, this work focused on the domain of science communication indicates a much higher (several-fold) increase in the frequency of retweets of the #SciComm tweets upon the addition of images (Figure 2). To rationalize this finding, it should be noted that images in general have very high importance for the communication of science and scientists readily possess images that are routinely used for communicating their results in a visually appealing way to journals, as well as for poster presentations, teaching lectures, and conference speeches. Possibly, the data indicate that the use of such images in the context of science

communication is much more appreciated by the general public than text-only tweets. Due to the complexity of science-related content in general, it is likely that the public is more appreciative of “simplifying” the complexity of the scientific matter by the use of visuals, which could be a possible explanation for the notably higher increase in retweets for the science communication (#SciComm) tweets containing images.

The increased visibility of tweets containing external links (Figure 2) could be due to providing the possibility to verify claims from external sources (assuming that users interested in science communication are used to a writing style in which claims are supported with “references” as it is typically done in scientific papers), as well as the possibility to provide to interested readers additional relevant information together with the claims in the posted tweets (for example, by providing a link to a scientific publication or to a popular science news-article). Concerning tweets containing images, the observation that they induce increased visibility was expected and well-aligned with previous literature [12, 13], whereby the observation that combining image and hyperlink does not have an additive effect was rather surprising. Probably the explanation for this phenomenon is related to the X feature to automatically extract images from some hyperlinks and display them visually without the active participation of users (as a result, tweets containing hyperlinks often contain visuals automatically added by X, and active addition of images selected by the user might simply result in exchange of one visual with another for such link-containing tweets).

Is a picture worth a thousand words in the world of X science communication? Without an image, the average number of retweets was 0.7 and after adding an image, it raised to an average of 4.4 retweets (Figure 2). This indicates a 6.3-fold increase in retweets ($4.4 \div 0.7 = 6.3$). One tweet has a maximum of 280 characters and a 6.3-fold increase in retweets would help gain a reach that is equivalent to a maximum of 1,764 tweeted characters ($6.3 \times 280 = 1,764$). Thus, in the context of science communication (#SciComm) tweeting an image on average achieves a reach that is higher than the reach yielded by tweeting a thousand characters. Assuming an average word length of 4.79 characters per word in the English language [20], 1,764 characters would correspond to an average of 368 words. Hence, in X science communication, a picture is not worth a thousand words, rather it corresponds to approximately 368 words. Although such a number is below “a thousand words” still it is not completely out of the range of popular expectation, and the wisdom captured by the popular adage still remains impressive!

Conclusion

In conclusion, our analysis of 656,992 #SciComm tweets shared for a period of one year (28 May 2020 to 28 May 2021) indicates that the inclusion of an image or a hyperlink is associated with a several-fold increase in the number of retweets and impressions (views) but having both an image and a hyperlink in the same tweet does not have an additive effect on the quantified visibility parameters. Hence, for a visibility-boost researchers may consider adding a picture or a hyperlink while communicating science to the public on X.

Abbreviations

CI: confidence interval

COVID19: coronavirus disease 2019

Declarations

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Author contributions

HM: Data curation, Visualization, Writing—original draft. AGA: Conceptualization, Investigation, Supervision, Writing—original draft, Writing—review & editing. FE and MH: Conceptualization,

Investigation, Writing—review & editing. SB, MM, RL, MKP, and HW: Writing—review & editing. All authors read and approved the submitted version.

Conflicts of interest

Author Atanas G. Atanasov is the Editor-in-Chief of *Exploration of Digital Health Technologies*, but he had no involvement in the peer-review of this article and had no access to information regarding its peer-review.

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Not applicable.

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Not applicable.

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Not applicable.

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