Special Sections: Opportunities and Challenges of Online Instruction

JMBE Journal of Microbiology & Biology Education

TikTok: An Emergent Opportunity for Teaching and Learning Science Communication Online

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KEYWORDS social media, science communication, TikTok, online learning, professional skills, 21st century STEM, course-based undergraduate research experience

INTRODUCTION

Since the rise of social media in the early 2000s, educators have increasingly used it in their pedagogical approaches (1, 2). Educational usage of social media improves the student learning experience (3), especially if the social media activity is accessible, relevant, and on a platform which students already frequent (4). Social media platforms such as Facebook, Twitter, and YouTube have been used in STEM education for various purposes, including group projects, discussion forums, delivery of lecture-style content, and development of science communication skills (4, 5). Educational use of social media continues to grow as social media becomes increasingly integrated into daily life.

During the COVID-19 pandemic, social media usage rose as a means of staying connected during social distancing (6, 7). Furthermore, the pandemic has highlighted the role of social media in spreading information and disinformation alike. It has shown the importance and impact of social media for STEM professionals in explaining science and medicine in a widely accessible, accurate, and engaging way.

Because current events have highlighted the importance of science communication in social media outlets, we decided to promote the use of social media in the classroom and laboratory of our course-based undergraduate research experience (CURE). Especially notable was the rise of the new social media platform TikTok, a short form video-sharing platform popular with teenagers. As reported by CNBC, TikTok global monthly users increased from about 507 million in December 2019 to 689 million in July 2020 (https://www.cnbc.com/2020/08/24/tiktok-reveals-us-global-user-growth-numbers-for-first-time.html), reaching 1 billion global monthly users in September 2021 (https://www.cnbc.com/2021/09/27/tiktok-reaches-1-billion-monthly-users.html) (8). Focusing on the platform with the most growth and relevance to our students, we implemented a 2-fold approach to using TikTok in an innovative pedagogical strategy to model and teach effective science communication. This helped students to practice and refine their science communication skills using the information systems of their generation.

PROCEDURE

TikToks were used as a teaching method in the second semester of a three-semester CURE sequence at Binghamton University. This work was done within the Microbial Biofilms in Human Health research stream of the larger First-year Research Immersion (FRI) CURE Program. During the second semester of this program, students began training in microbial biofilm research by working together on a class research project while developing a team research proposal to be executed in their third and final semester (9, 10). This course met once a week for a 1-h lecture and twice a week for 3-h hybrid laboratory periods (11). Teaching TikToks were developed and filmed by undergraduate peer mentors, former FRI students, under the direction of the stream's Research Educator, the instructor of the three-course sequence (10), and they were shared with students during class lectures and labs where the content was relevant.

A free TikTok account is required to create and post videos, but it is not required to view TikToks. The creator can download the TikTok as a MOV file to their device and then share it via alternate platforms. TikTok accounts and individual videos can be set to "private" to control who can view the video to protect instructor and student privacy. Peer mentors and students were instructed not to publicly post their TikToks without prior instructor permission. Additionally, students were required to follow all university social media guidelines regardless of privacy settings (https://www.binghamton.edu/communications-and-marketing/media-public-relations/social-media/guidelines.html). If it is released publicly, other TikTok users can engage with the content. The public TikTok "Discover" page is organized by trending hashtags (https://www.tiktok.com/creators/creator-portal/en-us/getting-started-on-tiktok/finding-

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The authors declare no conflict of interest.
Received: 1 October 2021, Accepted: 3 December 2021, Published: 28 March 2022

content-communities-and-creators/), keywords or phrases preceded by the "#" symbol that are used to index and tag content for increased searchability and discoverability. Popular hashtags for effective science communication could include: #science, #microbiology, #STEMlife, and #research. Additionally, the individualized "For You" pages are populated by an algorithm that favors content which uses trending sounds, dances, transitions, and hashtags (https://newsroom.tiktok.com/en-us/how-tiktok-recommends-videos-for-you). These features should be considered for effective science communication on the TikTok platform.

Peer mentor-created TikToks incorporated videos, photos, or both, either captured in the TikTok app or uploaded from the device library, though it was easiest to capture media directly using the app. Depending on the learning goals, TikToks were filmed in various relevant locations (laboratory, computer screen recording, campus etc.). Stickers and text were added to highlight important points. The audio components were either original sounds by the creator or overlays from TikTok's library of sounds. TikToks were designed to share ideas and information in a short period of time (originally <1 min). Each teaching TikTok addressed one major concept and emphasized ideas most easily explained with visual aids. Video topics included common laboratory mistakes which became known as #labfails (such as incorrect aseptic technique, Appendix 1), instrument use (such as how to balance a centrifuge rotor, Appendix 2), and basic research methods (such as science writing conventions, Appendix 3).

At the end of the semester, students were challenged to create TikToks about the research being done in the lab or their team's proposed research projects (Appendix 4) following the provided assignment instructions and rubric (Appendix 5). The goal of the assignment was to build 21st century science communication skills, such that students were able to effectively communicate their research to the general public using social media outlets such as TikTok. Students learned the principles of science communication, setting, timing, effectiveness, and memorability (12). Students were encouraged to make TikToks with these principles in mind, aiming to be accurate, accessible, and engaging by using current trending sounds, challenges, and dances to reach a wider audience. In addition to evaluating science communication skills, this activity also showed how well students understood the broad scientific concepts taught in the course, including course content and research methods. Students were allowed to work independently or with other students from their research team if they did not feel comfortable being filmed or using social media platforms.

Because this instructional approach is visual and auditory in nature, special considerations should be made to make content accessible for students and their intended audience. The autogenerated "captions" feature within TikTok will create transcribed subtitles from audio and should be utilized with proofreading. Additional closed captions can be provided through the addition of text descriptions using text stickers. Video descriptions of important visual information can be added into the video caption if it is short, or in a pinned comment on the video for use in text-to-speech programs.

Safety issues

Caution was used when filming TikToks within the laboratory to ensure that all of ASM's Laboratory Biosafety Guidelines were being met for the use of electronics or personal devices in the laboratory (13). Students should be explicitly instructed on ASM's Biosafety Guidelines for the use of personal devices in the laboratory if personal devices must be used. We also recommend that any TikToks publicly affiliated with the university or hosted on university social media accounts follow university social media guidelines. Additionally, for the protection of human subjects involved in this study, IRB approval was requested for use of student materials with their informed consent. This study (STUDY00003286) was granted an exemption by Binghamton University's Institutional Review Board under Section 45 CFR 46 104(d) (4) of the Code of Federal Regulations.

CONCLUSION

The development of this pedagogical approach on the fly, as an adaptation to the challenges of teaching in a pandemic, did not allow sufficient time to implement a thorough assessment protocol. Anecdotally, students indicated that teaching TikToks were helpful for learning new content remotely before entering the lab. They especially valued #labfails (laboratory mistakes or challenges) shared by undergraduate peer mentors, both to learn from and to feel less isolated during the challenges of research setbacks.

The value of this approach was most evident through the TikTok science communication assignment. Submissions allowed for assessment of students' basic understanding of their research and course concepts and their effectiveness in science communication. Student feedback from end-of-semester-reflection essays showed excitement and understanding of the purpose of the assignment: "...[it] would be something to not only help me understand what I was learning about in science but allow me to explain what I learned to others." Students demonstrated a clear grasp of science communication principles in the design of their TikToks: "...I found one of the trends that was popular on TikTok and made lyrics that would both fit the trend, as well as correspond to the scientific message I was trying to produce." Assignments also provided creative outlets for students to share struggles and laugh through their learning mistakes, by creating their own #labfails TikToks that recounted past failures in a humorous and educational manner.

Overall, this activity helped students to think about communicating their research to a broader, non-scientific audience through the information systems of their generation. It also forced them to be creative and think about science communication principles as they apply to social media. We plan to continue implementing this activity in future semesters and across other social media platforms to help students practice science communication in a way that is relevant and fun. However, in

future iterations, we would like to better help students to understand how to balance professionalism, accuracy, and entertainment in conveying their research on social media. Additionally, we would like to use the opportunity to teach them about communication accessibility issues and give them the tools to make their message more accessible (alt. text, captions, color contrast, accessibility checkers, etc.).

Continuing to incorporate social media platforms such as TikTok into higher education is a valuable way to both teach course material and develop 21st century science communication skills. The teaching tools and student assignments shared here can be easily adapted for any class, not just a CURE. Science communication skills are important for all STEM professionals, not just researchers. Thus, incorporation of these methods into any STEM class could be a helpful addition for building these skills for communicating important topics or current events related to the class curriculum. The flexibility and popularity of TikTok means that it can easily accommodate the science communication principles of setting, timing, effectiveness, and memorability to create unique educational videos that could potentially reach millions of people (12). Furthermore, the ability to easily capture, edit, and share video content from a single application makes creating TikToks easy for new content creators and a great way to engage students while simultaneously contributing to science outreach initiatives. It is the ethical responsibility of researchers to disseminate findings with the public in a timely way. As the COVID-19 pandemic has shown, effective science communication is vital to fulfilling that obligation. Inspiring the next generation of science communicators will continue to improve science communication, making exciting discoveries accessible to everyone.

SUPPLEMENTAL MATERIAL

Supplemental material is available online only.

SUPPLEMENTAL FILE 1, PDF file, 0.01 MB.
SUPPLEMENTAL FILE 2, MPG file, 6.8 MB.
SUPPLEMENTAL FILE 3, MPG file, 18.8 MB.
SUPPLEMENTAL FILE 4, MPG file, 19 MB.
SUPPLEMENTAL FILE 5, MPG file, 7.2 MB.
SUPPLEMENTAL FILE 6, PDF file, 0.1 MB.

ACKNOWLEDGMENTS

We thank the First-year Research Immersion program, the Spring 2021 undergraduate peer mentors from the Microbial Biofilms in Human Health stream for providing video ideas, and Sonia Hills and Julia Gerstman for providing insight and feedback on developing this approach.

We have no conflicts of interest.

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