Biology Students' Views of Science Communication

A Reflective Approach to Oral Communication in Undergraduate Education

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Educational efforts to promote effective oral science communication at the undergraduate level tend to reinforce strategies related to impression management. Students are taught tactics that can be used to create the impression of competent science communication without reflectively considering epistemological beliefs. Deeper aspects of oral science communication, including underlying epistemic functions, are overlooked. In this article, we examine an undergraduate biology course that includes student reflection about the nature of science communication. Rather than treating science communication as a task of impression management, we prompted students to reflect on their views of science communication. Our findings show that students' oral performances while they give presentations aligned with their personal views of what it means to communicate scientifically. Viewing science communication primarily as a verbal craft (i.e., an activity with a specialized verbal design) encouraged students to make effective use of verbal strategies during presentations. By contrast, students' tendency to overlook visual communication in scientific exchanges led to visual performances in need of improvement. Our findings highlight the need for instructional approaches that offer students opportunities to engage in reflective discussions about what it means to communicate scientifically.

Science communication has been increasingly recognized as a critical aspect of scientific training that can result in many benefits for the scientist and society. Effective communication skills can lead to the availability of clearer scientific information that is more accessible and compelling for a broader spectrum of society, allowing for the establishment of multidirectional communication between scientists and nonscientists, including, decision-makers, stakeholders, and the general public (Kuehne et al., 2014; Nisbet & Scheufele, 2009). Science communication skills can also help eliminate barriers among academic, public, and political communities, thereby reducing the gap between the results of scientific research and their various applications in society (Arlettaz et al., 2010; Kuehne et al., 2014; Meyer et al., 2010). As such, it is critical for science communication to be explicitly taught and embedded in the curriculum of undergraduate science programs.

In an effort to guide educational efforts in this area, scholars have established sets of core skills that undergraduate students need to develop to become effective science communicators (see Table 1). This scholarship identifies sets of oral skills that undergraduate science instructors should target as part of their teaching, as well as communicative abilities that undergraduate science students ought to develop as a result of such educational interventions. Based on extensive feedback from practitioners and professional experts, these communicative skill sets identify features that characterize oral communicative competence in practice.

Despite these efforts, however, current science communication education for undergraduate students is often ineffective and limited (Besley & Tanner, 2011; Chan, 2011). Although oral scientific presentations are numerous, pedagogical focus is primarily on the synthesis and transmission of content to other science experts rather than on the fostering of communication skills (oracy) that can be flexibly used to effectively engage multiple audiences (e.g., laypeople, policymakers) across various social contexts (e.g., public outreach, media relations). Another issue is the prevalence of unreflective instructional activities that give little (if any) consideration to nature of science communication, despite current disagreement on the exact nature of such activity by scholars (Burns et al., 2003). Moreover, science communication is often approached superficially, taught simply as an agreed-upon set of performative qualities (e.g., tone of voice, eye contact) used by effective practitioners to create the impression

TABLE 1

Core oracy skills from the science communication literature.

Mercer-Mapstone and Matthews's (2017) Oracy Skills Framework	Chan's (2011) core skills
• Identify and understand target audience. • Use language that is appropriate for your target audience. • Identify the purpose and intended outcome of the communication (take-home message). • Consider the level of prior knowledge in the target audience. • Separate essential from non-essential factual content in a context that is relevant to the target audience. • Use a suitable mode and platform to communicate with the target audience. • Consider the social, political, and cultural context of the scientific information. • Use or consider style elements appropriate for the mode of communication (e.g., humor, anecdotes, analogy, body language). • Understand the underlying theories leading to the development of science communication and why it is important. • Promote audience engagement with the science. • Use the tools of storytelling and narrative. • Encourage a two-way dialogue with the audience.	• How to plan, prepare, and develop a good poster or PowerPoint presentation • What makes a good or bad presentation • How to understand and cater to the different interest and learning styles in an audience • How to effectively work in groups and handle conflict • How to develop questions and constructively critique others' work • How to respond to questions

of competent science communication (i.e., projecting the image of being a science expert). Students are taught how to influence (or manage) an audience's perceptions about oneself by strategically presenting themselves in a manner that it is consistent with the role of a scientist. Such an instructional approach is problematic because it overlooks deeper aspects of science communication, including underlying epistemic functions, linguistic nuances, and social subtleties. Impression management (Goffman, 1974) is favored over more in-depth reflection about what it means to communicate scientifically.

In this article, we address this issue by examining an undergraduate biology course that included students' reflections about the nature of science communication. Rather than treating oral science communication as a task of impression management (i.e., public display of competence through oral performance), we prompted undergraduate students to explicitly and reflectively articulate their understandings (i.e., personal views) of science communication prior to completing the class assignment.

The nature of science communication

Science communication can be loosely defined as any social engagement that involves one person (the communicator) sharing and negotiating science-related information with another (the audience), with more nuanced distinctions possible when making specific separations between target audiences (e.g., laypeople vs. academics), channels of communication (e.g., written vs. oral), and objectives (awareness, enjoyment, interest, opinion-forming, and understanding; Burns et al., 2003). In this article, we focus specifically on oral science communication in an academic setting while paying special attention to student views on critical differences between science communication and the more specialized term *scientific communication* that is used by and among scientists exclusively (Kobylarek, 2017).

As a highly specialized type of social performance, effective oral communication of science requires, among other things, that an individual acquire and publicly demonstrate specific delivery abilities or skills (Tsang, 2020). On the academic stage, the student-presenter must be able to skillfully perform a series of communicative acts consistent with different degrees of accepted notions of science communicative competence (Table 1). Additionally, as research has shown, social performance is grounded in personal belief (Fishbein & Ajzen, 1975). How students communicate reflects underlying and often tacit assumptions about what it means to communicate scientifically; views of the nature of science (i.e., what the scientific endeavor is like and how scientists go about their work); views of the nature of science communication (e.g., perceived purpose of communicating science, appropriate ways of communicating science); and beliefs about the message, audience, and channel for communication. In other words, when giving scientific presentations, students communicate in manners that are consistent with their personal views of science and science communication. Students' oral performance is rooted in personal beliefs, so the range of successful performative aspects of science communication will reflect the diversity of performers.

However, as we discussed earlier, impression-centered approaches to oral science communication education commonly encourage undergraduate students to simply exhibit competence in enacting the role of a science communicator without explicitly articulating or reflectively considering their personal beliefs. Students' views of the nature of science and science communication remain unchecked. Compounding the problem, students have been shown to often hold naive views of the nature of science (Clough, 2006; Lederman et al., 2002). Various aspects of science are viewed simplistically or inaccurately, including tentativeness, creativity, and objectivity.

In light of the fact that students' communicative performances (action) are reflective of their communicative views (beliefs), it stands to reason that naive views of the communicative aspect of science may also be pervasive among students, with possible implications for their own emergent communicative abilities. As such, a critical aspect of improving students' science oracy skills is helping them develop more informed understandings of the nature of science communication. As an initial step in this direction, this article examines how undergraduate biology students explicitly articulated their views of the nature of science communication prior to their performance of oral scientific presentations.

Research design

Exploratory in nature, our study had a flexible and emergent research design aligned with the tradition of grounded theory (Glaser & Strauss, 1967). As part of this study, descriptive data were systematically collected through open-ended research methods (i.e., survey and video-recorded classroom observations), then analyzed inductively to build a naturalistic account (Lincoln & Guba, 1985) of undergraduate students' views and oral performance of science communication.

Participants and setting

This study examined a third-year biology course on the topic of animal behavior that was taught by the second author (Adam Brown), who held a PhD in biology and had approximately 14 years of teaching experience. Participants included a group of undergraduate students ($n = 57$). Aimed at introducing students majoring in biology to the scientific study of animal behavior, this 13-week course focused on the ecological and evolutionary benefits of a variety of animal behaviors, such as communication, altruism and sociality, territoriality, aggression, feeding habits, mating systems, and parental care.

Another important goal of the course was to develop students' communication skills. To this end, students were provided with science communication instruction and guidance on how to communicate effectively. More specifically, students read and discussed several chapters and sections from a student guide (Brown, 2012) that provided an overview of the process of science and scientific communication (Table 2). During classroom sessions, there were extensive discussions and reflections about the nature of science communication. The course also included an oral presentation assignment. Students were to select a particular animal behavior of interest, find research articles from the primary literature, and give an oral presentation about this animal behavior to a nonspecialized audience. As part of this assignment, students also had to create a seven-slide PowerPoint slideshow to share during their presentations. Assessment was based on the communication style and coherence (i.e., aesthetic design, layout, narrative) as well as the scientific content (i.e., explanation of the context, interpretation of results). For 28% of students surveyed, this was their first time ever giving an oral presentation in an undergraduate class.

Data collection

Data regarding students' views of science communication were obtained through the use of a short written survey. More specifically, prior to their oral presentations, students were asked to answer the following questions:

1. In your experience, what features or manners would describe how professional scientists or biologists communicate scientific information (i.e., scientific communication)?
2. In what ways do the communications from professional scientists or biologists differ from those of "regular" people or laypeople?

Students' responses to these questions were shared and discussed in class. Reflective consideration of their views of the nature of science communication was followed by oral

TABLE 2

Curricular materials on science communication.

Student guide section	Brief description
Chapter 1: How to Learn, Retain, and Communicate Biology (pp. 6–9)	Introduction aimed at raising students' awareness of the pervasiveness and value of science communication for the scientific profession
Chapter 4: Oral Presentations (pp. 29–31)	Description of how scientists communicate with a variety of audiences (scientific and nonscientific), with an emphasis on the need for different strategies
Three Audiences (pp. 34–36)	Informative boxes with description of strategies used by biologists when communicating with three specific audiences: business group, government agency or ministry, and town hall meeting
Section 4.1: Presentation "Look and Feel" (pp. 40–46)	Description of how to effectively prepare and use PowerPoint slideshows during oral presentations (includes guidance on aesthetics, visual design, body language, tone of voice, eye contact, etc.)

Source. Brown (2012).

presentations. Students' oral performances of their scientific research presentations were video-recorded. Serving as a secondary data source, video data were used mainly as a source of researchers' observations.

Data analysis

In this study, we adopted a "grounded theory" approach to data analysis (Glaser & Strauss, 1967) that calls for the iterative and combined use of interpretative and flexible methods of analysis. There are no a priori hypotheses or codes; instead, analytical categories emerge and are gradually refined based on close examination of meanings and patterns in the collected data. Overlapping in nature, our emergent categories focused on three fundamental aspects of science education: what, how, and why. The "what" category included student comments on the content communicated by scientists (e.g., "biologists communicate results" and "conclusions drawn from data"). Within the "how" category (the dominant one), we included students' commentary on the unique linguistic features and communicative manners of scientists (e.g., "scientists use many technical terms"). Finally, the "why" category dealt with scientists' communicative goals or reasons to communicate (e.g., "to convey an understandable message to all"). Students' written responses were systematically read until themes in the students' views of science communication became discernable. The display of the data was enhanced through the inclusion of excerpts from the coded textual materials alongside descriptive statistics (frequencies of codes).

The video recordings were analyzed qualitatively. Discursive records of oral presentations were carefully examined to assess students' communicative performances in light of their views of the nature of scientific communication. This examination was multifocal, centering specifically on the three aspects of science communication: (i) narration (e.g., enthusiasm, concise language, appropriate terminology); (ii) mastery of subject matter (e.g., organization of thought process, logical flow to presentation); and (iii) slideshow aesthetics (e.g., visually appealing, good balance of text and other media).

Results

In this section, we present the results of the qualitative analyses. First, we examine students' views of science communication, focusing specifically on the themes of scientific language complexity, visualization, and scientists' ability to overcome linguistic differences. The focus then shifts to themes related to students' oral performances. More specifically, we examine verbal and visual aspects of students' oral presentations in light of their views of science communication.

Students' views of science communication

Students generally considered scientific communication to have a higher degree of complexity than everyday conversations. The higher complexity was attributed to various factors, including complex vocabulary, topics, and manner (style). Here are a few student quotes from survey responses:

> *"Regular/lay people communicate in a more general, simplified manner compared to scientists. There is a greater emphasis on the conclusions drawn from data rather than the data itself."*

> *"Science communication is much more complex than an everyday conversation. For this reason, scientists must be able to simplify content in a way that doesn't take away from the quality of that content. They must be able to introduce their topic through definitions and background information in a way that will simplify it for the listener."*

"Scientists have to explain complex ideas to audiences that may not have any background on that topic, so they need to be able to explain and define terminology beforehand, then get into the actual content of the presentation."

The majority of the students (51%) mentioned that scientists used more technical vocabulary than the average person (Figure 1). For all of these students, what set scientific communication apart from other types of engagement was primarily word usage. Put differently, scientific and other forms of communication were most commonly differentiated by students on lexical grounds. Interestingly, nonverbal differences were hardly mentioned. Only three students commented on the use of imagery (e.g., "visuals are usually clear and simple but effective without distracting the audience"; "regular people will most like not use as much visual representation for data have more of a relaxed tone"). Such a trend suggests a tendency among students to overlook visual communication in scientific exchanges.

Closely related to that trend, many students conceived of science communication as a type of event in which speakers needed to overcome language differences (similar to a bilingual exchange). Twenty-three percent of the students mentioned the need for speakers to spend time explaining complicated terms or avoid using the complicated terms altogether. However, there was noticeable disagreement among students in their survey responses about whether or not scientists were actually able to accomplish this when communicating:

FIGURE 1

Student comments about word differences between scientific and lay communication.

- Scientific communications tend to be more "wordy" and use very complex vocabulary.
- Communications from professional scientists differs from regular people in that scientists use many technical terms.
- There is a lot of jargon associated with the science field.
- Professional scientists/biologists often communicate using vocabulary that is different than that of a layperson.
- Scientists have a more refined vocabulary when it comes to explaining concepts within the world of science.
- Obviously, scientists use very technical jargon that relates to science.
- More scientific lingo and typically more thought-out points
- Vocabulary is quite advanced and has to be very specific.
- Jargon used is more professional and specific.
- Jargon, more technical language
- A more elaborate vocabulary

"Scientists are very knowledgeable about the subject but are able to explain it fairly simply, so that anyone can understand."

"Scientists use potentially confusing terminology relating to the topic as needed."

"Scientists are able to explain the information with the correct terms while still making sense to the listener."

"I have found that they attempt to avoid jargon so as to convey an understandable message to all."

"From what I have seen, scientists generally do not bring their vocabulary down to a basic level of understanding. It is almost like they talk as if everyone knows what they are talking about already. I attended a conference this fall, and many of the presenters talked in a way that made them seem as though they were superior to us delegates, however they did not simplify their language so it was hard to follow at times. For the most part, professional scientists communicate scientific information in a way that is not easily understood by everyone."

"Scientists are very heavy on the scientific jargon and it's confusing. They don't try to accommodate for people who aren't at their level of comprehension."

Although it was mentioned relatively less often, manner and style did feature in students' views of science communication, as 26% of the students characterized scientists' professional communicative practices as being more objective, direct, formal, precise, and/or concise than laypeople's communication, which was seen as more casual and less straightforward in the delivery of information (Figure 2). For these students, communicating scientifically may be seen as a "superior" way of talking that is clearer, more rational, and better organized. These students' views of science communication share a high degree of resemblance to what high school students perceive as the "proper" way of talking about

FIGURE 2

Student views of scientists' communicative style.

- Biologists differ from lay people in that they are able to communicate results in an objective manner that does not make their topic emotive.
- The overall tone is very objective and straight to the point.
- Scientists are very specific regarding the content that they discuss and typically do not make sweeping generalizations.
- Scientists are usually very stoic and are concentrated on conveying the material.
- Scientists tend to use more precise language then regular people. I also believe they are more direct in communication.
- Regular people are not as concise and straightforward in their communication.
- No/very little slang
- Scientists are also more careful/specific with the words they use to avoid mis-leading.
- More concise and skeptical.
- They are sometimes dry, they are usually rational in their manner.

science (Lemke, 1990). To sound like a "science person" (i.e., project a scientific self-image), one needs to adopt a formal and informative tone, avoid colloquial forms of language, be serious, and use technical terms. An important part of being a professional scientist is perceived as being able to talk this talk.

Students' oral performances

Students' presentations focused on a variety of biological topics, such as camouflage in cephalopods, male parental care among mammals and primates, aggression in birds, mate finding among pandas, snails' inbreeding depression, infant roughing by male baboons, sexual coercion in dolphins, male competition in chameleons, and salmon foraging strategies.

For the most part, in our observations of the videos, we found that students performed consistently well on verbal aspects of the science communication task. Our observation notes repeatedly highlighted students' oral strengths while presenting (e.g., appropriate terminology and language use; good tone, conversational; good explanations; asking questions and using research to answer was good strategy; good use of questions; good explanations). Students' strong verbal performance aligned with their views of science communication as a verbal craft (i.e., an activity with a specialized verbal design). Recognition of the importance of the task seemed to have encouraged students to closely attend to their verbal strategies when preparing their presentations.

By contrast, students' visual performances were often characterized by areas in need of improvement. Students frequently fell short of designing visually effective slides or using them effectively during their presentations. Here are a few excerpts from our observation notes:

> *Graphs were spoken over without walking us through to know what was being talked about; it was confusing trying to follow along.*
>
> *There was a graph during page on salmon vs. fitness that was not discussed at all; confusing without knowing what to look at/pay attention to.*
>
> *Don't put graph legend on slide, too hard to read.*
>
> *There was confusion when pointing to four boxes on slide and saying "as we see here" because we couldn't tell what you were pointing to.*

Our notes indicate that students gave less consideration to their visual communicative strategies when preparing for their oral presentations, a trend consistent with their views of science communication overall.

Discussion

As we indicated in the beginning of this article, educational efforts to promote science communication at the undergraduate level have been largely focused on impression management (i.e., public display of performative ability). Students are simply provided with effective tactics for orally presenting themselves in a scientific manner and influencing (managing) an audience's perceptions about oneself without explicitly articulating or reflectively considering their personal beliefs. However, as our findings show, oral performance is closely linked to personal views. One communicates as one views science communication to be. This alignment between students' oral performances when giving scientific presentations and their personal views of science and scientific communication has important implications for educational practice.

It is well established in the social sciences that communicative performance is guided by a speaker's framing of a social event (Goffman, 1974). Speakers carry with them mental representations and interpretive schema that they use to make sense of social situations and distinguish among different types of interactional activity (e.g., a scientific presentation from an informal conversation). Speakers' "interpretive frame" or framework of understanding informs their participation in social events, guiding how they act and respond to the audience. Moreover, competent speakers actively produce "framing"—that is, they are able to organize, establish, evoke, and transform their interlocutors' frame of a social situation through strategic employment and effective manipulation of communicative clues. For instance, joking can help reframe a presentation more casually. As such, students' views (interpretative framework) of the nature of science communication influence their ability to frame their oral presentations scientifically. This is precisely what the reported findings revealed.

The realization that students' communicative ability is closely linked to their views of their nature of science and scientific communication has important implications for undergraduate education. The finding underscores the need for instructors to approach science communication not as a task of impression management but as a reflective framing task. Rather than simply providing tips or tricks of trades that students can use to "put on a science show," instructors need to promote student reflection about the framing of science communication. This alternative approach is likely to help students develop an increased level of awareness of their tacit assumptions about the nature of science communication as well as an enhanced ability to monitor and regulate their framing of oral science presentations as events of a particular nature (e.g., authoritative, formal, dialogic, casual). As several studies have recently shown (Oliveira et al., 2021; Tsang, 2020), self-regulation and self-monitoring abilities are central to becoming an effective oral communicator.

Approaching science communication as a framing task will require adding a new dimension to existing theoretical frameworks for curriculum development. For instance, Mercer-Mapstone and Matthews's (2017) Oracy Skills Framework includes four dimensions—physical, linguistic, cognitive, and social emotional—none of which attend to students' view of science and scientific communication. Based on our findings, we suggest the addition of a fifth dimension that attends to students' personal epistemologies and deeper (philosophical) questions such as these:

- What is science communication?
- What does it mean to communicate scientifically?
- What do I view as being considered as science communication?
- How are my views being enacted during oral performance?

The addition of this nature of science communication dimension is essential for ensuring that science communication education at the undergraduate level goes beyond superficial performance and becomes more reflectively and epistemically or philosophically grounded.

Conclusion

Our findings highlight the need for more reflective instructional approaches to science communication education at the undergraduate level. In addition to creating opportunities for students to practice communication skills, instructors also need to engage students in reflective discussions about what it means to communicate scientifically. Without reflection about the personal beliefs behind communicative action, classroom activities such as student presentations run the risk of amounting to a simplistic and thoughtless exercise of impression management through oral performance. Taking a more reflective approach informed by students' personal epistemologies is essential if university science instructors are to succeed in their efforts to train professional scientists who are skillful and thoughtful communicators and capable of effectively engaging policymakers, peers, and the public in an integrative way.

References

Arlettaz. R., Schaub, M., Fournier, J., Reichlin, T. S., Sierro, A., Watson, J. E., & Braunisch, V. (2010). From publications to public actions: When conservation biologists bridge the gap between research and implementation. *Bioscience*, *60*(10), 835–842. https://doi.org/10.1525/bio.2010.60.10.10

Besley, J. C., & Tanner, A. H. (2011). What science communication scholars think about training scientists to communicate. *Science Communication*, *33*(2), 239–263. https://doi.org/10.1177/1075547010386972

Brown, A.O. (2012). *The biology undergraduate student's guide to success*. Nelson Education.

Burns, T. W., O'Connor, D. J., & Stocklmayer, S. M. (2003). Science communication: A contemporary definition. *Public Understanding of Science*, *12*(2), 183–202. https://doi.org/10.1177/09636625030122004

Chan, V. (2011). Teaching oral communication in undergraduate science: Are we doing enough and doing it right? *Journal of Learning Design*, *4*(3), 71–79.

Clough, M. P. (2006). Learners' responses to the demands of conceptual change: Considerations for effective nature of science instruction. *Science & Education*, *15*(5), 463–494. https://doi.org/10.1007/s11191-005-4846-7

Fishbein, M., & Ajzen, I. (1975). *Belief,* *attitude, and behavior: An introduction to theory and research*. Addison-Wesley.

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Aldine.

Goffman, E. (1974). *Frame analysis: An essay on the organization of experience*. Harper & Row.

Kobylarek, A. (2017). Scientific communication. *Journal of Education Culture and Society*, *8*(2), 5–8.

Kuehne, L. M., Twardochleb, L. A., Fritschie, K. J., Mims, M. C., Lawrence, D. J., Gibson, P. P., & Olden, J. D. (2014). Practical science communication strategies for graduate students. *Conservation Biology*, *28*(5), 1225–1235. https://doi.org/10.1111/cobi.12305

Lederman, N. G., Abd-El-Khalick, F., Bell, R .L., & Schwartz, R. S. (2002). Views of nature of science questionnaire (VNOS): Toward valid and meaningful assessment of learners' conceptions of nature of science. *Journal of Research in Science Teaching*, *39*(6), 497–521. https://doi.org/10.1002/tea.10034

Lemke, J. L. (1990). *Talking science: Language, learning and values*. Ablex.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage.

Mercer-Mapstone, L. D., & Matthews, K. E. (2017). Student perceptions of communication skills in undergraduate science at an Australian research-intensive university. *Assessment and Evaluation in Higher Education*, *42*(1), 98–114. https://doi.org/10.1080/02602938.2015.1084492

Meyer, J. L., Frumhoff, P. C., Hamburg, S. P., & de la Rosa, C. (2010). Above the din but in the fray: Environmental scientists as effective advocates. *Frontiers in Ecology and the Environment*, *8*(6), 299–305. https://doi.org/10.1890/090143

Nisbet, M. C., & Scheufele, D. A. (2009). What's next for science communication? Promising directions and lingering distractions. *American Journal of Botany*, *96*(10), 1767–1778. https://doi.org/10.3732/ajb.0900041

Oliveira, A. W., Brown, A. O., Carroll, M. L., Blenkarn, E., Austin, B., & Bretzlaff, T. (2021). Developing undergraduate student oral science communication through video reflection. *International Journal of Science Education*, *11*(2), 143–154.

Tsang, A. (2020). Enhancing learners' awareness of oral presentation (delivery) skills in the context of self-regulated learning. *Active Learning in Higher Education*, *21*(1), 39–50.

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