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Post-Normal Concerns in Science Communication Pedagogies

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ABSTRACT: How might an instructor of science communication approach the post-normal issues of ethos, credibility, trust, and expertise? This analysis draws from recently published science communication course descriptions, syllabi, and pedagogical publications that describe science communication courses. Science communication pedagogies from multiple disciplines were categorized for their approach to post-normal concerns and instructional design. Examples range from no consideration to including post-normal concerns. Ultimately, this analysis complicates our assumptions since it suggests instructional design might matter more than disciplinary norms for facilitating the inclusion of post-normal concerns. This finding has practical implications for hiring, housing, and silo-breaking in the academy.

KEYWORDS: credibility, engagement, ethos, expertise, pedagogy, science communication, syllabus, trust

1. INTRODUCTION

Imagine being a new faculty member, unsure postdoc, or curious graduate student. You have been assigned to teach a new course in your program – science communication – a course that everyone agrees fulfills a need for your students, but no one really has any advice for how or what to teach. What would you do? The premise for this small, exploratory study is that you would seek example syllabi online using the most basic search terms for your course. What is found there would likely influence the course design, topics, and the approach to post-normal concerns like ethos, credibility, trust, and expertise your new course would take.

In the last decade or so national organizations such as the National Science Foundation (NSF) and the American Association for the Advancement of Science (AAAS) acknowledged the need for better training in public science communication. To fill this perceived need need a variety of university courses, programs, and trainings in a variety of STEM and communication (social science and humanities) fields have developed. However, we do not know a lot about this pedagogy’s content on a broad scale. Are there distinctions by field or discipline? Does it matter who teaches the course? In what stage of a student’s coursework do the courses tend to appear? This project stems from frustration about describing science communication pedagogy as a single entity and curiosity about what goes on in the pedagogy of this multi-disciplinary pursuit.

First I review the literature that informs this inquiry. Then I explain how I made decisions about the content analyzed and the method. I review some significant limitations and explain preliminary findings. Finally, I open up discussion about the findings’ implications.

2. LITERATURE REVIEW

What courses that engage science communication ought to be teaching is a long-standing conversation in writing, rhetoric, and communication fields but is often published using
particular STEM discipline focuses and vehicles. For example, Sprain and Timpson’s (2012) proposal for case-based pedagogy in environmental communication targets sustainability science. Drury, Bost, Wysocki, & Ingram (2018) study of deliberative pedagogy is located in a biology classroom and journal. The urge to contextualize science communication pedagogy follows a rhetorical sensibility that places importance on a pedagogy’s locale and particulars. Publishing in disciplinary journals benefits scholars by opening up more places to publish and targeting interested audiences.

However, siloed pedagogical knowledge can leave generalist science communication teachers at a loss. Those who teach multi-disciplinary science communication courses are faced with attempting to individualize the course, integrating disciplines’ norms and helping students appropriate specialized language (Bartholomae, 1986) or use the course as a means to intervene in the status quo (McGreavy, Druschke, Sprain, Thompson, & Lindenfeld, 2016). Most textbooks geared towards generalist pedagogy seem to take a genre production approach, though a broad study of textbooks from multiple disciplines would shed more light on their influence. As Ceccarelli (2013) reminds, pedagogical choices should be explicitly made and principled; literature in science communication often treats teaching as a monolithic means of engagement; a view that needs nuance and means for better evaluation.

In addition to limiting the circulation of general pedagogical knowledge, disciplinary silos also limit our understanding of how science communication pedagogy is responding to post-normal concerns. “Post-normal” as a term is a response to Kuhn’s (1962) delineation of “normal science” as “an actualization achieved by extending the knowledge of those facts that the paradigm displays as particularly revealing,” a process he also characterizes as “mopping up” (p. 24). Mopping up implies a stable system in which scientists can assemble facts, apply, and disseminate knowledge without challenge until a new paradigm comes along. However, challenges to deficit model approaches in the public understanding of science and the realities of high uncertainty and stakes in science-informed decision-making have led to more complicated models of science that emphasize judgements of science quality (Funtowicz & Ravetz, 1991). This post-normal mode involves an acknowledgement that the public (and scientists themselves) are influenced by rhetoric in their judgement of science quality (Gross, 1996).

Although I expect the approach to post-normal rhetorical concerns such as ethos, credibility, trust, and expertise varies due to each discipline’s unique relationships with its public and internal audiences, we do not yet know whether and how science communication pedagogy writ broad is shifting to accommodate these concerns.

3. CONTENT SELECTION AND LIMITATIONS

To discover what a frustrated new teacher would find using a simple Google search, and start to answer the question of how post-normal concerns are being integrated in science communication pedagogy, I gathered the first twenty-five syllabi that populated under a query for “science communication syllabus.” The query resulted in syllabi for a variety of disciplines including Geoscience, Veterinary Medicine, Health Science, Climate Science, Biology, Communication, Writing Studies, Education, Science & Technology Studies, Journalism, and others. Although there are a few clearinghouses and archives for discipline-specific syllabi in science communication, these did not populate in the first couple of pages of results, effectively hiding them from our clueless Googling teacher.
Ultimately I ended up with twenty-five syllabi from eighteen disciplines. I coded them for instructional design approach, which I identified as the guiding principle for the course. These themes ended up as three codes: exploring theory, exploring case studies, and practicing genres. I allowed myself to double-code syllabi where appropriate. Finally, I coded for whether post-normal rhetorical concerns seemed to be present or not present in the syllabus.

Obviously there are a lot of limitations to this approach. First, this is a small sample, and the questions I am addressing could certainly be answered using a full database of syllabi. However, for a pilot close reading and thematic analysis (Nowell, Norris, White, & Moules, 2017), twenty-five give me plenty to work with. Also, the small sample is more realistic for the scenario of understanding what a new teacher of science communication would gather.

Secondly, a limitation I experienced was in deciding which courses count as science communication. I decided to be guided by the names of the courses and take a broad approach. This is because we do not yet know how post-normal concerns are being integrated into curricula across disciplines. I do not know in what courses, disciplines, and at what academic levels those concerns might show in the syllabi. Some example course names in the corpus include: Introduction to Science Writing; Communication, Environment, Science & Health; Writing in Biology: Science in the News; Climate Change Science, Communication, and Action; and The Art of Science Communication. Courses varied from undergraduate to graduate level.

Third, post-normal concerns might be integrated in a course without distinctly appearing in a syllabus. Although I did seek terms related to the rhetoric of post-normal science such as ethos, credibility, trust, and expertise, I also allowed myself to close-read and interpret syllabus content. This was necessary because the terms associated with post-normal science vary in type and meaning across disciplines. For example, the debate over exactly what is and should be meant by scientific ethos is almost a century old (Merton, 1938).

Relatedly, looking at syllabi does not allow for a complete and deep understanding of the stance taken in a course towards post-normal concerns. For example, it is common to see vague language in these syllabi such as, “We will also explore the ethical, social and political issues raised by media coverage of science and medicine.” My decision was to code the sentence as indicating that post-normal concerns probably are present. In this case the sentence at least acknowledges issues outside of deficit-model production. When post-normal concerns show up in syllabi I am assuming their presence indicates that these topics are an important component of the class and focused attention is being paid to them.

4. CODING

To code the syllabi, I first recorded the course’s discipline. I then created descriptive codes to capture the approach to instructional design the course seems to take. Although some categories of course design are codified in science communication pedagogical literature (ex. case-based, deliberative, etc.) these did not map perfectly on the themes I found in the corpus of syllabi. Instead I found three themes of course design: theory, case study, and genre.

- Theory-based approaches encouraged students to read and discuss the theoretical underpinnings of science and society issues.
- Case study-based approaches grounded student discussions, projects, and course units in historic real-life situations.
• Genre-based approaches gave students the opportunity to practice science communication production meant for audiences outside the classroom.

None of the syllabi in the corpus stated outright that outside audiences ever saw student work or that students ever engaged in ongoing real-life situations as part of course work, though a few syllabi gave hints that service-learning may be incorporated. Therefore, these activities are not included in the instructional design thematic codes, even though service-learning approaches are often espoused and explored in science communication pedagogical literature as a way to combat deficit model thinking (Namir, et al., 2018).

I also coded for whether or not I saw any hint of post-normal rhetorical concerns, such as credibility or trust, present. For example, the following is an excerpt from a Science & Technology Studies syllabus that was coded for taking a genre-based approach with post-normal issues present:

A practical course in communicating science considering various genres of output for different audiences and on different platforms. Students learn how to write short news stories, profiles, and reportages for broadsheet newspapers and popular science magazines, targeting a range of audiences from educated adults to school children with an interest in science. They write blog posts and produce other kind [sic] of contents for social media such as video collages for Youtube [sic]. They interview scientists on their work and present their interviews in writing as well as through podcasting. Issues in the public understanding of science are discussed from this practical standpoint of communication.

Here, genre was tagged as the approach since students are practicing the production of several named genres. I coded that post-normal concerns were likely present due to the last sentence’s mention of “issues in the public understanding of science” which does not guarantee but does suggest post-normal issues will be explicitly present.

Another example from Plant Biology worked in a similar way, but with a distinct advocacy lens. This syllabus claims, “By the end of this course, students will... learn how to ‘read’ an audience and successfully discuss their work without overwhelming or talking down.” I coded post-normal issues as present, since this sentence indicates issues of ethos and trust will be explicitly discussed. The syllabus also included that students will “learn how to think both as a scientist as well as a reporter/advocate of science.” The advocacy lens showed up in a couple syllabi in this corpus, but not enough to become its own instructional design approach code. However, I would expect in a larger sample this approach would appear as a full-fledged thematic code.

A third example from Engineering was interesting to code because the syllabus explains students will be reading theory and investigating case studies as well as practicing genres:

This course provides an overview of science communication and an exploration of recent issues that highlight its importance. Students complete the course with a theoretical understanding of science and public knowledge on the global stage and practical experience of doing communication in different forms.

Courses consist of lectures, readings and group works. As a course focused on communication, ample opportunities are provided to discuss the content of lectures and texts, to deepen understanding and to practice skills in expressing opinions. Throughout the course, exercises are given where students use different formats of science communication focused on different areas of science and engineering, which will result in a final project – a public communication event.
Here I faced a choice in coding for approach. Initially, after studying the learning outcomes and the course schedule, I coded the course as taking a theory and case study approach even though genre practice was also integrated throughout. However, after similar mixed approaches emerged from other syllabi during the iterative thematic analysis I decided to triple-code the approach. Again, this example shows the limits of relying on a syllabus to code the content of a course.

5. FINDINGS

There are a few interesting findings from this study. First, eleven of the twenty-five syllabi seemed to tackle science communication through practicing genres. However, only two of those eleven signalled in their syllabi that any post-normal concerns are discussed.

Seven of the twenty-five syllabi signalled post-normal concerns are present in the pedagogy. Of those seven, the course design approaches were coded: theory (3), theory & case study (1), case study (1), case study & genre (1), and genre (1). Although with such a small sample, my goal was not to correlate post-normal concerns’ presence and the approach numerically, this breakdown supports the assumption that a theory approach is more conducive to integrating post-normal concerns than other approaches to course design.

I also did not find a correlation between discipline, approach, and the presence of post-normal concerns. The table (Table 1) below shows the seven syllabi that signalled the presence of post-normal concerns with their course design approach and discipline.

Table 1

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<td>Case Study &amp; Genre</td>
<td>Freshwater Science</td>
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<td>Genre</td>
<td>Public Health</td>
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This seemingly complete lack of correlation I found surprising, since I thought I might see some clustering of STEM fields vs. humanities or social sciences. However, even in the full sample of twenty-five the fields did not cluster by approach.

6. DISCUSSION AND IMPLICATIONS

In summary, I found a range of integration of post-normal rhetorical concerns in the first twenty-five syllabi a new teacher would encounter via Google search. There were several examples that had no indicated consideration of post-normal rhetoric. Unfortunately, there were also no syllabi that centered those issues. As expected, I found instructional design seems to be linked to whether post-normal concerns are taken up.

However, though I expected disciplinary norms to impact the approach to a science communication course’s instructional design that did not seem to hold true in this small sample. Also I was surprised by the seeming cross-pollination across disciplines. It might turn out that instructional design has a more important impact on content than disciplinary norms. Ultimately, this analysis complicates our assumptions about multi-disciplinary science communication pedagogy. The seemingly present and likely ongoing knowledge and pedagogy sharing in science communication as a multi-disciplinary field has practical implications for hiring, housing, and silo-breaking in the academy.

REFERENCES