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Editor's Note

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We are excited to publish Issue 8.1, our first as editors of *Prompt*. During the transitional period, we have been appreciative of the careful and caring labor that past editors Susanne Hall, Holly Ryan, and Jon Dueck have invested in the journal. We echo, too, the gratitude Susanne expressed in her final Editor's Note (2023) for the passion, labor, and expertise of the journal's editorial team, its reviewers, and the authors whose work has appeared here. We feel fortunate and humbled to inherit a set of policies and procedures that are smart and humane. Rather than finding ourselves eager to mold the journal to our preferences and priorities, we instead come into our editorial positions with a desire to maintain the thoughtful course of the ship.

That desire to maintain course does not mean that we have made no changes. Indeed, we are excited to steer the journal to continued impact by:

- Signing an MOU with the WAC Clearinghouse in June 2023 to affiliate *Prompt* with their family of journals. Mike Palmquist and Michael Pemberton were key to this effort, and we are grateful for the new pathways to visibility and expertise this relationship will bring.
- Bringing on a new set of energetic associate editors. Several associate editors ended their terms in 2023, and our call for applicants was met with an impressive number of impressively qualified individuals. The following people have joined *Prompt's* editorial team as of November 2024:

    - Sara Callori, Associate Professor of Physics, California State University, San Bernadino
    - Eman Elturki, Lecturer of English, University of Illinois, Chicago
    - Fangzhi He, Assistant Professor of the Practice (Writing Studies), Davidson College
    - Kristy Ganoe, Assistant Professor in English, Pennsylvania State University
    - Angela Laflen, Associate Professor in English, California State University, Sacramento
    - Jessica McCaughey, Associate Professor of Writing, The George Washington University
    - Thomas Girshin, Associate Professor of English, California State University, San Bernardino
    - Drew Loewe, Professor of Writing and Rhetoric, St. Edward's University
    - Jonathan Marine, PhD candidate in Writing and Rhetoric, George Mason University

    These new colleagues join Alex Halperin, Aimee Mapes, Dave Wessner, and Ethan Youngerman, who continue with us as associate editors.

prompt
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- Lining up a special issue focused on assignments from a single writing program, the Expository Writing Program at NYU. Slated as Issue 9.2, this effort should help us refine future calls for additional program-focused special issues. We hope that explorations of assignments from individual writing program ecologies will become a signature type of special issue. We hope, too, this focus for special issues will help us ensure a broad range of assignments across disciplinary contexts.

Across the essays and assignments in the current issue, you will find contributors taking up important concerns including agency, motivation, and play; cultural preservation; productive failure; ambiguity and contested knowledge; and audience awareness. Spanning first-year writing, technical communication, art, chemistry, biology, and disability rhetorics, the assignments in this issue provide several generative ideas for application across a range of contexts.

Tolonda Henderson's essay, "The Unbibliography: When Failure is Not a Waste of Time," describes an assignment that asks first-year composition students to reflect on the task of discarding sources as they work through the process of creating an annotated bibliography. Thus, the Unbibliography assignment recasts a moment that might be considered a failure as a valuable part of the process. Drawing on comments from a previous class, Henderson finds that the assignment helped students assess source quality and relevance with more sophistication.

"Bridging the Worlds of Art and Science: How General Chemistry Empowers Cultural Heritage Preservation," by Adrian Villalta-Cerdas, asks students to use theoretical chemistry concepts and apply them to art and cultural heritage conservation, emphasizing the practical application of chemistry concepts to real world artifacts. Through the process, students come to see not only the significance of scientific literacy in cultural domains, but also the importance of preserving cultural artifacts and artwork.

Carolyne King's essay, "Constructing Disability: Creating a Keyword Portfolio" describes a semester-long assignment in which students identify and develop explanations for terms related to disability. King explains that, unlike encyclopedia entries that often present knowledge as static, keywords help students engage with the contested and shifting nature of disciplinary knowledge. Through creating keyword entries and an accompanying cover letter, students grapple with rhetorical constructions of disability and access, including their own positionality.

Natalia Andrievskikh's essay, "Student-Created Tabletop Games as Advocacy: Exploring Alternatives to the Op-Ed Genre in First-Year Writing Courses" describes a critical making process leading up to the collaborative development of tabletop games. Andrievskikh argues that this kind of learning through play enhances student critical thinking, persuasive argumentation, and rhetorical agency.

Chadene Tremaglio and Michelle Kraczkowski's essay, "In Layman's Terms: Teaching Students to Understand the Scientific Literature Through Blog-Style Writing Assignments," describes their efforts to promote deeper reading and clearer writing about scientific concepts. In their upper-level undergraduate biology course, they developed a blog-style lay summary as a writing-to-learn activity that they have since revamped in response to student feedback.

Finally, we're proud to be making the University of Wyoming the new editorial home of the journal; UW has a long and storied history when it comes to writing instruction, particularly the ways best practices in the field are intimately tied to issues of academic labor. As we continue to shape the journal, we will be looking for opportunities to shine a brighter light on how individual writing assignments respond to the conditions of work in specific institutional contexts.

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Hall, S. (2023). Editor's Note. *Prompt: A Journal of Academic Writing Assignments*, *7*(1), 1–7. https://doi.org/10.31719/pjaw.v7i2.172

The Unbibliography
When Failure is Not a Waste of Time

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Abstract

The Unbibliography asks students to keep track of sources they thought they might use in an annotated bibliography assignment but ultimately rejected. Each discarded source is annotated with details about these two moments—when the source seems valuable and when it proves less useful than it originally promised—in the research process. The project also includes a component that requires students to reflect on how the Unbibliography impacted their experience of developing the annotated bibliography project. By highlighting and valuing a part of the research process that is typically regarded as a waste of time, the Unbibliography resituates "failure"—identifying and discarding potential sources—as an essential part of the process. In this way, students are encouraged to grow from novice to experienced researchers.

Introduction

Research—an integral part of writing in an academic context (Bodemer, 2012; Elmborg, 2005; Isbell & Broaddus, 1995)—is often described as a process of trial and error. This characterization has the potential to help students think of research as iterative, non-linear, and messy, yet most documents that students are asked to produce for their classes focus on demonstrating success without providing an opportunity to reflect on how false starts, missteps, and failure can be valuable parts of the research journey. For example, an annotated bibliography project prompt might include information on how many sources a student should include without providing any guidance on how many sources should be consulted along the way. To the novice researcher, this may imply that if the assignment requires five sources, the student or researcher can just use the first five they come across that meet the basic criteria. Experienced researchers know the satisfaction of developing a complex project based on a wide range of sources that may or may not have made the final cut, but novices often need scaffolded help to come to the conclusion that a grab-and-go approach to research is insufficient. The Unbibliography assignment is designed to help them move towards that conclusion.

I have most recently assigned the Unbibliography to my own students as a graduate instructor of record in the First Year Writing (FYW) program of the University of Connecticut. I first articulated it, however, as a suggestion to a writing department faculty partner while working as an instruction and reference librarian at George Washington University. The Unbibliography is rooted in an idea I encountered while studying to be a librarian called the Rule of Three: a student should examine three times as many sources as called for in the assignment prompt. When working on an annotated bibliography that asks for five sources, then, the student will produce the best work if they examine at least fifteen sources rather than settling for the first five they encounter. Thus, the Unbibliography asks students to keep track of sources they thought they might use in the annotated bibliography assignment but ultimately rejected. Each discarded source is annotated with details about these two "decision points" (Elmborg, 2005, p. 11): the initial rationale for choosing the source and the explanation for discarding it. The project also includes a component that requires students to reflect on how the Unbibliography impacted their experience of developing the annotated bibliography project. By highlighting

prompt
a journal of academic writing assignments

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and valuing a part of the research process that is typically regarded as a waste of time, the Unbibliography resituates "failure"—discarding sources that initially looked promising—as an essential part of the process. In this way, students are encouraged to grow from novice to experienced researchers.

Of course, the Unbibliography is not the first attempt to adapt or extend annotated bibliography assignments. For example, Jacob D. Richter (2020) assigns an Infosphere Probe which expands the media streams which are acceptable and even necessary to explore and include. Allison Hosier (2015) asks her students to write an "un-research" (p. 126) essay based on knowledge they already possess; students then search for sources that support, challenge, enhance, or "add new information" (p. 130) to their essays. The Unbibliography differs from these reimaginings of the annotated bibliography assignment by shifting the focus away from the finished product and toward the cutting room floor.

Information Literacy and the Unbibliography

Annotated bibliographies are often assigned to "jump-start the research process in preparation for a larger assignment or project" (Richter, 2020, p. 26; see also Mantler, 2017). My experience as an instruction and reference librarian, however, has taught me that the task of listing and describing adequate sources can only go so far in prodding students to grow as researchers. One of the information literacy concepts articulated by the Association of College and Research Libraries (ACRL) (2015) in their *Framework for Information Literacy for Higher Education* is "searching as strategic exploration" (p. 22). They explain that "novice learners may search a limited set of resources, while experts may search more broadly and deeply to determine the most appropriate information within the project scope" (p. 22). In other words, an emerging sense of information literacy involves becoming accustomed to looking at more sources than students might use for a particular project. This aspect of information literacy makes the Rule of Three particularly relevant. Most students, however, are either unaware of this advice or unfamiliar with the benefits of following it. Warwick et al. (2009) found that students tended to engage in what they call "strategic satisficing" (p. 2409). In other words, students in their study would "create time-saving strategies to complete the coursework with minimum effort rather than harnessing their skills to complete an excellent assignment" (p. 2409). I do not fault students for seeking to manage their limited time wisely. Instead, I use the Unbibliography to incentivize them to "search more broadly and deeply" than they might ordinarily do.

The Development of the Unbibliography

One concept that frequently arose when I collaborated with writing department faculty as a librarian was helping students evaluate sources. My approach to this skill has been to ask students to bring in sources they knew they would not or could not use for the assignment. Our conversation about why they would or could not use those sources enabled the class to develop criteria to guide their research process. These criteria typically matched those articulated by the CRAAP test (Currency, Relevance, Authority, Accuracy, Purpose; see Blakeslee, 2004); when there were gaps I would offer suggestions. Understanding how to evaluate sources and examining enough sources are, however, two different skills. Based on the Rule of Three, I suggested to a few of my faculty partners that they require students to submit a list of sources the students had looked at but decided against using. One of my faculty partners liked the idea and assigned the project.

At first, students would often report that they rejected a source because it was not on their topic. While relevance is an important evaluation criteria, the discarded sources were often

wildly off topic which gave the impression that students may have thrown together a list that had little or nothing to do with the process of finding sources they actually intended to use. In other words, these students had not been adequately discouraged from strategic satisficing. To address this problem, I worked with the faculty member to adjust the prompt in following semesters to ask students to examine sources, not just look at them. The faculty member and I also clarified what was meant by "examine," namely that the Unbibliography should include sources the student initially thought they might use but decided against. The annotations written in response to the tweaked prompt revealed that the adjustment was successful: students still discarded sources based on relevance but did so in a more nuanced way.

As both a librarian and an instructor of record, I have worked with annotated bibliography projects and the Unbibliography as intertwined assignments. For that reason, I have made sure to reference the latter when teaching the former. For example, I typically use topics volunteered by students to drive our exploration of library databases. This has meant that the student in question could guide our search process by indicating whether the first few sources on a results list seemed relevant or acceptable. Before demonstrating how to refine the search to get better results, I would remind the students that whatever source prompted the need to refine was fair game for the Unbibliography. I modeled the Unbibliography annotations with statements like "I thought I might use this article because the title is spot on for my topic but on further examination, I decided it was too old." It was my hope in doing this that the Unbibliography would remain at the forefront of students' minds and that it would feel possible.

The Impacts of the Unbibliography

In the fall of 2022, I included the Unbibliography as an optional assignment for a television-themed FYW course I taught at the University of Connecticut. In the context of a labor-based grading contract, an annotated bibliography was required of all students while the Unbibliography was positioned as one of many ways a student could pull their grade up from a B towards an A. Most of the optional assignments for this class had the end of the semester as a due date, but I stipulated that the Unbibliography had to be turned in at the same time as the required annotated bibliography to emphasize the fact that these assignments were meant to operate in tandem.

In preparing to write this essay, I solicited and received written permission from seven students to anonymously refer to and quote from their projects. Because the writing was reflective in nature, I was able to get a good sense of students' experiences of doing the Unbibliography. I believe this assignment was a success for these students; some said outright that the Unbibliography made them a better researcher or writer. I got a sense that I had converted more than one to the Rule of Three strategy of research because their comments indicated that the project had changed how they planned to conduct research in the future. More than one student reported that before doing this assignment, they hadn't realized how helpful it would be to have a variety of sources to choose from.

Students who completed the Unbibliography assignment showed evidence of leaving strategic satisficing behind as a method of doing research. One student reported that "this was…a good project to do because it proved to me that you have to comb through so many sources to find usable ones. I could not just pick the first five I came across and expect my annotated bibliography to make sense for my research question." In other words, without the Unbibliography, this student would likely have stopped examining sources once she found five that met the criteria for the annotated bibliography. Instead, she read "over thirty sources to find just five to use for [her] project," even though she only needed to look at fifteen to satisfy the requirements of the combined assignment. Another student echoed these observations, explaining that he

compiled a "long list of possible sources" so that he wouldn't have to search again for sources for the Unbibliography. He added: "I think doing this helped me pick better sources for my annotated bibliography because I had so many to choose from." This suggests that this student may choose to recreate this research process for future projects even if looking at more sources than needed is not required or explicitly rewarded.

Part of the assignment requires students to provide a specific reason for rejecting each source listed on the Unbibliography. Sometimes students listed quality issues as reasons to not use a source—it was too old, or it was "just a list of facts." More often, though, the reasons had to do with relevance of the source to the student's research question. For example, one student explained that "since my research subject was exclusive to the United States and this piece was for worldwide television, I decided not to utilize it." One trend in the annotations that I was not expecting was that a number of students reported listing a source on the Unbibliography rather than the annotated bibliography because they had found another source that was more successful at meeting their needs. For example, a student wrote that "other articles discussed the same issue with more excellent knowledge, prompting me to utilize something other than this." The source in question was not flawed, it was simply not the best amongst what the student had found. Many students may not have come to this conclusion without having been encouraged to and rewarded for extending their research beyond the first sources that met the criteria.

Another unexpected but related trend in the student reflections was that the Unbibliography helped more than one student realize that relevance (like quality) is not a static concept, but instead is fluid and dynamic. What may have seemed relevant at the beginning of the research process may have been entirely irrelevant by the end. The shifting nature of the relevance of a source was most obvious when a student changed their topic entirely, but sources also became less suitable as students refined their research questions. At times, the very process of reviewing and rejecting a particular source led the student to revise their research question. For example, one student started with the research question "Do actors have more engagement within television when they are active in media elsewhere?" In one of his annotations, he indicated that "this article made me rethink how I would think about actor engagement;" his final research question was "How does an actor's activity within social media affect the viewer's engagement on television in the United States?" The new research question was more specific and ultimately more generative.

Another student reported that her final research question was shaped by trends in the research she was finding: "Many of the other sources I was using focused on the reading, writing, and speech development of younger children. This source was not in alignment with those other parameters." The source in question was relevant to her original, broad research question, but as that research question was refined in response to the available scholarship, the idea of what was relevant to the project changed. I was very pleased to see this trend in the students' reflections as it demonstrated that students were beginning to understand that "searching for information is often nonlinear and iterative, requiring the evaluation of a range of information sources and the mental flexibility to pursue alternate avenues as new understanding develops" (Association of College and Research Libraries, 2015, p. 22). The students' mental flexibility was stretched and expanded as they evaluated the information sources in front of them and they had more sources in front of them than they would have had without the Unbibliography assignment. These students have grown into sophisticated researchers who value so-called failures as necessary steps in the process of developing their future research projects.

Successes, Limitations, and Ideas for the Future

In my experience, students often approach research as though it was called "refind"—repeating the process of finding acceptable sources rather than exploring the available sources until they have the best. The Unbibliography allows students to both practice the Rule of Three and reflect on how deploying this strategy helps them craft better research projects. One limitation of the Unbibliography as I have assigned it, however, is that all students would benefit from the Rule of Three but not all students engaged with it. More students indicated they were going to do the Unbibliography than actually turned it in. This suggests to me that some students found the process to be more difficult or more time-consuming than they had anticipated. One who turned it in said he thought it would be easy but was proven wrong. An adjustment I may make in the future is to require the Unbibliography of all students rather than making it an opt-in assignment. Unfortunately, another limitation of the assignment is that it may not scale up very well. In the fall of 2022, I assessed five citations and annotations from thirty-two students in addition to ten each from the nine students who completed the Unbibliography—a total of two hundred fifty. If all thirty-two students turned in the combined project, however, I would need to assess four hundred eighty citations and annotations. The advantages for the students may or may not outweigh the consequences for my time and for the other projects and priorities of the syllabus.

As the Unbibliography continues to evolve, I intend to lean into the metacognitive underpinnings of information literacy as I update the framing of the assignment for my students. The ACRL defines metacognition as "an awareness of one's own thought process" (Association of College and Research Libraries, 2015, p. 9) and positions its development as an essential part of moving from novice to expert researcher. The expanded prompt included as supplementary material is one outcome of my increased commitment to foster metacognitive growth. I anticipate that having a written account of the purpose and benefits of the Unbibliography will not only help students asynchronously but also spark in-class conversation about the hows and whys of the assignment. These conversations will encourage students to consider how they think about research and how that conception of the research process might expand by opting into the Unbibliography assignment.

Finally, a possible extension of the Unbibliography would be to pair it with a research project other than an annotated bibliography. Because "scholarship is a conversation" (Association of College and Research Libraries, 2015, p. 20), any research project involves locating, assessing, and engaging with past research. Students often must also find, evaluate, and choose quotes, data sets, or other objects of study. Either circumstance presents an opportunity to introduce and incentivize the Rule of Three. For example, a sociology instructor might pair a twenty-source Unbibliography with a ten-source literature review. Alternately, a literature instructor might ask students to find and reflect on nine quotes from a text they are meant to close read before choosing the three that best help make their argument. The Unbibliography would be a valuable resource to any instructor who wanted to scaffold the research process and make it more transparent regardless of the shape taken by the target project. In adopting this kind of assignment, instructors can guide students into an appreciation of the value of the messy parts of the research process that might otherwise feel like a waste of time. By reframing apparent failure as an integral part of the process, instructors can invite students into a more sophisticated relationship with the concept of research.

ASSIGNMENT
Unbibliography

Unbibliography (4 points[1]): A list of ten sources that you considered for your Annotated Bibliography but ultimately rejected with annotations indicating why you considered each item and why you decided not to use it. At least three of these rejected sources must be scholarly. You will also write 1-2 pages on how this assignment shaped your thinking about your Annotated Bibliography. This assignment must be turned in with your Annotated Bibliography.

[**Editor note:** An expanded version of the original assignment the author intends for future use is included as a supplement to this article (see Supplementary Materials).]

Notes

[1]My grading policy states that completing all required work in the manner in which it was assigned will earn the student a B (84). The Unbibliography is one of several optional assignments that students can complete to raise their grade to an A (94).

Supplementary Material

For supplementary material accompanying this paper, including a PDF facsimile of the assignment description formatted as the author(s) presented it to students, please visit https://doi.org/10.31719/pjaw.v8i1.168.

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Bridging the Worlds of Art and Science

How General Chemistry Empowers Cultural Heritage Preservation

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Abstract

This article presents a novel pedagogical approach, integrating theoretical chemistry concepts into practical art conservation applications to enhance learning and skill development in students. This strategic assignment focuses on cultural heritage conservation, emphasizing the practical application of chemistry concepts. Students recognized the importance of chemistry in analyzing artifact composition and developing tailored conservation methods, appreciating its role in maintaining historical authenticity and promoting cultural pride.

Introduction

In the continuously evolving landscape of chemistry education, there has been an increasing emphasis on integrating innovative pedagogical techniques to enhance students' conceptual understanding and real-world application of course materials. Among these methodologies, incorporating writing assignments has become valuable in fostering a more profound, reflective engagement with course concepts.

Chemistry, inherently abstract and complex, presents significant challenges in the pedagogical realm, often leading to lower student engagement and understanding (Johnstone, 2006). These issues emphasize the necessity of innovative teaching strategies to enhance students' comprehension and application of chemical concepts (Bodner, 1986). One such approach is incorporating writing assignments, posited to encourage deeper engagement, analytical thinking, and practical application of scientific knowledge (Rivard, 1994; Robinson et al., 2009; Smith et al., 2018). Despite noted challenges such as time-consuming grading and potential disconnect with traditional exam performance (Hand et al., 2004), this pedagogical tool presents an intriguing opportunity to enrich learning outcomes in chemistry education. The current paper dives into this topic, proposing an innovative writing assignment centered around the intersection of chemistry and cultural heritage conservation, aiming to address some of these challenges while enhancing student learning.

The existing body of literature on writing assignments in chemistry education has indicated its pivotal role in enhancing student engagement and comprehension of complex scientific concepts. One prevalent approach, as illuminated by Visser et al. (2018), involves writing tasks to encourage a deeper exploration of theoretical concepts, ultimately facilitating the translation of these ideas into practice. However, the effectiveness of writing assignments is often contingent on their design and execution.

While the value of writing assignments in promoting scientific literacy and understanding has been affirmed, certain studies have also shed light on their limitations in chemistry education. For instance, grading such projects can be significantly time-consuming, presenting an issue for educators managing large classes (Hand et al., 2004). Further, students might find it challenging to articulate intricate scientific concepts through writing, potentially leading

prompt
a journal of academic writing assignments

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to misunderstandings or oversimplifications (Reynolds et al., 2012). Moreover, while writing assignments stimulate critical thinking and conceptual understanding, evidence suggests they may not directly correlate with improved scores on conventional examinations (Nurnberg, 2017). This potential disparity underscores the necessity of implementing diverse assessment methods to evaluate a student's competency in chemistry holistically. Therefore, while writing assignments hold considerable educational value, these limitations must be acknowledged to refine their implementation for optimized learning outcomes.

Indeed, even with the recognized challenges, a growing body of literature supports the integration of writing assignments into chemistry education, underscoring their significant benefits in enhancing students' comprehension, critical thinking, and application of scientific concepts. For example, Rivard (1994) found that writing exercises in science education could dramatically improve the comprehension of scientific concepts. Similarly, studies found that students who participated in writing-to-learn activities showed increased engagement and a more profound understanding of chemistry concepts (Burke et al., 2006; Greenbowe et al., 2007). Nurnberg (2017) observed that writing assignments enhanced conceptual understanding and facilitated the development of critical thinking skills. Moreover, work by Cooper (1993) emphasized the role of writing in helping students connect theoretical chemistry knowledge with real-world applications. Writing assignments thus represent a powerful pedagogical tool, nurturing students' abilities to assimilate, articulate, and apply chemistry knowledge, despite the acknowledged limitations.

In advancing the field of chemistry education, this paper presents a unique pedagogical approach that strategically addresses prevailing limitations and gaps identified within the existing body of research. Our novel pedagogical proposition aims to circumvent the frequently cited challenges while concurrently bolstering student engagement and strengthening the bridge between theoretical and applied chemistry, with a particular focus on art conservation science. In this assignment, students are tasked to analyze culturally significant artwork related to the university critically, applying fundamental chemistry concepts from the course to the processes involved in art conservation. Their analysis culminates in comprehensive reports, which, in turn, constitute a valuable educational resource for future course participants, thereby encouraging a learning continuum within the academic community. This method offers an immersive learning environment by vividly demonstrating the practical relevance of course content within art conservation science. Simultaneously, it fosters a sense of communal continuity and shared academic journey among successive student cohorts. This work, therefore, presents a unique and impactful contribution that seeks to effectively bridge the worlds of art and science and introduce an enriching dimension to chemistry education.

Designing the Activity

The conception of the writing assignment was informed by the author's experiences from the "Writing-in-the-Disciplines" workshop led by Dr. Carroll Ferguson Nardone and Dr. Todd P. Primm at Sam Houston State University, and a summer fellowship at the Indianapolis Museum of Art under the supervision of Dr. Gregory Dale Smith, both undertaken in 2022. Following these engagements, the preliminary draft of the learning activity was developed during the summer and subsequently incorporated into the curriculum in the fall of the same year.

The workshop introduced the author to three principal writing strategies from Bean and Melzer's (2021) publication on classroom writing integration, adapted for the General Chemistry I course. These strategies encompass exploratory writing (informal, unedited writing used to generate, extend, deepen, and clarify thinking), microthemes (concise, formal, closed-form writing, typically under 250 words), and thesis statement writing (a one-sentence summary of

an essay's argument). The initial draft of the writing assignment thus incorporated these three strategies to cultivate students' writing skills. Constructive feedback from workshop facilitators and participants led to several revisions, primarily focused on optimally introducing first-year college students to art conservation techniques and content knowledge commensurate with their educational level. The writing strategies were incorporated into the writing assignment and during in-class activities related to the chemistry topics covered in the activity.

Upon completing the workshop, the author engaged in a summer fellowship at the Indianapolis Museum of Art, a commitment that entailed a three-month residency within the museum campus. The fellowship exposed the author to the domain of art conservation science through participation in various field research projects. This intensive learning process equipped the author with the pedagogical content knowledge essential for adequately introducing students to the field of art conservation under principles delineated by Bucat (2004) and Rodriguez and Towns (2019). In essence, the author's experiential learning approach to art conservation research was effectively translated and adapted for implementation within the context of introductory-level college science courses.

Previous endeavors that bridge art conservation and chemistry have been reported (McBurnett, 2021; Wells & Haaf, 2013), often accentuating advanced analytical chemistry techniques. Although insightful, explorations traverse beyond the grasp of introductory chemistry courses due to their emphasis on intricate data analysis and technical writing within chemistry-oriented frameworks. Conversely, the venture delineated in this manuscript endeavors to entwine central chemistry notions with exploring culturally significant artwork, aligning more harmoniously with the foundational skill set acquired by students in their first year of college. The learning activity seeks to equip science majors with the requisite knowledge to elucidate the pragmatic application of chemistry in preserving artistic heritage while ensuring a mindful engagement with the ethical obligations inherent to the handling and analysis of valuable artifacts.

The discourse surrounding the prudent selection of conservation methodologies was seamlessly integrated into the assignment by directing students toward pertinent video resources. The videos present the nuanced interactions among curators, conservators, and scientists, essential for ascertaining the optimal methodologies to maintain and preserve artworks, with a propensity towards non-destructive testing whenever feasible. Moreover, students are ushered into a domain wherein the scientific analysis of art objects is undertaken with judicious discernment, and the selection of analytical techniques is meticulously scrutinized by an interdisciplinary team of professionals, exhaustively contemplating all avenues before settling on a particular methodology, especially in instances where destructive sample analysis is posited as a viable option. Additionally, the museum personnel, comprising the museum director and curator of collections, furnished a concise introduction (5-10 minutes) to students regarding the collection's artworks and artifacts, along with the common strategies employed to preserve these items, taking into consideration the object's material, which included fabrics and textiles, metal objects, paper documents, and paintings. These objects' materials were a fundamental part of the assignment, as described below. In this way, the assignment fosters a deeper understanding and appreciation for the synergy between chemistry and art conservation, akin to the integrated pedagogical frameworks adopted in other institutions like Ithaca College (Esson, 2021), where historical knowledge and empirical investigations are employed to unravel the mysteries veiled within artworks.

Context and Goals

The assignment was conceptualized for implementation in the General Chemistry I course at Sam Houston State University, an introductory science course categorized at the 1000-level

and primarily intended for students majoring in the STEM disciplines of science, technology, engineering, and mathematics. Each section of the course typically accommodates a cohort of approximately 60 students. In its traditional form, this course contains few writing exercises, primarily centered on elaborating and describing laboratory experiments. Evaluations predominantly comprise multiple-choice questions, with minimal emphasis on writing tasks. Each course instructor is responsible for teaching three sections without the assistance of a teaching aide. Upon successful completion of the course, students are expected to:

1. Grasp fundamental chemistry principles encompassing atomic and molecular structure, chemical bonding, stoichiometry, molecular functionality, and the periodic properties of elements.
2. Relate modern chemistry's scope, methodology, and applications to their physical world, enhancing their scientific literacy and appreciation for science's societal impact.
3. Cultivate critical and analytical thinking skills for solving chemical problems, verifying result reasonability, and applying these skills in advanced chemistry or related subjects throughout their academic and professional journey.
4. Develop problem-solving skills in chemical processes, understand the micro-macro level relationships in chemistry, and employ symbolic language to represent physical and chemical processes.
5. Gain a nuanced understanding of chemical phenomena like bonding, molecular geometry, thermodynamics, acids, bases, and the relationship between structure and reactivity.
6. Foster teamwork abilities, effective communication, and the capacity to identify significant resources for continued learning, preparing them to interpret and integrate new chemical knowledge and ideas in future endeavors.

The assignment was designed with two objectives: (1) to enable students to form meaningful correlations between the realms of art conservation science, fundamental chemistry concepts, and chemical analysis methodologies, and (2) to stimulate an interest in scientific disciplines and an appreciation for scientific literacy due to its significant societal implications. Thus, the proposed activity objectives augment the established learning outcomes common to all sections of the general chemistry program, with a specific focus on applications in art conservation. The activity incorporates two reflective essays (i.e., microthemes) to gauge the students' perceptions and attainment of these goals (see section *Impact on student learning*).

Assignment Overview

The assignment, formulated with an interdisciplinary approach, is designed to incorporate central chemistry concepts into exploring culturally significant artwork. It invites students to select and analyze various artifacts, culminating in a detailed written report constructed following a provided template.

The assignment involves using Microsoft PowerPoint for report generation, and a structured template is provided to aid in organizing students' work. The undertaking is intended not just to complete tasks but as an enriching learning opportunity to elucidate chemistry concepts from the course. Students are encouraged to solicit guidance from their instructor or leverage other university resources, such as the Sam Houston State University's Academic Success Center, which includes writing support and online resources.

The assignment is structured into several key stages. Initially, students are required to visit the Sam Houston Memorial Museum (located on campus around a five-minute walk from the

chemistry department), where they choose and photograph four distinct artifacts, including a fabric or textile piece, a metal object, a paper object, and a painting. Subsequently, they compile a brief description of each artifact, detailing its historical context and other pertinent information gleaned during the museum visit.

One chosen object must be relevant to the student, prompting a 200-word reflection on its significance. The next step involves watching videos about the conservation of the selected object type and summarizing the videos' content, focusing on the connections with chemistry concepts or techniques addressed in the CHEM1411 course.

To deepen their understanding of art conservation and implement the writing strategy of microthemes, students must find an additional, related video online and summarize it, justifying its relevance to the conservation of their chosen artwork. Art conservation videos are abundant online from reputable sources like art institutes, museums, private conservation professionals, and higher education institutions, thus making it easier for students to choose relevant videos for the assignment. The last part of the assignment is to draft two reflective essays, one on how chemistry can promote the conservation of cultural heritage in Texas and another on the importance of preserving artifacts and artwork like those housed at the Sam Houston Memorial Museum and, more broadly, within the state of Texas. Each response should be within a recommended word count.

Implementation and Assessment

The initial implementation of the assignment occurred in the Fall semester of 2022. Instructional materials and guidelines were disseminated to students in the tenth week of the semester, providing a completion timeframe of four weeks. Students had undertaken several other course assessments and completed six out of ten chapters at this juncture. This ensured that students had acquired a sufficient knowledge base in chemistry to comprehend the assignment and the art conservation topics and methodologies highlighted in the assigned activity videos. Moreover, the timeframe allowed students to plan their museum visit and finalize the report with ample opportunity to raise questions and receive feedback from the instructor. It is possible to integrate structured peer review sessions during class hours, wherein students may evaluate each other's work in groups, adhering to established rubrics. However, this approach was not employed during the Fall semester of 2022. Class time was dedicated to discussing the assignment and encouraging students to inquire about chemistry in art conservation science. Overall, the assignment was met with a positive response from the students. They appreciated the integrated approach, which facilitated applying their chemistry understanding through university museum resources.

The grading system consisted of three tiers: 100%, 50%, or 0%. These grades are assigned based on: (1) the student's demonstration of diligence and comprehension of the chemistry content in the presented classwork; (2) the timely submission of the required document via the course management online platform; and (3) the report's completeness and accuracy. The activity accounted for 3% extra credit to the final course grade. All reports were collected in digital format and graded by the instructor.

Impact on Student Learning

Integrating this writing assignment into the chemistry curriculum resulted in various impactful learning outcomes, delineated below.

The outcomes of this assignment elucidate an extensive understanding by students of the crucial role of chemistry in the conservation of cultural heritage artifacts. The ramifications of

chemistry within society and the significance of scientific literacy stand as paramount learning outcomes within the general chemistry program, consistently upheld across all course sections. The course sections that undertook the writing assignment were allowed to directly engage with these learning objectives by establishing a connection between chemistry content knowledge and its practical utility in art conservation science.

Students demonstrated cognizance of the interplay between environmental factors and material interactions in preserving artifacts, reinforcing the notion that understanding chemical principles can aid in formulating restoration techniques and preventative measures against decay. They discerned the application of chemistry in preserving art pieces and documents following solubility principles. Further, students recognized the importance of chemical testing for identifying the composition of artifacts, thereby aiding in the customization of conservation methods and facilitating the removal of contaminants. A notable outcome was their acknowledgment of the role of chemistry in preserving artifacts in a manner that lends credibility to historical narratives, besides serving as an educational tool on conservation processes.

Additionally, students perceived the essentiality of understanding diverse chemical reactions and the requisite specialized knowledge to conserve various artifacts. They highlighted the significance of chemistry-based preservation in promoting cultural pride. Moreover, they underscored the role of chemistry in adapting conservation techniques to local environmental conditions, preserving textiles, handling metals, future-proofing artifacts, and actively engaging students in conservation initiatives. They observed that the chemical preservation of artworks provides valuable insights into the lives of historical figures and societies, thereby highlighting the comprehensive benefits of this integrative pedagogical approach in chemistry education.

The students developed a comprehensive understanding of the importance of preserving artifacts and artwork, particularly those housed at the Sam Houston Memorial Museum and within the broader context of Texas. They underscored the indispensable role of such preservation in facilitating historical comprehension, sustaining cultural diversity, and averting the recurrence of historical errors. They appreciated the significant pedagogical value of artifacts and acknowledged their potential to inspire innovation. Furthermore, they recognized how artifacts serve as tangible commemorations of historical accomplishments and as carriers of personal and familial legacies. Economically, students identified the significant implications of artifact preservation and emphasized the need for preserving the technical skills associated with restoration efforts. Their insights also pointed towards the potential of artifacts in unveiling historical enigmas, underlining the essential role of document restoration in maintaining societal records and the value of artifacts in providing an authentic glimpse into the past. These holistic insights elucidate the transformative capacity of this writing assignment. This pedagogical approach significantly enriches chemistry education by adopting a practical, immersive, and integrative learning experience.

Limitations

The successful completion of this activity hinges on students having a foundational understanding of chemistry principles to effectively interpret the online videos concerning art conservation science and their intersection with chemistry. Consequently, the activity had to be scheduled towards the latter part of the semester and could not be executed earlier. The conclusion of the course concurrently aligns with other assessment components in General Chemistry, such as examinations and laboratory reports, as well as additional coursework in students' other classes. Despite the four-week completion period, this coincidence posed a challenge to a subset of students in fully engaging with the activity. One potential remedy to this issue may be organizing the museum visit and associated activities earlier in the term, and subsequently integrating the

art conservation connections later in the semester.

It is also crucial to consider the writing proficiency of first-year college students, as additional resources might be necessary for them to complete their assignment. Our institution is equipped with the Sam Houston State University's Academic Success Center, designed to assist students with such tasks. It is essential to highlight the availability of these resources to students, encouraging them to utilize them effectively. In the pursuit of enhancing the writing abilities of students, particularly those in their first year, a meticulous approach is required beyond merely directing them to online resources. It is advised to hone in on the primary objectives of the educational endeavor at hand, allowing for a targeted instructional and evaluative approach. For instance, if the crux of the exercise lies in synthesizing scientific principles or concepts with museum artifacts, a pedagogical pathway should be laid out: beginning with smaller, informal assignments, gradually progressing towards more refined and formal expositions, as exemplified in the current assignment structure. It's imperative to provide a scaffolded learning experience that aids in meticulously developing the necessary writing skills. Establishing a clear and achievable set of expectations alongside a supportive learning environment will likely foster improved writing competency, particularly in articulating complex interdisciplinary connections between chemistry and art conservation science.

Conclusions

This interdisciplinary assignment, crafted to weave fundamental chemistry principles into investigating culturally significant artwork, successfully encouraged an enriching and integrative learning experience for students. It permitted students to apply their academic knowledge practically, facilitating a more comprehensive understanding of chemistry's role in art conservation science. The assignment alignment towards the end of the course, when students had acquired adequate chemistry knowledge, proved to be a strategic decision, albeit posing potential challenges due to concurrent academic assessments.

The execution of the assignment did present some limitations. The timing of the activity towards the end of the semester, although necessary due to the foundational chemistry knowledge required, did coincide with other course assessments, causing some students to struggle with complete engagement in the activity. A potential solution may involve scheduling certain components of the assignment, such as the museum visit, earlier in the semester.

Overall, this innovative assignment was a valuable pedagogical tool, encouraging students to forge meaningful connections between theoretical chemistry concepts and their practical applications in art conservation. It created an engaging learning environment, inviting students to explore their cultural heritage through a scientific lens, enriching their educational experience. The insights gleaned from this assignment underscore its potential as a transformative approach in chemistry education that fosters a practical, immersive, and integrative learning journey.

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ASSIGNMENT

Integration of Art Conservation Science and Cultural Heritage Preservation in General Chemistry

Vision Statement

To promote the application of chemistry content and students' skills within the chemistry education community, your work will be available to future students to learn relevant course concepts applied to art conservation science.

Activity Description

The assignment consists of selecting and analyzing artwork with relevant cultural heritage importance to the students in light of chemistry concepts in the course. Students will prepare a written report following a provided template.

Tools and materials

Students will use *Microsoft PowerPoint* to prepare their reports. A template is available for students to organize their work. To complete the assignment, you should seek help from your instructor or via other university resources (e.g., Sam Houston State University's Academic Success Center, Department of Chemistry Teaching Assistants). *See this assignment as a learning opportunity to clarify chemistry concepts in the course.*

Museum visit

1. Visit the Sam Houston Memorial Museum. The museum is free for university students with their ID.
2. Select one object made of fabric or textile (not paper), and take a photo.
3. Select one object made of metal, and take a photo.
4. Select one object made of paper, and take a photo.
5. Select one painting artwork, and take a photo.
6. Museum information about the artwork: write a brief description of the selected art (i.e., fabric or textile, metal, paper, painting), its history, and relevant information gathered during the museum visit. Do not select an object that has limited information. Your response should be 50 words long. You might find more information about the object on the museum website.

Art conservation science connection

7. Which selected object/artwork is the most relevant to you? Why does this object hold relevance to you? This is a personal type of question. Your response should be 200 words long.
8. Watch all of the videos below for the corresponding type of object/artwork you selected:
    a. Metal Conservation
        - Alamo Cannon Restoration at Texas A&M

- Preserving Texas history at the RELLIS Campus
- Restoring Historic Alamo Cannons at Texas A&M
- The Alamo Battle Cannons Return
- Conservation of iron artifacts at Jamestown

b. Paper Conservation
- Behind the Scenes at NYPL's Conservation Lab
- Conserving Old Master Drawings: A Balancing Act
- The Chemistry of Bathing, "A Harlot's Progress"

c. Fabric and Textile Conservation
- Conserving Textiles - Asian Civilisations Museum
- See behind the scenes at the National Trust's Textile Conservation studio
- Conservation of a 12th-century textile

d. Painting Conservation
- Why are paintings by Reynolds so difficult to clean? Art Restoration - National Gallery
- Examining a Panel Painting
- The Conservation of Nelly O'Brien

9. Write a summary of the videos you watched and the connections you found with chemistry concepts or techniques covered in the CHEM1411 course. Your response should be 200 words long.
10. Browse the internet and find another video with information relevant to art conservation of the type of object/artwork you selected. Write a summary of the video you found and justify its relevance to preserving the object/artwork and how it connects to the CHEM1411 course content. Your response should be 200 words long.

Reflection on the assignment

11. Based on what you learned from the videos, how can understanding the chemistry of the objects/artwork promote the conservation of cultural heritage in Texas? Your response should be 200 words long.
12. Why is it important to preserve objects and artwork like the ones found at the Sam Houston Memorial Museum and, more generally, in Texas? Your response should be 300 words long.

Supplementary Material

For supplementary material accompanying this paper, including a PDF facsimile of the assignment description formatted as the author(s) presented it to students, please visit https://doi.org/10.31719/pjaw.v8i1.178.

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Constructing Disability
Creating a Keyword Portfolio

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Abstract

Many upper-level courses introduce students to specialized terminology and discipline-specific theoretical concepts. This Keyword Portfolio assignment invites students to explore their understanding of new concepts and to recognize disciplinary terms as rhetorically structured and evolving rather than as merely static definitions. Situated in a course about disability rhetoric, students complete the Keyword Portfolio project by writing a series of keyword entries in which they first explain the chosen disability concept, then present and explain an example of the concept drawn from texts or their lives. After composing their entries across the semester, students write an introductory, reflective cover letter where they describe their chosen audience for the portfolio and explain their composing choices and organization. Students' reflective letters evidence the success of this assignment as it supports students in gaining experience with new concepts and with developing important explanatory and analytical writing skills. The portfolio illustrates how students have gained broader knowledge of key disability concepts and their interrelationships, as it shows the myriad connections among terms that students can explain at the end of the semester.

Introduction: Description and Rationale for Assigning a Keyword Portfolio

How can upper-level and graduate course instructors introduce students to concepts and theories for their discipline, without causing students to view disciplinary terms and jargon as discrete knowledge? Raymond William, publishing his pivotal *Keywords: A Vocabulary of Culture and Society* in 1975, emphasizes not only that keywords describe what is "essential" within a discourse for practitioners to know, but that keywords cannot be understood merely as fixed knowledge (Patterson, 2004, p. 66). To help students recognize how concepts evolve and a discipline's knowledge proliferates, The Keyword Portfolio (KWP) is a writing-to-learn assignment that spans the entire semester. Situated in a mixed graduate and undergraduate special topics English course[1] on disability rhetoric, the KWP both introduces students to disability terminology and also helps them to reflectively trace their understanding across the semester. Focusing upon terminology is particularly appropriate, as rhetorical study has long been sensitive to how language is used to construct all aspects of our reality from beliefs and values to spaces and bodies. Rhetorical projects thus seek to understand how language, communication practices, and power are connected.[2] Whereas students have often faced learning new terminology as a comprehension exercise, the KWP requires students to engage with nuances of how language structures their understanding and, further, how the meanings of terms evolve as the discipline produces new knowledge.

Students in the Topics in Writing and Rhetoric: Disability Rhetoric course are not expected to have prior knowledge about disability. Rather, the course is designed to introduce students to disability concepts and how to apply rhetorical lenses to investigate the role of disability in everyday culture and life. As a field, Disability Studies draws upon examinations of disability in history, policy, ethics, art, and literature to better understand the lived experiences of persons

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with disabilities and to critically examine sociocultural elements that shape disability experiences. Disability Studies has proliferated in the last 30 years, especially within the humanities (Wood et al., 2014), as interest and needed knowledge about disability has increased after the passing of the Americans with Disabilities Act (ADA) in 1990. University students are increasingly interested in learning about disability, as suggested through the growing number of programs appearing in many institutions (Simon, 2013). This interest itself, though, reflects the growing presence of disabled students in higher education. A 2016 report by the National Center for Education Statistics states that as many as 19% of undergraduate students in the United States have a disability (National Center for Education Statistics, n.d.). This disability rhetoric course seeks to help students broaden their knowledge of disability and to learn to recognize common tropes that circulate and reproduce social, economic, and political inequality. Students develop and demonstrate this knowledge via analytical projects that apply theoretical concepts to guide their critical interpretations of texts or artifacts, thus examining disability already present in their lives.

In order to help students reach these insights, the KWP spans all 15 weeks of the semester and is composed of two parts: a selection of keyword entries and a reflective cover letter. In their entries, students identify disability terms or concepts that are of particular significance to them, then explain the term/concept, supplying an example as they do so. Further, because students practice explaining concepts via real-world examples that they encounter in their everyday life (from personal experiences to newspaper or social media posts, to examples in advertising, TV, movies, or books), composing these entries also ensures that students connect their new disability knowledge to their lives and become more critically aware of the presence of disability. At the end of the semester, students create a reflective cover letter where they address their learning of disability concepts and describe a purposeful organization and audience for their portfolio. Drafting the cover letter helps them to identify and explain common threads among entries that showcase their interests or personal relationship to disability. Lastly, the KWP encourages students to practice their skills in accessibly designing Microsoft Word documents. Students are asked to apply tenets of accessible document design including using style headings to create e-reader-friendly documents, explaining images, and using plain language practices.

The Work of Keywords and the Motivation for this Assignment

Disciplines are built around questions, not around static knowledge. As Pamela Saunders (2018) describes as part of her review of two collections of keywords, texts that trace the terms most important to a community represent "discipline-building projects" (n.p.). Students need to understand keyword entries as providing insight into the specific resonance within a particular community. Mastering the complexities of using terms that have interlocking and evolving meanings is a display of expertise and membership (e.g. Dryer, 2019, p. 249). To participate in this discipline-building ethos, keyword entries must avoid an "encyclopedic, alphabetized structure and didactic tone" (Saunders, 2018, n.p.). Thus, entries should not be merely didactic, but must address concepts and tensions that a discourse initiate needs to gain familiarity with.

As a relatively new discipline, Disability Studies benefits from tracing the intersections among important terms in the manner that keyword collections entail. In fact, a 2015 text by Rachel Adam, Benjamin Reiss, and David Serlin, *Keywords for Disability Studies*, takes as its project identifying and "revisit[ing] the categories, concepts, and assumptions that define disability and the experiences of people with disabilities more broadly" (p. 1) especially by "question[ing] fundamental terms and concepts that may seem settled in order to understand how and why they were used in the first place and how they might evolve in the future" (p. 1). While the short entries offered in this book provide newcomers with a "basic definition" (Adam et al.,

2015, p. 2), the authors also describe their hopes that the focus upon "highlight[ing] debates and differences" (p. 2) within the field will help initiates to better recognize connections between terms as well as interdisciplinary linkages.

I developed the KWP because students needed support with understanding the new and varied terminology used to describe disability experiences, and they also needed practice in analyzing the ways in which disability is constructed socioculturally. Because terminology for disability is constantly changing and the use of different terms can indicate the user's ideological position, it is important for novices entering the field both to recognize terminological complexity and nuance, and also to gain familiarity and comfort with terms so that they can engage in discussions of disability experiences. The purpose of the portfolio also aligns with a longer history of instructional techniques for teaching about disability that involve asking students to think critically about and reflect on the significance of language (see Woiak and Lang, 2016). As the assignment spans the semester, the KWP offers students a space for reflecting upon their learning in the course as their knowledge and understanding of disability grows. Students' keyword portfolios thus intersect with the disciplinary-building projects of all keyword collections (see Adams et al., 2015; Patterson, 2004). However, this iteration also highlights the more personal interests of the student as a learner—a goal particularly appropriate and important for emphasizing the student's individual positionality.

Supporting Students in Drafting Keyword Entries

Students' KWP entries, composed throughout the semester, consist of two parts: first, an explanation of the concept in the students' own language and words; and secondly, an example. In composing their entries, students can draw upon the course readings for terminology. However, students are also encouraged to develop their own keywords or to make an entry for a concise phrase using popular sources or even taking inspiration from daily language use. For example, several students have researched and included the acronym *TAB*, which stands for temporarily able bodied, after hearing this term used in class. Often, students describe choosing terms because, when they first learned the concept, they immediately could think of an example from a favorite TV show, an advertisement or social media, or another pop culture moment; in these cases, the student may work backwards from the example to broaden their understanding through analysis. At other times, students' choices are more analytical or motivated by curiosity—students may begin to explore a term's meaning by reading laterally across online sources as they develop their understanding of the concept, and then choose an example they want to discuss further.

As part of introducing the KWP, the instructor provides students with an example entry which models the expected rhetorical moves (see supplemental file "Example Keyword Entries" for instructor-created entries). Following a group discussion of the genre and its discourse moves, students draft their first entry. On the due date of that preliminary entry draft (approximately Week 3), students complete a short free-write on the experience of composing their first entry.[3] They also reflect on questions or issues experienced as they drafted, what they learned from the experience, and what they might want to try to do differently in their next entry drafts. After class discussion of these experiences, students review the goals for a keyword entry and then engage in a brief peer review activity where they practiced reading and giving feedback on a sample entry once again. Only after this preparation do students split into peer review groups to share entry drafts. During peer review, students focus broadly upon determining, first, if the draft is meeting the goals of an entry where the term or concept is explained and easily understandable; and second, if the example helps to further illuminate how the concept works. In both written and spoken comments in their groups, students provide constructive,

reader-response based commentary which focuses upon concepts and the work the entry is "doing" rather than upon stylistic or grammatical issues—an appropriate level of review for a first draft.

Students compose the portfolio across the semester. By the end of the term, undergraduate students need to complete at least seven entries, and graduate students must complete at least eleven entries. Students do not have to follow a strict schedule for completing entries, although suggested due dates are listed on the syllabus. Periodically, the class writes a check-in note on portfolio progress, and students also participate in several flexible workshop days. In these workshops, students choose to either participate in peer review on drafts of entries, meet with the instructor to discuss their progress or questions, or continue to draft entries individually. Sprinkling these workshop days and due dates across the semester helps students to pace their progress on this assignment and prevents students from writing all their entries in a compressed timeline just before the assignment is due.

Reflecting on Their Learning and Their Writing Choices: The Cover Letter

Several weeks before the end of the semester—when students should have completed most of their required entries—the class discusses and starts to create the Cover Letter. In their cover letter, students describe why they chose their terms and reflect upon the learning that the portfolio evidences. This document asks students to think carefully about rhetorical considerations of their portfolio: What is their purpose? Who is their audience? How have they chosen to order terms to help that audience and achieve that purpose? As part of this consideration, students must identify the audience they imagine for the portfolio. Students should be able to specify audience characteristics such as the context (in a class, or part of a community, organization), the age range, the level of experience or prior knowledge with disability, etc.

In addition to describing rhetorical considerations of audience and purpose in their cover letter, students can also reflect upon process challenges. For example, they might identify what terms were most difficult or which required the most research. They can also choose to ponder what they learned about writing in the new genre of keyword entries—uniting their learning by reading entries from *Keywords in Disability Studies* during the semester with their own goals for writing entries in their portfolio. Lastly, students are also asked to think about creating access via these portfolios: What kinds of users with disabilities did they imagine? What were the access needs of audience members? Although students compose the documents in Microsoft Word (which has limited design capabilities), they are asked to use elements like a table of contents, accessible image descriptions, and to practice composing an accessible document.[4] Thus, students also experience composing accessibility, including the learning curve of considering new audience needs and of wrestling with new technology aspects, as they complete this assignment.

Preparing to Teach the Keyword Portfolio

In preparing to use the KWP with students, it is important that instructors anticipate a few issues that students may experience. First, because of the nature of the assignment as a series of entries, instructors should expect to discuss with students how to handle the inclusion of a disability slur as an entry. As a course centering a minority group that is beset by a range of slurs—both recently recognized as in the case of "retard"[5] but also often historically obscured as shown in the history of the term "idiot"[6]—this project allows students to investigate terminology and to better understand how language works and is used to position groups in society. It is

important that students be allowed to investigate terms even if they are slurs, and to recognize why and how the slur has been used. However, students may need additional guidance in how they write about the use of a slur in relationship to audience. For example, if a student has chosen an audience of K-6 educators and is discussing a term like "special" (in phrases such as "special needs," "special education," etc.), they will need to think about the common resonances and uses of the term in that community to critically address its use.

A second common issue that has impacted student success with the portfolio is how students understand the purpose and genre of keyword entries. The keyword entry genre is not primarily definitional, but rather smooths the user's understanding of an appropriate application of important terms (Saunders, 2018). Further, the concise and accessible explanations that students practice in their entries also support larger goals in learning academic writing skills related to close reading and theoretical analysis. Students practice application-based analysis in the entries, which is a key writing practice for English and humanities-based research projects. Encouraging students to focus upon using their own language to guide their explanation (rather than relying upon quotation of scholarly sources or definitions) also helps students to avoid merely reproducing definitions of terms, thus creating entries that define concepts statically. Rather, entries should help to showcase the rhetorical positioning that such terms support in everyday life.

Finally, when creating their cover letters, students need guidance in thinking about how to capitalize upon and discuss the common theme(s) that organize their entry inclusion. Often, students perform reflection as a kind of confirmation to an instructor that they have successfully learned something; however, the cover letter requires them to find and articulate patterns in that learning and to address how this learning might be useful to an audience. For example, one student, who was particularly interested in learning about disabilities with a goal of applying access principles in her future work as an educator, organized her terms into two themes of *personal* and *social*. As part of explaining the (inter)personal connections between disabled and able-bodied people, she included terms like *normal, freak, infantilize, staring,* and *micro-aggression;* her social keywords, which emphasized the relationship between the person with a disability and cultural or structural forces, included terms like *eugenics, person-first vs. identity-first language, equity,* and *accessibility.* Yet another student focused her portfolio on highlighting intersections between disability studies and Black and Queer studies by selecting terms like *passing, crip,* and *intersectionality*; her reflection on the field included a critique of the prevalence of white scholars, and often, the hidden influences of Queer and Black and brown community ideas on disability concepts. A chart showing the frequency of popular terms in the class and some additional notes on term-choice is included in a supplemental file.

Future Development

In future iterations of this disability rhetoric class, devoting time to presenting, sharing, and discussing the work of the portfolios and how each student's portfolio has different goals would be useful. This inquiry could take different forms based on time and the environments available—from all portfolios being published to a course website, to a science-fair styled evening of reading and discussing with printed or digital copies (or both) of each portfolio available to readers, to dividing the students into "portfolio reading groups" and guiding them in a discussion, to a traditional, formal presentation by each author. Even after the portfolios are complete, students can benefit from reading each other's projects and providing feedback on their reading experience. Often, in writing classes, we read only early drafts of each other's work and rarely get to celebrate the finished product. Thus, such a celebration of the final product would also help students to celebrate their learning rather than only see the assignment as something to

get done. Further, discussing the different terms and versions—as well as the overlapping and popular terms—might present different visions of the course and learning for the instructor to learn about as well. In noticing the differences that might emerge between how students have treated the same terms, this sharing of keyword portfolios can also reinforce the ways that keywords are rhetorical, rather than static. Further, reflecting upon differences in positioning can only better help students to appreciate how carefully examining language use can showcase how the user or speaker or writer is connected to a community.

ASSIGNMENT

Disability Keywords Portfolio

Background

In order to track the new vocabulary and the new concepts we are learning, you will create a Portfolio where you introduce keywords and concepts. One of our class texts, *Keywords in Disability Studies*, presents an example of one approach to these kinds of resources that identify key terminology/vocabulary and provide context to explain the term and some of the historical context around its importance. Our version takes its inspiration from this, but is intended to chart your own (growing) understanding of Disability Studies and important concepts.

What the Portfolio Should Look like and Include

1. **Reflective Cover-Letter**: A one-page (single-spaced) introduction to the Portfolio and a description of why you chose these keywords. (We will discuss what and how to produce your introductory cover letter, later in the semester after you've gotten a grasp on the portfolio entries.)
2. **Keyword Entries**: Each Keyword/Term entry should appear on its own page, single-spaced. Each entry must have at least two paragraphs and include an Explanation & an Example.

    - *Explanation of term*: explain the concept and its importance/use for disability studies; you should rely upon your own language as much as possible (use summary primarily, although paraphrase & some quotation is acceptable for phrasing from sources that you feel needs to be reproduced; please make sure to ethically cite your sources.)
    - *Example of Concept/Term*: You should provide an example that helps to explain/unpack the concept; this can come from any resources you find to be appropriate—from YouTube or a TV show, a movie, book, sign on campus, etc. Introduce the example and explain how your reader should be able to see the term at work through it; this brief analysis should help to deepen your reader's understanding of the concept in action.
    - *References*: Each entry should have its work-cited information included; you can include images (especially as used for examples) but please make sure to cite them as well.

A Note: Sources

You may find that while you are first introduced to the term via our shared course readings, you need to do a bit more research (on Google, using other readings than those assigned in our shared course texts, or library research) to create your full explanation. Your research can use scholarly, popular, and even credible sources from social media. For example, a TikTok video from a disabled person explaining their use of identity-first language might be an excellent

source to use to explain identity-first language.

A Note: Style

Your explanation and example should be written in accessible language; please use complete sentences, but you can write informally provided that this choice supports your goal of explaining the concept/term and reflects your chosen audience.

Additional Guidelines

- Use a readable font/size; please number each page
- Make sure the keyword appears and stands-out easily at the top of the page (I suggest that you use a header)
- Practice accessible writing; include a Table of Contents
- Practice ethical citations: for each entry, please include references used. You may use APA or MLA as you prefer.

Undergraduate Portfolios: must include a minimum of 7 terms;
Graduate Student Portfolios: must include a minimum of 11 terms
The Keyword Portfolio assignment is worth 20% of your course grade.

Accessible Writing Guidelines

Creating *more* accessible documents includes a range of practices. In your portfolio, you should follow best practices for accessible document design (which we will discuss in class).

- Describe images and use captions for charts/images.
- Use MS Word style headings (which e-readers work better with).
- Use simple fonts like Arial, Helvetica. Avoid stylized fonts (e.g. Comic Sans).
- Practice plain language that is appropriate for your chosen audience (use shorter, more concise paragraphs; avoid jargon; break up text into digestible pieces; use active voice often; clearly organize the document and use headings to help the reader follow that organization).
- Use white space in the document: create 'visual breath' in how the entry appears. Think about paragraphing and image placement (if used in an entry).
- Check your 'readability' score on entries; we all have different audiences, so consider if the level is appropriate to your chosen audience.

Approximate Semester Schedule for Drafting Entries and the Portfolio

Week 2	Introduce assignment and discuss example entry ("Inspiration Porn")
Week 3	Draft 1 entry; bring two copies to class for peer review
Week 4	During class, free-write to check in on progress
Week 5	25-minute workshop period during a class
Week 6	Strongly recommended: you should have drafted 25% of your expected entries (for undergrads, at least 3 entries; for grads, at least 4 entries)
Week 9	Strongly recommended: at least 2/3 of entries should be completed. Another 25-minute workshop period during class; introduce Example #2 ("Crip Time") and the showing/telling/analyzing color-coding activity
Week 11	Draft of Portfolio entries (strongly recommended, at least 80% of entries are done); Reflective Cover Letter explained
Week 13	25-minute workshop period during class; recommend that interested students set up a conference during Week 13-15 on Portfolios
Week 15	Portfolio due (Final Copy)

Notes

[1]ENGL 495/595 is the designated course number for special topics in rhetorical and composition courses at Salisbury University; other examples of topics taught under this number include the rhetoric of true crime and environmental rhetoric.

[2]Jay Dolmage (2014) defines rhetoric as "use uses of language for persuasive ends" which is better understood as "an operational, discursive means of shaping identity, community, cultural processes and institutions, and our every-day being in the world" (p. 2).

[3]A suggested schedule by approximate week is appended to the end of the assignment prompt.

[4]Creating accessible documents is a complex and situated writing task; however, students discuss several readings and examples to help facilitate their attention to access needs, including the Microsoft "Support" page's "Make your Word documents accessible to people with disabilities". Students also review *The Composing Access* project's website and "How to Create Accessible Content."

[5]See Downes (2013). In this editorial article, Downes briefly reminds that "retard" was originally a medical label. He highlights the campaign to end the casual use of the term ("Spread the Word to End the Word").

[6]See Dolmage (2017, p. 64). Dolmage shows how the term 'idiot' was used as part of a hierarchy of mental deficiencies and for eugenic purposes. Specifically, idiot was the lowest step on this hierarchy.

Supplementary Material

For supplementary material accompanying this paper, including a PDF facsimile of the assignment description formatted as the author(s) presented it to students, please visit https://doi.org/10.31719/pjaw.v8i1.158.

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Student-Created Tabletop Foresight Games as Advocacy

Exploring Alternatives to the Op-Ed Genre in First-Year Writing Courses

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Abstract

The author argues in favor of game-based pedagogies in a writing and technical communication classroom. This assignment asks first-year writing (FYW) students to collaboratively create a tabletop game that would educate players about topics related to climate change. The assignment scaffolds writing, research, and communication steps that guide students through the iterative process of composing. The final project includes a research paper and a formal project proposal along with a playable boardgame prototype. As students engage in critical making, they gain a nuanced understanding of their chosen topics, hone critical thinking skills, and develop rhetorical agency. Since this assignment offers an alternative format for public-facing argumentative writing, the author reflects on how game building can help students make persuasive arguments and on the potential of tabletop games as a venue for advocacy. The format of ludic learning (learning through play) also proves a valuable tool for content-based courses, which makes it possible to tailor the game-building assignment to a wide range of classrooms beyond FYW.

Introduction

The assignment asked first-year writing students to work in teams on creating playable prototypes for a foresight game on a topic of their choice broadly related to possible developments of the environmental crisis. As a genre of games that explores speculative future scenarios rooted in current socio-cultural, technological, environmental, and other pressing concerns, foresight games allow students the creative freedom to imagine alternative futures while at the same time grounding them in research and analysis of present-day issues. For this assignment, students designed playable prototypes for tabletop boardgames that would raise awareness of the global climate emergency and educate players about the environmental impacts of their everyday choices. The game-building project aimed to facilitate content learning through various game mechanics (for example, through different categories of cards such as asset, action, or trivia cards, game action choices available to players, built in interactions between players, etc.). The game materials did not need to have fully developed graphics or be technologically advanced: instead, the emphasis was on the content, intended message, and functionality of the playset. The final project also included a short research paper on the game's topic and a formal project proposal.

I developed this assignment to experiment with alternatives for a final course project, which for me up until recently had been an opinion essay (what used to be referred to as the Op-Ed genre before the *New York Times* retired the term in 2021, see Kingsbury, 2021). I had previously assigned other multimodal genres that would invite students to compose a public-facing call to action using digital and visual formats such as public service announcement posters, PowerPoint presentations, or short video essays targeting a specific audience to make a persuasive argument. While the game design assignment similarly focused on multiliteracy development and semiotic

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remediation ("translating" meaning across modalities), I have found that it offers at least two additional pedagogical affordances: introducing students to procedural rhetoric (Bogost, 2007) and creating room to teach writing genres that would serve as paratexts for the project (including workplace communication assignments such as memos to the team, project tracking charts, and product pitches).

It seemed kairotic to introduce the game assignment devoted to the future of climate change in the post-pandemic university and in the year of the failed COP27 climate talks. In the context of climate emergency education specifically, games "have shown to be a viable means to facilitate experimental learning and thereby increase the level of personal and emotional engagement of the game's participants" (Gerber et al., 2021). Games, both digital and analog, "make complex and interrelated problems tangible and are thus suitable to be applied in the context of environmental problems and sustainable development" (Gerber et al., 2021). The gaming industry was at an all-time high during the COVID-19 pandemic since it provided an essential outlet for interpersonal communication (Skwarczek, 2021, June 17). Arguably, tabletop games have also experienced a comeback as a result of the pandemic, which inspired many people to search for ways to re-engage with analog, material formats of face-to-face communication. This surge of user interest has translated into a rise of teacher-scholar attention to the medium of games across the disciplines as educators seek to create a learning community and boost student engagement.

Scholarship Informing Assignment Design

In the classroom, where students often persistently view their work as addressed to the professor despite our best efforts to instill a sense of a "real" audience, the writing process often gets reduced to "guessing" what kind of product the instructor would like to see, which silences students' own voice and agency. In order to create a more authentic communicative context, many rhetoric and composition scholars advocate for a project-based learning (PBL) approach (Bell, 2010; Blumenfeld et al., 1991; Helle et al., 2006; Solomon, 2003). In addition to addressing a target audience, PBL necessitates teamwork, allowing students to practice their communication skills in both written and oral form. Through multiple rounds of researching and sharing information that would inform their project, brainstorming game design as a team, pitching ideas, visualizing and describing prototypes, and writing up game descriptions addressed to potential users, students experience composition and communication authentically.

Arguably, central to PBL is "critical making," a term coined by Matt Ratto and Stephen Hockema (2009) to denote "an elision of two typically disconnected modes of engagement in the world—'critical thinking,' often considered as abstract, explicit, linguistically based, internal and cognitively individualistic; and 'making,' typically understood as material, tacit, embodied, external and community-oriented" (p. 52). Ian Bogost (2013) Bogost offers the notion of "carpentry" to illuminate "the process of making things that help philosophers…pursue arguments and questions." The focus on critique through making helps students understand knowledge as physically relevant, bridging "the gap between creative physical and conceptual exploration" (Ratto, 2011, p. 252) and translating abstract concepts into concrete and tangible formats. As Jody Shipka explains it, multimodal formats facilitate situated learning through tapping into affective modes of learning and recognizing "highly distributed, embodied, translingual, and multimodal aspects of all communicative practice" (Shipka, 2016, p. 253). Recent studies agree that multimodality enhances rhetorical awareness, supports transferrable multiliteracy skills, and increases student agency (Cedillo, 2017; Dunn, 2021; Gonzales, 2018; Palmeri, 2012)

Tanya Clement (2012) lists the crucial components that promote student learning outcomes in a PBL classroom: "critical thinking, commitment, community, and play" (p. 387).

In accordance with Clement's findings, the game assignment framed writing and making as collaborative endeavors in which creation of the final project was not an end goal, but a tool to enable productive—and playful—engagement with interactive formats for critical thinking purposes. As critical game studies have shown, ludic formats offer "rich pedagogical opportunities" (Shultz Colby, 2017, p. 59). In particular, Ian Bogost (2007) suggests that games enact a new kind of rhetoric—what he terms "procedural rhetoric," or "the practice of persuading through processes" (p. 3). In other words, games can serve as an alternative format to build persuasive arguments that reach audiences in unconventional ways. This view allows us to imagine a game as a text: an interactive, multimodal, non-linear immersive narrative that constructs meaning over time through the user's experience of play. As any other text, games can therefore be used as classroom materials to analyze, interpret, critique, imitate, create, review, and revise.

In "Game-based Pedagogy in the Writing Classroom," Rebekah Shultz Colby (2017) interviewed 24 instructors within the fields of rhetoric and composition and technical writing about their experiences teaching (with) games. Her findings suggest a variety of roles that games can assume in writing courses, from serving as objects of rhetorical analysis, to illustrating complex theories, to creating alternative venues for meaning-making. Designing a game requires writing what Shultz Colby calls "paratexts": various written communication genres involved in design and dissemination. In a technical writing classroom, for example, a game design assignment offers a chance to practice professional writing formats such as usability testing reports, market research, user-facing tutorials, FAQ guides, and game descriptions, among others (p. 64).

As a product of culture, games can both reinforce and contest prevalent cultural norms. In her influential study of radical game design, Mary Flannagan (2009) ponders whether games (and the concept of play, more generally) can "not only provide outlets for entertainment but also function as means for creative expression, as instruments for conceptual thinking, or as tools to help examine or work through social issues" (p. 1). She believes in the subversive potential of games and suggests that critical play—that is, play "characterized by a careful examination of social, cultural, political, or even personal themes that function as alternates to popular play spaces" —can promote change (p. 6). Critical games, therefore, shift the focus from interactive entertainment to interactive learning and make games an especially impactful tool for activism.

Other recent research on board games as advocacy suggests that the learning that happens during critical play facilitates argument-making for social action (Bogost, 2007; Gee, 2003), although admittedly, the pedagogical implications of game design as argument-making need to be further theorized and studied. The potential of board games to raise awareness and initiate critical conversations about social justice needs more attention, especially considering the highly participatory, interactive nature of ludic formats. Shultz Colby (2017) explains that "As complex systems, games teach students strategic problem solving but, even more importantly in a world of increasing complexity and interconnection, systemic thinking: how one person's actions can affect the entire system" (p. 56). This focus on individual responsibility and systematic interconnectedness is crucial in teaching public-facing advocacy genres.

Assignment Structure and Sequence

The assignment took place over the final six weeks of a first-year writing course. Prior to the final project, students engaged in traditional research and writing activities: the first essay in the course focused on close reading and representing complex texts and thoughtful, analytical work with textual evidence, while the second unit provided opportunities to practice writing as constructing a conversation and introduced students to database research. By the final unit, students had gained practice in finding, selecting, and working with multiple sources, and were

prepared to tackle the research requirement of the team project.

Teams were limited to three members to make the work easy to coordinate. I asked each team to put together an accountability agreement, committing to contribute equal effort. The teams were also required to start a project-tracking document in a shared Google folder where they assigned tasks and kept track of work completion. Much of their collaborative work took place during class time to ensure equal participation by all team members.

The graded components of the assignment were an individually written Research Report; a collaboratively written Project Proposal which included a problem statement, a synthesis of theoretical foundations for the game, a project description addressed to potential producers, and a game rules section addressed to players; and a team presentation of the game along with a set of collaboratively designed materials (cards and a board). Assessment was not based on the material or visual qualities of the design: as Ratto and Hockema (2009) explain, "Critical making emphasizes the shared acts of making rather than the evocative object. The final prototypes are not intended to be displayed and to speak for themselves" (p. 53). For our purposes, the game prototype needed to have functional elements and easy to grasp rules to enable content learning through play, while polished, detailed design of game materials was not the end goal.

The unit can be roughly split in three stages: brainstorming and research (Weeks 1 and 2), invention and play-testing (Weeks 3 and 4), and revision and presenting (Weeks 5 and 6). However, viewing these tasks as distinctly separate would be both counter-productive and inaccurate: since both research and composition are iterative processes, students revisited the earlier tasks during the later stages of work on the project, for instance, doing more research in response to a newly uncovered gap in understanding, or going back to the invention stage after realizing that some of the game mechanics did not work effectively. Writing the project proposal took several steps: for example, students wrote the theoretical foundations section after we read and discussed assigned readings on game design as advocacy; the section describing the rules and mechanics for their game was assigned later, after they play-tested and finalized the rules, and so on. All the written components of the project required revision at the end of the unit to reflect the changes made as a result of peer review and development of the team's vision for their game.

During Stage 1, students were introduced to the assignment and its underlying belief in games as advocacy. Since this approach was new to the students, we devoted time to read and discuss excerpts from the foundational texts: *Critical Play: Radical Game Design* (2009) by Mary Flanagan and *Persuasive Games: The Expressive Power of Videogames* (2007) by Ian Bogost. We also read selected sections of *The Rules We Break* (2022) by Eric Zimmerman, a textbook on game design that offers practical steps for invention. *The Rules We Break* turned out to be an especially fitting choice for teaching game design in the writing classroom because of its attention to the social and process-oriented nature of game invention; in fact, I often found the language that Zimmerman uses to describe design and peer review practices directly applicable to writing instruction. Pointing out this parallel to students helped me emphasize the affinity between making and writing and demonstrate the value of peer feedback for all types and formats of composition.

At the initial stage, students spent time collaboratively brainstorming their games and did preliminary research, for which each student researched a different aspect of the topic to report to the team. For example, one team member would be responsible for researching background information, another would review the public conversation about the chosen controversy and identify stakeholders in the issue, and the third member might focus on the questions of policy. Students then shared their findings with the group in a research memo with annotations to the sources. Such setup approximated what research might look like in collaborative workplace

settings: the communicative purpose of the memos was to share knowledge with the rest of the team and to collectively create a more nuanced, well-rounded understanding of the topic.

Stage 2 of the project mainly focused on invention and gathering formative feedback on both the game design itself and the supporting documentation. Students collaboratively wrote the theoretical foundations section of the project proposal to synthesize the theory about critical play and procedural rhetoric and to reflect on game design as argument-making. At this stage, I aimed to give students as much exposure to various examples as possible, including board games that students selected as examples of effective and clear game mechanics. We studied examples of existing foresight games such as *2030 SDGs* by Imacocollabo, *Future Geoscientists* by Strivens and Hadler (both of which specifically address environmental issues), *The Thing from the Future* by Situation Lab, *Peek* by Raskob and Salinas (both of which explore social issues in a speculative future), and some others. Similar to how writers exploring a new writing genre benefit from exposure to models, these examples also introduced students to the range of possibilities and offered model structures. We also analyzed examples of public-facing descriptions of games and considered how these descriptions framed the game's message to the audience. Invention and play-testing took place parallel to collaboratively writing various sections of the proposal.

During Stage 3, teams revised the proposal and research documents and the game materials based on feedback. The two last classes were devoted to formal project presentations during which students pitched their game design, explained the problem that the games aimed to tackle, and demonstrated the games in action. Stage 3 incorporated reflection activities to help students recognize the connections between material and conceptual exploration and observe parallels in the multi-step, revision-based processes of making and composing.

Successes and Limitations

The assignment was implemented successfully in the Fall 2022 first-year writing course at a large R1 university. Unexpected, but rewarding experiences included productive pedagogical collaboration with the Office of Sustainability and colleagues and graduate students from the Game Design program who offered feedback on course materials, suggested additional resources, and agreed to visit one of the classes to play-test students' games. Having guest visitors helped students recognize their coursework as relevant to the larger community outside the classroom. I also encouraged students to play-test games with their friends and report to their team whether the players could make sense of the intended message of the game. Such multiple rounds of sharing the games in progress ensured that students' projects reached real audiences.

As a result of this unit, we had 5 team-created game prototypes. *Dish It Up* challenges players to consider the environmental footprint of their diets. This game relies on set collection, a game mechanic used, for example, in *Scrabble.* Players race to create three recipes by collecting ingredients; they can choose or pass on a card on their turn. The cards have varied sustainability value (e.g., plant-based ingredients have a higher sustainability score than meat, organic ingredients are valued higher than non-organic, etc.) Players can also gain sustainability points if they reuse ingredients, cutting down on food waste. The player with the most sustainability points in the end wins. *City 2070*, a game devoted to imagining possible futures of urban sustainability, borrows some game mechanics from *The Game of Life*. Players move around the board and make choices whether to invest in sustainable projects and earn "Leaf Points" or to save their assets. When someone lands on a Chance field, players draw an event card (natural disasters, government reforms, etc.) that either multiplies or depletes everyone's Leaf Points and assets. There are also Trivia fields with challenge questions about urban impact on the climate. At the end, the player with the most Leaf Points wins. *Going Green* is a game about everyday choices (commuting by bike or driving, recycling or burning trash, and so on). Players use a spinner and make a choice

based on whether they want to take either the faster, environmentally harmful, or the slower, environmentally friendly option. There are also Event fields that either punish or reward the players' previous choices. As the authors explain, "We hope that players will learn that making small decisions throughout the game will have consequences later in the game, just like in real life." Two more games, *Farmer Frenzy* and *Green Uprising,* imagine sustainable farming of the future, with a setup similar to *Monopoly*.

Arguably, students ended up doing more rounds of research (and more purposeful discussions of their findings) than they typically would for a FYW course paper. The assignment also included conventional text-based components that built on the previous course writing assignments. And yet, students did not readily recognize their work on the games as "legitimate" academic work of research and writing: during in-class reflection time, some students questioned whether game building was a "serious assignment." It took deliberate reflection prompts to guide students to see how the iterative process of brainstorming, invention, composing, play-testing, and revising a game was similar to the writing process and that the assignment allowed for practice of crucial writing skills. Since I was purposefully trying to provide an environment that would extend student work beyond "writing for the professor," it took me by surprise that students appeared to have deeply seated stereotypes about what "counted" as academic work, and that they discounted work that is not "boring" as not "serious enough" to be legitimate in academia.

From what I observed as I was teaching this unit, the assignment encouraged students to take creative risks and explore complex ideas through new formats, learning to view composing from the position of authority. Although some students initially expressed lack of confidence about their ability to successfully complete the project, their enthusiasm and engagement was high throughout the progression and the level of confidence increased as they were able to recognize zones of familiarity within the seemingly new task at hand. While being a part of a course assignment, building a game offered students a possibility to reach real audiences beyond the classroom walls. Students learned to recognize their research and knowledge making that happened in the classroom as having potential impact on the outside world, which increased their motivation.

The limitations of the assignment design mainly came from the difficulties in locating the pedagogical resources to support instruction of what might still be an unfamiliar format for many writing instructors. Rebekah Shultz Colby (2017) follows her discussion of game-based pedagogy by pointing out that there currently are "very few resources for teachers within rhetoric and composition and technical communication on how to teach writing with games" and calls for further teacher-scholar research on "wider game-based pedagogical practices" (p. 58). It is especially important to consider the affordances and limitations of game-based writing assignments when working with a diverse body of students, including ELL writers, neurodiverse learners, and students from varying socio-economic backgrounds. The ludic format has the potential to appeal to diverse audiences, offering innovative ways to practice composing. As a result of conceptual exploration and communication of complex messages that takes place in the process of creating a game, students practice transferrable skills needed to express complex ideas in writing.

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ASSIGNMENT
Foresight Game Design as Advocacy

Learning Objectives
By completing this assignment, students will be able to:

- identify, research, and represent to an outside audience a significant socio-cultural problem of students' choice
- demonstrate audience awareness in public-facing genres by clearly communicating the purpose of writing and choosing appropriate rhetorical means to make arguments
- practice critical thinking skills using a hands-on critical making approach
- experience designing a multimodal artifact that functions as a call for action
- practice the professional writing genre of proposal to pitch an idea

Assignment Overview
Our theme for this progression is climate change mitigation and imagining the future(s) of environmental change. You will work in teams of three members to collaboratively create a board game designed to explore imaginary futures of climate change. You will research your topic, brainstorm the project, collaboratively write a proposal, and compose and peer review the game design. As a game, it should be dynamic, imaginative, and fun; however, we will aim to shift the focus from interactive entertainment to interactive learning. Your game's goal will be to educate players about climate change and inspire them to reassess their daily choices that impact our environment.

Rationale
We have long known that games (both digital and analog) have far more functions than simply serve as a fun activity: they transmit cultural knowledge, reflect societal values, and reinforce social norms. Gameplay is often designed to embrace and uncritically perpetuate problematic ideologies such as colonialism, militarism, or sexism (think about combat video games, or gender roles in games, etc.) However, the opposite is also true: games have the power to help us critically reassess and adjust our values and to educate players through the process of playing.

Recent research in critical game studies shows that games can create impactful learning and community-building experiences, which makes board games a great medium for critical thinking and advocacy. You will explore the potential of tabletop games to make a persuasive argument that would encourage players to critically think about their environmental footprint and moves them to action.

Required components of this assignment
Research Report
The goal of the research report is to inform your team about the issue that your game will focus on. You need to understand more nuances about this issue in order to design possible future scenarios for the game.

- Each team member will research and write up a research report on a designated aspect of the topic (the team assigns which aspect of the issue team members will

research)
- Each research report needs to include at least 4 sources of different kinds (academic, journalist, opinion, background)
- Each research report should be at least 4 pages long and should follow MLA format, with the Works Cited page (not included in the 4-page count)
- Each team member's research report will be graded individually (10% of your final grade for the course)

Proposal

Address this document to potential publishers or organizations interested in possibly adopting your game: your goal is to convince them that the game is effective, entertaining, and well-designed and is ready to be presented to larger audiences.

- Collaboratively written
- 4-5 pages
- Include a theory section where you engage with the class readings about critical play to provide a theoretical foundation for your proposal
- Include a problem statement section to represent the specific issue that the game will address
- Articulate the educational goals of the game (What do you hope the players will learn about the issue?) Make sure to explain *how* the game would work to achieve the educational goals
- Clearly describe the proposed game format and rules
- Reference your influences and inspirations: give credit to the game(s) that served as the model(s) for your project
- Clearly state which components of the game would need to be professionally produced (e.g., how you envision the graphic design of the cards or the board; which elements of the game would need to be included in the printed version, how many elements are included in the set, etc.)

Game Materials

This includes the collaboratively created elements of your game (e.g., cards, assets, tokens, board, etc.). Game materials do not have to be "professionally" designed: you are creating a playable prototype. In other words, the visuals need to be functional, but do not have to look perfect. You will not be graded on technical quality of the game pieces, but on how well they function in the game.

Additional (ungraded, but required) documents:

Teamwork Agreement and Project Tracking

- Collaboratively written
- Should include a chart to keep track of each member's contributions and rules for teamwork and accountability
- Who is responsible for which part of research
- How the work on the project is split up among the team members
- Should include notes from each class meeting and team meetings outside of class.

Final Reflection

- Each team member writes their own reflection
- At least 2 pages long

- Reflect on your team's work process and accountability
- Reflect on your learning of critical thinking, research, and writing skills
- Talk about the rhetorical choices your team made in creating the game
- Tell the story of the idea and your process, including revisions
- Include self-assessment of effectiveness, clarity, and educational potential of the game that your team created.

Revision

You will submit a draft of all written documents first and will later revise and resubmit based on instructor and peer feedback and the final version of your game design.

Grading

- Research report: 10% of your final grade for the course
- Project Proposal: 10%
- Game Materials and Pitch / Presentation: 10%

Supplementary Material

For supplementary material accompanying this paper, including a PDF facsimile of the assignment description formatted as the author(s) presented it to students, please visit https://doi.org/10.31719/pjaw.v8i1.169.

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In Layman's Terms

Teaching Students to Understand the Scientific Literature through Blog-style Writing Assignments

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Abstract

Lay summaries are commonly written by researchers in many disciplines to translate technical scientific concepts into language that can be understood by general audiences. In our first-year introductory biology course, we employed a write-to-learn pedagogy by incorporating a lay summary-style writing assignment that encouraged students to explain the major results of a journal article in their own words, a format we referred to as "blog-style" for our students. We chose to use this format to allow students to focus on understanding, defining and explaining key scientific terminology, without regurgitating technical jargon. Students selected and read a scientific journal article connected to a biotechnology topic at the start of the semester and were given worksheets to complete throughout the semester that guided them in the reading of their article. We also offered in-class workshops that focused on best practices for reading journal articles, how to write for a general audience, and how to avoid plagiarism. Students then composed two-page, lay style summaries highlighting some of the key findings of the articles that they read. This assignment resulted in many students producing engaging, well-written papers that allowed them to demonstrate meaningful understanding of some of the technical terminology and concepts in their articles.

Keywords: Science communication, writing for general audiences, write-to-learn, first year students, introductory biology

Reflective Essay

The ability to effectively communicate is a necessary skill that many college graduates remain deficient in (Kramer & Kusurkar, 2017), and this can have a major impact on their future careers. Increasingly, individuals working in science and medical fields are being called upon to engage in public outreach (e.g., interviews, op-eds, etc.; Brownell et al., 2013a), particularly in the context of the pandemic. Many of the students at our institution are in pre-health professions programs and pursuing careers in patient-facing roles; when they graduate, they will be expected to communicate with patients and the community about complicated medical topics. Thus, we consider the ability to communicate accurately about scientific concepts in a way that can be understood by an inexpert audience an essential skill for our students to develop. However, for many students, learning how to read and write about scientific concepts can be a difficult task that is encumbered by the highly technical nature of these concepts and a lack of familiarity with the associated jargon. As such, when students are asked to interpret scientific writing, they often rely on regurgitating phrases and vocabulary from their sources, thus, never truly demonstrating an understanding of the topic.

To promote students' understanding of complex scientific concepts, we thought it would be beneficial to have them write about such concepts in their own words. This approach to writing has previously been demonstrated to improve student perception of their own understanding of the primary scientific literature as well as their confidence in their writing abilities in an upper-level, undergraduate biology majors course (Brownell et al., 2013b). In the sciences,

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this style of writing is commonly referred to as "lay style" or "lay summary," where the writer attempts to convey highly technical scientific information to a non-specialist audience. A lay summary focuses on communicating the main findings of a research study in an accessible way, by carefully defining terminology and jargon, and using short sentences to succinctly explain concepts (Tancock, 2018). Given the demonstrated benefits of using this type of writing in the science classroom (Brownell et al., 2013b), we wanted to employ a lay-style writing assignment coupled with reading a scientific journal article in our 100-level biology course, which has heavy enrollment of non-biology, pre-health professions majors. We decided to refer to the writing style we were aiming for as "blog-style" for our students, as blogs are a medium that many students are familiar with, although the analogy to blogging did not extend to publishing the students' papers online in this version of the assignment. The objectives of this assignment were twofold: first, we aimed to expose them to reading scientific journal articles, a difficult skill that they need to develop as they pursue upper-level coursework, and second, we wanted to give them an opportunity to demonstrate their understanding of the article through writing in a non-technical style. Thus, the overall goal of our Biotechnology Blog Paper assignment was to push students to articulate the key findings of a scientific journal article for a general, non-disciplinary audience.

The Biology Department curriculum at our institution recognizes the importance of developing students' critical thinking abilities and communication skills and acknowledges the need for focused coursework to achieve these goals. After completing introductory biology, our biology majors take a dedicated scientific writing course, which aims to fulfill these goals by having students read scientific journal articles organized around a selected topic and conduct a meta-analysis in the form of a lengthy term paper. However, biology majors make up a small percentage of students in our introductory biology courses; nearly 85% of students who take this course are pre-health professions majors who do not go on to take the scientific writing course. Therefore, incorporating a writing assignment based on the primary literature in this introductory course serves not only to help prepare our biology majors for more advanced coursework in later semesters, but also gives non-majors the opportunity to benefit from write-to-learn pedagogy and develop their science communication skills. These skills are important for students to learn, regardless of their major, because having a better understanding of their world will help them make informed decisions, ideally with better outcomes (Brownell et al., 2013a). Further, this strategy is in line with the most recent write-to-learn literature that encourages professors to utilize writing as a means to improve student understanding of content across disciplines, as well as to better engage students and stimulate critical thinking (Bean & Melzer, 2021).

A writing-to-learn approach is an often-underutilized tool in science courses, despite strong evidence demonstrating its effectiveness at improving student learning and increasing engagement (Reynolds et al., 2012). We have tried several ways of incorporating writing assignments into our course over the past several years, with varying levels of success. From 2016–2019, these assignments ranged from papers that compared two journal articles on a biotechnology topic to an entire semester dedicated to writing papers in place of exams. Papers replacing exams were shown to improve student perceptions of learning and increase their critical thinking skills (Guttilla Reed et al., in press). Despite the value, these alternative assignments have always required a significant investment of time to help students build their reading and writing skills, which can be difficult to carve out of an already packed curriculum. Therefore, in fall of 2020 we set out to design a writing assignment that would feel less daunting to the students while still encouraging the development of their critical thinking, reading, and writing skills. Thus, the Biotechnology Blog Paper assignment was created.

Over the last three years, approximately 350 students in majors spanning biology, nursing, and health sciences have now completed the Biotechnology Blog Paper assignment in our introductory biology course. The assignment constituted their final course project and was the capstone of our biotechnology unit, the last unit of the semester. Students were given the task of reading a scientific journal article and writing a two-page blog-style paper summarizing the significance, key research findings, and conclusions of their article using accessible language. To start, we randomly assigned students to one of five current topics in biotechnology, which included bioengineering, CRISPR gene editing, the genetics of addiction, gut microbiome, and gene therapy. Although we centered our assignment around the topic of biotechnology and selected papers that fit this theme, this assignment is adaptable to nearly any concept of an instructor's choosing and could be done with as few or as many subtopics as desired. Students were then given a choice between two scientific journal articles per topic, which were carefully selected by the instructors. To try to ensure that all articles were roughly equivalent in terms of readability, we tried to select articles with five or fewer figures containing a variety of biotechnology methods. After students selected a journal article, they participated in workshop sessions that introduced them to best practices for reading the scientific literature, gave them guidance on how to write in a lay/blog style, and instructed them on avoiding plagiarism. When discussing blog-style writing, students were shown examples of different writing styles for various audiences, and we offered the advice that they should write as if they were explaining their paper to their family or friends. After the workshops, the students then had approximately three weeks to read their article and write their blog-style summary paper.

For the paper itself, students were instructed to write a two-page blog-style summary of their article that focused on the significance of the study to the general public. We deliberately limited them to two pages to avoid having students write an overview of an entire article. Students were first tasked with developing a QCC (question, conflict, or concern) as a way to frame the major question being researched in their study. This required them to identify the key findings and major conclusions of the study, and then translate these into their own words. Students were encouraged to think about why the average citizen should care about the research. They were told to imagine trying to explain the article to a relative, for example a grandparent. Given the page constraints, we suggested students focus on one or two pieces of scientific data they felt were most important to the study they read. We explained that we were not looking for a perfect, technical understanding of all of the experiments in the article but rather were looking for students to articulate the connection between what the study was examining and why the average person should care about it. Style and clarity were also important, and students were encouraged to write in an engaging manner. We also offered extra credit to students for creating a piece of artwork or a meme to accompany their paper, which was a popular addition to the assignment.

Since its debut in Fall 2020, the Biotechnology Blog Paper assignment has steadily evolved each semester. In our first iteration, we tried introducing the whole assignment during our final unit of the course, which took place during the last four weeks of class. While students were enthusiastic about the informal writing style, many still reported feeling rushed and overwhelmed by trying to understand their journal articles. So, for the Fall 2021 semester, we revamped the assignment by having students start it much earlier in the semester, introducing the assignment in the first week of class, and holding the workshops on reading scientific literature earlier as well. We also provided additional scaffolding to better support students with reading and translating their articles. We created worksheets designed to help students summarize the major sections of their articles, and we made these due throughout the semester to keep them consistently immersed in the assignment. These worksheets tasked students

with defining important jargon, identifying the hypothesis and purpose statements in the introduction, summarizing some of the data in the figures, pointing out the major conclusions of the work, and articulating the significance of the research for a non-disciplinary audience. The final worksheet was an activity on blog-style writing. Students were given timely feedback on the worksheets that focused on clarifying their understanding of each section of their papers.

Adjusting the timeline of the workshops and adding the guiding worksheets seem to have eliminated the student feedback regarding feeling rushed, and we noticed that overall, students had fewer questions regarding the expectations of the assignment. A representative example of an evaluation we received at the end of the semester stated, "The blog paper worksheet assignments in particular were very helpful when it came to writing the final blog paper. All methods and assignments were appropriate, useful, and structured to meet the different learning needs of those in the class." However, although the worksheets did seem to accomplish the goal of guiding students through a closer reading of their journal articles, some students still reported that they found the articles very challenging to understand, and others continued to struggle with writing the paper.

To identify potential solutions to remaining barriers, this assignment was workshopped in a Universal Design for Learning (UDL) faculty institute before the Fall 2022 semester. For students, journal articles can appear very technical and dry, and we have found that they often approach this task with trepidation and a preconceived sense of defeat. Borrowing from principles of UDL, students were assigned to read articles in groups, rather than on their own, to foster a sense of collaboration and community and provide them with a built-in support network throughout the semester as they worked to understand their articles (CAST, 2018). An in-class peer review session for the papers was also held before the final papers were due, giving students the chance to receive feedback on their writing. Students reviewed each other's work for clarity and organization on a provided worksheet and students were instructed to use this feedback in revising their paper. A final piece of this activity asked students to compose a brief reflection (~250 words) on the usefulness of the feedback they received to their final paper, and most students reported they found the peer review very helpful. This was unsurprising, as the benefits of peer review for both readers and writers are well-documented across disciplines (Cartney, 2010; Cho & Cho, 2011) and have been shown to be especially successful when guided rubrics are given (Kelly, 2015). The peer review session also gave students valuable insight into different writing styles as they read and explored each other's work.

Over the course of the many semesters that we have given this assignment, we have observed a majority of students presenting their ideas in a clear and well-organized fashion. However, we have also noted a few common pitfalls that continue to hinder student success. For those that struggled with the assignment, there was a tendency to include too much information or too little. For example, some students continued to use jargon without defining technical terms, while others struggled to find the right amount of experimental details to include, usually erring on the side of including too much. There were also cases of students including a lot of irrelevant information without actually summarizing the key findings of their article and attempts to oversimplify a topic too much. For example, one student described CRISPR as "a DNA sequence" and did not elaborate beyond this point, which is not sufficient to explain what CRISPR is for a non-disciplinary audience. These are issues that could be addressed by the inclusion of a focused paper outlining activity that would help students determine what their paper needs to define and explain in order to accurately demonstrate their understanding of the article they read.

Our overall goal was to create a writing assignment that would help first year students learn to read the scientific literature and allow them to demonstrate critical thinking about

complex scientific topics, without overwhelming them with a lengthy term paper. Our hope was that by interrupting the student impulse to repeat technical phrases from their articles and forcing them to rephrase in their own words, we would help them better understand what they were reading. This assignment also gave students the opportunity to develop science communication skills that many will go on to use in their careers as health-care professionals. Given that blogging is a culturally relevant and familiar medium to this generation of students, the use of a blog-style format seemed like a good fit for our assignment, and we can envision enhancing it in future semesters by having students post their work to a course blog for public dissemination. This would align with recent studies showing that the use of writing and reading blogs in the science classroom improves student perceptions of learning (Garcia et al., 2019), enables students to develop critical thinking skills (Conde-Caballero et al., 2019), and increases self-motivation (Kramer & Kusurkar, 2017). We feel this assignment could be adapted and implemented in virtually any science course to provide students with an opportunity to learn this valuable skill.

ASSIGNMENT
Biotechnology Blog Paper

Throughout the semester you have been working to read and understand a scientific journal article. Now it's time to write about it! For this paper, you will identify a major question, conflict or concern (a "QCC") within your assigned topic and write a focused and engaging blog-style paper explaining how your chosen article attempts to address this question.

What is a blog, and why should you learn how to write one?

Over the past decade, blogs have become increasingly popular sources for science news and analysis because so many of them are written for an "inexpert audience"- non-scientist, everyday folks who are interested in learning more about science! While journal articles are one of the main ways that scientists share their research, they are intended to be read by other scientists and are not written for a general audience. But because so much of research funding comes from Federal tax dollars (like the National Institutes of Health and the National Science Foundation) the general public are entitled to hear about the results, and we have a responsibility as scientists to share them! Learning to communicate about science or any complicated topic in a clear and engaging way will have enormous benefits for your future career, whether that career is in science, education, healthcare, politics, business, etc.

Guidelines

1. Your paper should be ~2 pages, paragraph format only, double-spaced, 12 pt font.
2. Review your Biotech Blog Paper worksheet assignments that you've completed throughout this semester, and re-read your scientific journal article again. These assignments were designed to help you understand the paper and summarize each section individually. Your goal with this blog paper will be to give a high-level summary of the whole paper, so use what you've done so far as a starting point.
3. Develop a 'QCC'—this is a question, conflict, or concern to focus your paper around. For example, if my assigned topic was "Covid-19" and I chose a paper that looked at the sequence of the SARS-CoV-2 virus, I might formulate a question such as, "should we be concerned about the virus mutating?"

4. Write in "Blog Style". A few tips:

    - Think of this as almost investigative reporting work: Who did the research? What did they do? Why/How did they do it?
    - Engage the reader: Why should they care about this topic? How might it help them?
    - Avoid listing the information that was in the journal article: Interpret, hit the reader with key important information and explain what it means.
    - Inform your audience: You should incorporate other sources of information to clarify the knowledge introduced because this is intended for a non-expert audience

5. No quotations. Put everything in your own words by paraphrasing and properly cite the sources in-text and with a reference list.
6. In addition to citing your journal article, you should also be using and citing your textbook (additional *academic* references are welcome). If you incorporate additional information, it should be academic sources only (textbooks, journal articles, agency reports…) DO NOT cite popular websites or Wikipedia (although you are welcome to look these up to help you understand the topic).
7. Have a look at these science blog posts for some inspiration:

    - To Protect an Endangered Snake, First Protect a Venomous One
    - Deadly Spread of Some Cancers may be Driven by a Common Mouth Microbe
    - Chocolate as Poison
    - Tomorrow's Catch

Extra Credit

Many science bloggers include fun little drawings or comics, or even memes, to illustrate the concepts they are presenting. Create a science meme (check out https://imgflip.com/memegenerator) or include your own piece of science art to accompany your piece and earn up to 3 extra credit points on your paper! Keep it relevant to the topic and professional, please!

Grading

Your blog paper will be graded on the following categories:

- **QCC Development (20%):** 'A'—QCC is clear and easily identifiable, 'B'—QCC is somewhat clear, 'C'—QCC is present but weak, 'D'—QCC is illogical or difficult to identify, 'F'—No QCC present
- **Understanding of the Topic (45%)**: 'A'—Understanding is clearly demonstrated, 'B'—Only minor issues with demonstration of understanding, 'C'—Major issues with demonstration of understanding, 'D'–Information presented is irrelevant or poorly organized, 'F'—No understanding of the topic is demonstrated
- **Style and Clarity (25%)**: 'A'—Information is well-organized and style is engaging and fun to read, 'B'—Information is organized but it is not very engaging, 'C'—Information is disorganized, and/or style is inappropriate for assignment, 'D'—Paper is difficult to read, ideas are presented in illogical order, 'F'—Information is not organized and paper is difficult to read
- **Formatting and Citations (10%)**: 'A'—Citations are present and correctly formatted, 'B'—Minor issues with citations, 'C'—Consistent issues with citations, 'D'—Major issues with citations, 'F'—No citations

Supplementary Material

For supplementary material accompanying this paper, including a PDF facsimile of the assignment description formatted as the author(s) presented it to students, please visit https://doi.org/10.31719/pjaw.v8i1.141.

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