4-19-2019

Beyond the Sandbox: Student Scholarship, Digital Citizenship, and the Production of Knowledge By Char Miller, Allegra Swift, Anna Kramer, and Benjamin Hackenberger

Char Miller
Pomona College

Allegra Swift
UCSD

Anna Kramer

Ben Hackenberger

CHAPTER 21

Beyond the Sandbox
Student Scholarship, Digital Citizenship, and the Production of Knowledge

Char Miller, Allegra Swift, Benjamin Hackenberger, and Anna Kramer

Introduction

When academics engage and value students as scholars, those students prove better equipped to assimilate the practices of information-literate citizens. Catherine Fraser Riehle and Merinda Kaye Hensley find that "active, experiential learning, including high-impact educational practices such as undergraduate research experiences, often requires students to interact with information in complex, authentic ways."[1] This complexity can fundamentally alter the dynamics of teaching and learning as they occur in classrooms and libraries. Part of that alteration, as Mark Caprio asserts, is to deconstruct the privilege of knowledge production that scholars often claim is their sole purview. The very attributes that undergraduate institutions hope to instill and cultivate in their students, he argues, such as "critical thinking, complex problem-solving and written and oral communication skills, parallel those developed through engagement with the scholarly research process….They are, in fact, attributes of the scholar."[2] That being so, part of our collective

challenge is to develop pedagogical strategies that bring together students, faculty, and librarians in a fluid curricular enterprise that advances student scholarship and promotes its public presentation and digital preservation. Acting on the opportunities created by these strategies will benefit under-graduates long after their graduation, inspiring them to remain strong advocates for higher education, intellectual engagement, and conscientious scientific analysis. These outcomes are crucial in an era of rising acrimony toward science, increasing anti-intellectualism, and the troubling concept of "alternative facts." Undergraduates who feel trusted and supported as public scholars, can become more empathetic humans and productive digital citizens. That charge is as robust as it is expansive: Mike S. Ribble, Gerald D. Bailey, and Tweed D. Ross, for example, exhort educators to "prepare students to be members of a digital society or digital citizens" by providing strategies that build on the International Society for Technology in Education's National Educational Technology Standards (NETS). These standards are designed to help students understand "the ethical, cultural, and societal issues related to technology," and "practice responsible use of technology systems, information, and software."[3]

Librarians in scholarly communication and instruction recognize this evolution in the academic agenda. As a result, they work with faculty and students to build a more robust understanding of digital citizenship and the learning and life outcomes that can flow from it.[4] The Association of Colleges and Research Libraries *Framework for Information Literacy for Higher Education*, for example, explicitly links the roles and responsibilities of librarians with those of students and faculty to address questions of information privilege, knowledge creation and access, as well as information ethics and essential attribution.[5] The *Framework*, as it has been devised, "draws significantly upon the concept of metaliteracy, which offers a renewed vision of information literacy as an overarching set of abilities in which students are consumers and creators of information who can participate successfully in collaborative spaces."[6] This metaliteracy "demands behavioral, affective, cognitive, and metacognitive engagement with the information ecosystem" and sets the stage for the practice of "critical self-reflection" that can lead students to become "more self-directed in that rapidly changing ecosystem."[7] Or, as Stephanie Davis-Kahl observes: "Developing a holistic approach to educating and developing awareness around scholarly communication issues in the curriculum, in the library, and on campus can help to create a culture of sharing that will impact the scholarly landscape of the future."[8]

The authors of this chapter—a scholarly communications librarian, a liberal arts professor, and two recent alumni of the environmental analysis program at Pomona College—take this broad framework, and its implicit pedagogical charge, seriously. In what follows, we relate our integrated ex-

periences with this complex educational mission through the collaborative development of classroom assignments framed around information literacy and privilege, critical thinking, and analytical rigor set within the instruction of the senior-thesis capstone course in the college's environmental analysis major. The chapter then describes the advancement of digital citizenship and the responsibilities that such a concept embodies through the subsequent publishing of the award-winning scholarship of two alumni on the Claremont Colleges' digital platform, Scholarship @ Claremont.[9] By its authorship and argument, then, this essay reveals its commitment to the very subject it explores.

Preparing the Next Generation of Digital Citizens: A Librarian's Point of View

The benefits of undergraduates' active participation in research have been valued for several decades.[10] Such participation is an "effective educational strategy" that benefits these emerging scholars, the faculty, institutions, and the larger society.[11] Yet communicating and disseminating students' research results has not been a priority, this despite the 1998 Boyer Report recommendations that "dissemination of results is an essential and integral part of the research process" and that communication should be integrated throughout a student's academic career.[12] By taking advantage of the internet's reach, for instance, it is possible to communicate undergraduate research and scholarship on a global scale. Yet educators often perceive the range of access to be much more constrained, limited to interactions between the educator and the student, in and out of class. This constraint runs counter to what one's alma mater hopes—that its graduates are equipped to engage productively and positively with society. That optimism weaves its way through the words of James A. Blaisdell, the fourth president of Pomona College, chiseled into the college's front gates: "They only are loyal to this college who, departing, bear their added riches in trust for mankind."[13] The other colleges in the Claremont Consortium make similar claims about the social purposes of their academic mission (see figure 21.1), nurturing "responsible citizens of the world" who have a "clear understanding of the impact of their work on society."[14]

To respond to the accelerated need for an educated citizenry living in a globalized world, librarians and faculty are beginning to collaborate in new ways. This is particularly true of their shared interest in critical information literacy pedagogy.[15] As part of that aspiration, libraries, which traditionally have supported and disseminated faculty research, are recognizing the value in doing the same for undergraduate researchers and scholars. Among these initiatives are the construction of collaborative physical spaces with an ar-

FIGURE 21.1
The five undergraduate Claremont Colleges mission statements in a word cloud.

ray of technology and experts to provide the tools for conducting high-end research and the creation of digital systems to collect, preserve, and disseminate all scholarship an academic community generates. This commitment has forced a shift in orientation: until recently, most librarians and faculty thought of undergraduates as consumers or users of information and not as creators who have a voice, agency, and place in the scholarly conversation. No more: Julia Bauder and Catherine Rod are among those urging librarians to facilitate undergraduates entering scholarly conversations and understanding the value of scholarly communication. Even so, their particular assertion limits this engagement to classroom assignments.[16] A number of institutions

are going a step farther by collecting and broadly disseminating the products of student research and scholarship, projecting this important work to a worldwide audience.[17]

An example of this dramatic alteration in educational enterprise and the emerging desire—even demand—to facilitate undergraduate scholarship occurred at the Claremont Colleges during the first decade of the twenty-first century, when some faculty and allied departments, along with two of the five undergraduate colleges, decided that it was essential to disseminate and archive undergraduate research. Publicly disseminating undergraduate research not only ensures an enduring record of academic achievement. It also provides an empowering pedagogical tool for the development of transferable skills for a more publicly engaged next generation of leaders, scholars, artists and citizens.[18]

The Claremont Colleges are a consortium of seven institutions—five undergraduate liberal arts colleges and two graduate institutions. The Claremont Colleges Library collectively serves each by aligning strategic initiatives with the educational and research missions of these colleges.[19] Since the creation of the Claremont Colleges Digital Library in 2006 and participation in the first international Open Access Week in 2008, the Claremont Colleges Library has been a champion for the democratization of information and the support of faculty and student scholarship and publication. In 2012, the library embarked on the initial stages of a Mellon Digital Humanities grant that signaled the beginning of several collaborative initiatives that contribute to faculty and student success and the distinction of the colleges. The first principal investigator (PI) for the ultimately successful grant, Jacqueline Wernimont (formerly of Scripps College), practiced the democratization of information by exploring new methods of publication and credit. Through her class, students explored archival material, experimented with digital platforms such as Scalar and Omeka, and engaged with the material in ways that transformed their undergraduate research experience. Wernimont collaborated with librarians whose expertise in digital platforms, digital literacy, and scholarly communications could help support and empower her students as nascent digital citizens. Beatriz Maldonado, Scripps College '15, wrote how she initially felt that she could not contribute to the production of academic scholarship and that people would criticize her if she shared her work publicly. Maldonado overcame her fear and found agency because of her strong desire to share what she had learned about the student protests in Claremont in the Scripps College Denison Library's Student Unrest Archives. "Not only did I learn new information, but I was also able to present it in such a way that it became accessible to the rest of the world…. I too had to become part of the cycle of opening the gateways to knowledge and make a place for myself…. Now I know that I hold the power, I hold the agency, I hold the voice."[20]

In 2010, the Claremont Colleges Library built a digital platform with the capabilities for indexing through Google Scholar, establishing an important starting point for faculty and student research. While academic libraries have been collecting their faculty publications since they established libraries within colleges and universities, this digital initiative collects scholarship regardless of format and shares it beyond the library's brick-and-mortar walls so that others can benefit from this work. The impetus for this project came after a prominent Claremont McKenna College (CMC) alumnus was unable to locate a hard-copy version of his senior thesis, leading the college's president to direct the registrar to make all future senior theses available online. Claremont College Library staff collaborated with the relevant deans at CMC to create a policy whereby the academic record of the college was preserved and accessible. Scripps College and a sampling of departments and intercollegiate programs soon followed suit. The impact has been profound (see figure 21.2).

FIGURE 21.2
Screenshot of the map of CMC senior theses downloaded around the world from Scholarship @ Claremont (http://scholarship.claremont.edu/), taken May 2017.
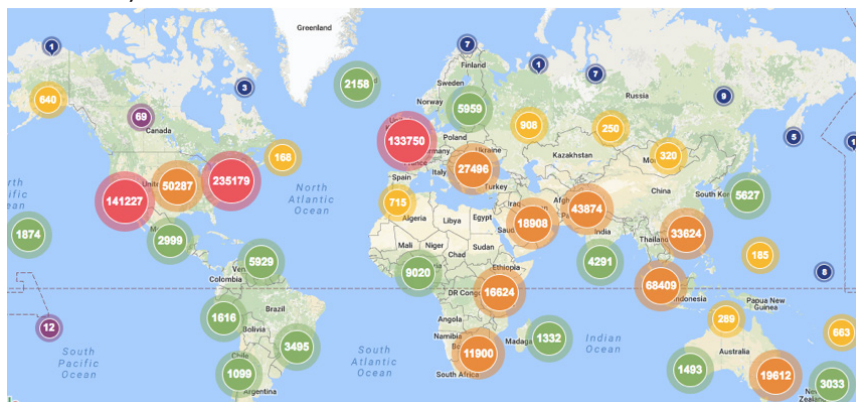
Frequent access of this scholarship provides evidence of the startlingly widespread impact of the decision to digitize and post senior theses. Over the past seven years, institutions from around the world—68 percent from the education sector—have viewed or downloaded the published work of CMC students 310,005 times.[21] This data does not tell the whole story, either, because student authors have the option to provide open access or keep their scholarship restricted to the Claremont Colleges. Traditionally, academics measure impact by citation counts, but data drawn from requests for access to restricted theses shows that a wider readership is interested in these restricted works, too.[22] The library receives a constant stream of emails from educators,

students, and researchers who believe the restricted thesis they have discovered through a simple Google search is important enough to make a request for access or to contact the author. The following are quotes from emails sent to the manager of Scholarship @ Claremont:

- From a Midlands State University student in Zimbabwe: "I am writing a dissertation on the feasibility of using bitcoin as an alternative parallel form of currency to try to combat the cash crisis that Zimbabwe is facing."
- From a Claremont Colleges professor: "I just took a look at the repository of past student theses…. I just want to emphasize that this is a stupendous teaching tool—not only because it is a repository of knowledge and an illustration for students of the vast diversity of topics that they might pursue. But it also 'raises the ante' for them really taking their thesis very seriously in the knowledge that it will be memorialized as well as scrutinized by future students. This is bound to 'up' the competitive juices of most students."
- From a university professor in Florida: "My team has been spending some time thinking about the future of autonomous vehicles. This piece of research "Who Will Be the First to Buy Autonomous Vehicles? An Application of Everett Rogers Diffusion of Innovations Theory" is one of the better-reasoned pieces of publicly available literature available on this topic, and I am hoping to connect with the author. I think a conversation with the author of this paper would be interesting and potentially mutually beneficial."
- A Claremont McKenna College professor emailed that an analyst for the Library of Congress Congressional Research Service responsible for providing reports to Congress on Mexico and Latin America discovered a senior thesis and remarked, "This thesis is amazing." The thesis was also cited by a commander at the US Naval War College: "Her work, and that of other outstanding CMC students, can make an important contribution to scholarly research and discussion, which has reached relevant audiences only through digital, online access."

These requests reveal the global reach of and need for accessible research that Scholarship @ Claremont is meeting, and the site's readership data and activity maps illuminate the geospatial nature of that demand (see figures 21.3 and 21.4).

Unless another author's work is accessed over 165,000 times, Kendyl Klein's CMC senior thesis on Scholarship @ Claremont will remain as one of the top five downloaded Claremont Colleges works of all time, easily surpassing statistics for faculty and student work. As a result of the visibility online, Klein's thesis has been quoted in *Elle* magazine and by her alma mater's media

FIGURE 21.3

Screenshot of a senior thesis about an environmental issue in Vietnam that was accessed and downloaded in Vietnam from Scholarship @ Claremont (http://scholarship.claremont.edu/), taken May 2017.
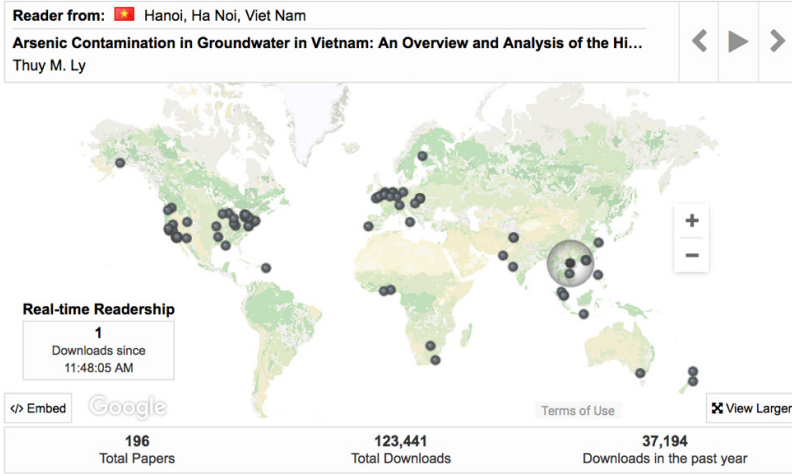
FIGURE 21.4

Screenshot of a senior thesis about an environmental issue in Ghana that was accessed and downloaded in Ghana from Scholarship @ Claremont (http://scholarship.claremont.edu/), taken May 2017.
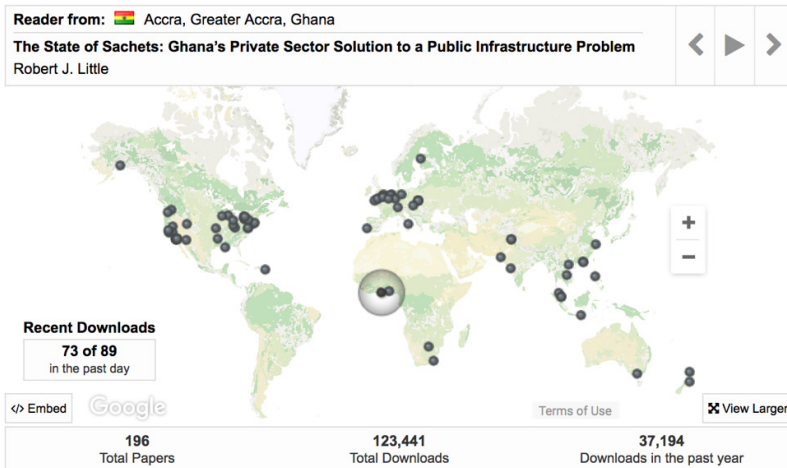
relations, and she has been interviewed by bepress, the software company that supplies the backend to Scholarship @ Claremont. In the interview with bepress, Klein remarks on how this experience has inspired her to continue this line of study. She notes that her "research could be useful in schools: clearly this could turn into some kind of program aimed at parents, teachers, and preteens." Her work and its impact are sources of pride for Klein, "it reminds me of who I am and what I care about."[23] Her insights, like those of others, underscore that undergraduates, by participating in a community of practice and publishing their scholarship online, are adding their voices to "the conversation as researchers and scholars."[24] Also, they are, not incidentally, embodying the Claremont Colleges' academic missions.

Pursuing a Passion: A Teacher's Perspective

Students can engage in this critical conversation only if their work is publicly accessible, which is why it has been so important to establish a digital space in which to publish their scholarship. Otherwise, their work is invisible, much like that of two undergraduate senior theses completed at the Claremont Colleges twenty-eight years apart. When I completed mine at Pitzer College in the spring of 1975, my three faculty readers assessed and graded the final draft and then placed the official version either in a file cabinet or on a bookshelf, somewhere. At least my son's senior thesis, completed in 2003 at Pomona College, can be located on the shelf with others in his major, where it is currently gathering dust in the history department's library. Although my son and I wrote our respective theses in response to primary sources and other archival records, and in dialogue with contemporary academic debates, no one outside of faculty or family ever interacted with these texts' arguments, findings, and insights. Since their production, neither has seen the light of day.

That has not been true for the scholarship that my students produce in partial fulfillment of their major in the environmental analysis program at the Claremont Colleges—they are required to post their work on Scholarship @ Claremont. I instituted this requirement in 2011 when I began teaching the senior thesis class, in part because I did not want my students' ideas languishing in a file cabinet or on a shelf, as mine had. Yet my reasoning actually was more pedagogical than personal, dovetailing with the academic goals of the environmental analysis program, in which I taught. EA, as it is known, is a five-college major and offers a highly interdisciplinary curriculum; I routinely mentor and advise thesis students each fall from three of the undergraduate institutions (Pomona, Scripps College, and Claremont McKenna Colleges).

The first thing I tell them on the very first day of the senior-thesis class is that writing a thesis is their chance to establish their intellectual legacy. I note that this semester-long project provides an unparalleled opportunity for them to demonstrate to themselves and the larger world how they (1) integrate the skills necessary to devise and develop an important intellectual initiative of their own making, (2) conduct the relevant research, and then (3) craft a set of arguments that are as powerful as they are persuasive. To reinforce their theses' significance, the second thing I tell them is that because their scholarship will be posted on Scholarship @ Claremont, their arguments will not disappear into the void.

The fact that their final drafts will be public—and will remain so—comes with a series of obligations and responsibilities (and not a little anxiety) as pressing and pertinent as those that their faculty must take on every time they put their fingers to a keyboard. Open access, for example, raises the stakes by reinforcing the meaning of information literacy and research accountability; scholars at whatever age and level of education must own and defend their arguments in the civic arena.[25] Publishing student scholarship also demands a transparency from these writers about what constitutes excellent work: however innovative their claims, accessibility enables others to see if they supported their perspectives in relation to the relevant primary and secondary literature. It also enables others to answer the following questions: Have they done their due diligence in citing the textual and illustrative resources they have employed? Have they scrupulously edited their final manuscript? Digitizing student scholarship, in short, inculcates these and other critical academic values. At the same time, this process can also help subvert traditional hierarchies of knowledge production that privilege faculty-created scholarship over all others.

Achieving these ambitious ends requires intense collaboration, and the EA program in Claremont has been lucky in the extraordinary level of support its students annually receive from colleagues in the Claremont Colleges Library. Beginning in 2012, librarians and EA faculty developed an information literacy skill set (and later a critical-thinking score sheet) that lays out the rubrics by which faculty thesis readers assess the senior theses (metrics that are shared with the students from the get-go so that they understand the standards by which their work will be evaluated).[26] Each fall, librarians come to the first weeks of the thesis class to identify and highlight library resources—human and reference-based—that will aid students in their research and writing. They also construct a program-specific webpage targeting the varied subjects that a particular year's seniors are exploring, including a robust set of links that stimulate and facilitate the students' initial explorations. Periodically, the librarians and faculty reevaluate the rubrics and other support systems to insure that they continue to meet the needs of student researchers

and the program's pedagogical goals. In the past, this self-analysis has also entailed a group of librarians and faculty reading a series of theses to help evaluate and normalize the grading process. This latter initiative has had an unexpected consequence of reducing grade inflation due to heightened expectations on the part of faculty who serve as readers of senior theses.

Whatever students may feel about the possibility of more stringent grading, they have reported that the experience of writing a senior thesis was one of, if not the, most important in their undergraduate careers. In the fall of 2016, in advance of the EA program's ten-year self-study, the program sent out a survey to 270 alumni who had graduated in the past decade. One of the questions probed their memories of the process of writing a thesis and the postgraduation value of their scholarship. Nearly 80 percent of respondents indicated that the required class, and the writing process itself, contributed "quite a bit" or "very much" to their understanding of the academic field. More compelling data, embedded in their written comments, demonstrate that their intellectual engagement has paid dividends that are both personal and professional:

- "My thesis was the most valuable part of my education in terms of preparing me for work. It gave me real experience and showed that I could accomplish something."
- "The thesis was a very important step in my academic career, giving me an undergraduate research experience that I have found many others did not have available."
- "My focused research for my thesis, which included some fieldwork, some lab work, and some policy research, is the main thing I have been able to cite as skills on a resume or in cover letters or interviews. That research allowed me to focus on one topic …which I could claim more expertise in when applying to jobs."
- "The senior thesis was another pivotal class for me because of the independence …to create my question and develop a methodology to address it. I learned so much from that experience and it has been a well-received story in interviews for jobs in the environmental field."

Not all alumni agreed with these positive assessments—one even urged the EA program to "take out the senior thesis requirement or make it substitutable with an internship or summer job. There was slightly too much focus on research skills which have limited use outside of academics." Yet, in the main, the alumni's strongly supportive comments affirm the program's pedagogical commitment to the process of thesis writing and to its dynamic implications for these young scholars.[27] Digital publication of their theses, moreover, amplifies and globalizes that dynamism. By going public with their ideas, students can and do recognize their potential impact on a community

of practice. They learn firsthand what it means to participate in, contribute to, and perhaps disrupt academic paradigms. By writing for a wider audience and gaining confidence in their voice and expertise, these emerging scholars assert their intellectual agency, cultural literacy, and digital citizenship—the academic trifecta.

Theory, Practice, and Engagement: An Emerging Scholar's Perspective

I began my thesis research, as many do, with ambition and confusion. As Professor Miller mentioned on the first day of our senior thesis seminar, the thesis was our first opportunity to write a work that could contribute to an intellectual legacy. At the beginning of senior year, I had a strong sense of what I had learned thus far as an undergrad, but very little idea of where I wanted to take this knowledge after graduation. I knew that I wanted to go into a design profession, but like most liberal arts students, I was keenly aware that my knowledge was more theoretical than practical. I had trouble envisioning how I could turn my interests in things like urban history and theory, environmental studies, and performance art into a coherent paper. After four years of studying sustainability at a liberal arts college, I wanted to find a way to synthesize some of the environmental frameworks and urban theories I learned into a nuanced argument about the "real" development of Claremont.

Although my instinct was to try to narrow my ideas from the beginning, my thesis readers, whose interest in sustainability represented three distinct personal and disciplinary perspectives, pushed me to begin my investigation broadly. Ultimately, I—like many other EA majors—settled on a defined geographical place situated at the intersection of multiple environmental and social systems. I chose to write about a large, conspicuously empty gravel pit immediately east of the Claremont Colleges. I wondered why, given the extensive urban sprawl of the Inland Empire, this cavernous open ground—a gap—had remained undeveloped. How had it resisted the pressure of the real estate market? How had this obviously underused patch of land escaped development? The short answer was that backfill and development had been cost-prohibitive, up until this point. My training in environmental analysis pushed me to develop iterative ways of thinking about this piece of land to expose the nuance in the longer answer. This land was all of the following:

1. Acreage surveyed through some means and brought into an American system of property rights;
2. A design problem with sociopolitical and technical narratives attached;

3. Terrain that, by virtue of its "otherness," served as a site for various unrealized and illicit uses that could potentially say something about a narrative struggle between dominant and oppressed/out groups.[28]

I knew I wanted to draw on the various disciplines of my advisers—history, landscape architecture, and architecture, and I knew that I wanted to enter a design discipline. Thus, I began my literature review by trying to understand how design and planning disciplines account for leftover spaces like the large quarry I was assessing. As any student who has conducted research will know, the "literature review" phase of research can be intimidating. I spent my first month imagining myself writing to an academic audience of historians, architectural theorists, and planners. I thought that the goal, as it was in my other academic papers, was to present a concise and accurate analysis and evaluation of relevant arguments. As this work progressed, however, I began to feel stuck between the banality of my place (it was a hole in the ground) and the seemingly groundbreaking scholarship I was reading. I thought; "How could I write something original about this hole in the ground that anyone would want to read?" As I struggled to understand how I would enter this conversation, my anxiety over writing a thesis with an original academic argument grew. I felt like I was spinning my wheels, and further, I felt like I was neglecting my original research topic: the gravel pit next to the Claremont Colleges.

On the advice of my advisors, I turned to the Claremont Colleges Library Special Collections. Although diving into the archive could not relieve my anxiety about creating an original argument about urban design and planning, it replaced this worry with a straightforward research task: find information about the gravel pit. I thought, "This, I can do." Of course, I quickly realized that what appeared straightforward actually was a collection of hundreds of moments in which I could draw connections to the scholarship I had experienced in my coursework. Ultimately, this trust in my advisors and my ability to bridge their diverse academic interests was the key element in helping me access the breadth of knowledge and research skills I had gained over my undergraduate education.[29]

Working in the archives was an open-ended method of research. My interests followed what I found: I was able to develop a close investigation of local mutual water companies at the turn of the twentieth century at some points, and, at another, a survey of the Claremont Colleges' planning history. As more documents piled onto my cart, I experimented with different ways of taking notes and documenting information. Most documents contained first- or second-person accounts of events and expansion plans, and I followed these narrative threads through my unruly pile, piecing together an historical narrative around key landowners and hydrogeological engineers.

My developing understanding of Claremont and improving skill in locating historical documents allowed me to identify the formative impact that late-nineteenth-century Claremont still has on the contemporary built landscape.

Viewing myself as an archival scholar also led to patterns of thinking that helped me follow multiple strains of scholarship. As I probed the specifics of water-rights litigation, the parameters of my arguments became more obscure, but their relevance to modern issues grew, compelling me to double down on the work of contextualizing my analyses and arguments. My archival research revealed that the story of urban development in the Inland Empire is not a straightforward narrative of land speculation, industry, and conservation, but rather a contested territory of overlapping and conflicting claims of access and ownership. Because my task was, in some senses, to mine these archival collections and scholarly analyses for any relevant information from these multiple strains of inquiry, I was able to develop a more theoretically complex understanding of the cultural dimensions of land use and development.

As any student or educator with exposure to college and college-prep curricula will recognize, learning to write to an academic audience is a goal that has long been central to undergraduate education.[30] Even though I had the support of my advisers, who provided both traditional feedback and collaborative brainstorming, the basic challenge of producing an academically relevant argument stood between a successful thesis and me. Knowing that my scholarship would be publicly available allowed my advisers and me to consider a broader audience for this history of Claremont. Instead of pursuing a traditionally narrow research topic, I was allowed to "play" in the archives and follow multiple strains of research. Paradoxically, writing to a general-knowledge audience about the history of Claremont allowed me to cover more academic ground. In the archives, I was investigating histories of hydrogeology and flood management, the underpinnings of property rights and development in colonial and imperial systems of thought, the significance of art movements in the 1960s, and several other threads that formed the basis of my account of Claremont's development. Ultimately, the primary-source-to-digital-publishing framework of the senior thesis provided an intellectual framework and long-term motivation for what would become my first piece of published scholarship, a coauthored article entitled "Watershed Politics: Groundwater Management and Resource Conservation in Southern California's Pomona Valley."[31] The EA program's outward focus, paired with its environmental and historical underpinnings, allowed me to dig deep enough into the archives to draw connections between my subject—a gravel quarry with seemingly limited relevance—and the political and socioeconomic systems that guide Claremont's development.

The most valuable thing I took away from my thesis research was this aptitude for bridging academic theory and the actual condition of the built environment. My thesis showed me that careful historical analysis—a skill typically sequestered within the ivory tower—can in fact lead to larger, normative claims about how communities can shape their built environment. This realization has also helped me understand that open-access research not only can expand access to the academy, but also can actually put the power of academia to work for the community. Analyzing my archival findings for a contemporary general audience was a process of unraveling and publicizing an often-ignored history of water and property rights in order to reframe the problem of development for an audience within and beyond the academy.

Since graduating and moving into the design field, I have continued to use these expanded academic skills on a daily basis to understand interactions between design, construction, and regulation. As a novice designer working in the same community I researched, I have watched homeowners, designers, planners, and community leaders think and act in ways that have direct connections to the one-hundred-year-old history I examined in my senior thesis. My undergraduate research nuanced my understanding of contemporary forces shaping the local built landscape. This experience is by no means unique in the EA program. Over half of my peers in the class of 2015, many of whom are close friends whose companionship in writing and thinking remains crucial to my work, wrote similarly nuanced and geographically based analyses. Further, this revelation is not limited to the class of 2015. Rather, it drew inspiration from reading the class of 2014's theses, and it contributed to other works through a number of downloads globally. My research into water rights helped launch another senior's scholarship two years later.[32] Observing these varied connections within my own scholarship and the EA program more generally has expanded my sense of agency as a writer, planner, and designer in a time of seemingly endless political instability.

Picking Up the Paper Trail: A Student Scholar's View

Jan Conn knows a thing or two about agency. She lives alone, in the wooden home, tucked into the hillside amid aspen, that she and her late husband Herb built in 1949. At the bend in her driveway, off a dirt road in the Black Hills of South Dakota, a hand-painted sign nailed to a tree says, "Please honk." The sign is to let her know that someone is coming: at ninety years old, her hearing is slightly less than perfect, which is still above average for that age. Conn is petite, barely five feet tall, and still sprightly: the result of her many decades of rock climbing, caving, and hiking. She wears a navy and green

patterned sweater, blue jeans, red socks, and gray sneakers; Conn still walks several miles to her mailbox every day. She sits with her knees tucked up to her chest with an ease and flexibility many sixty-year-olds can no longer attain. Sixty-seven years ago, Conn was the first woman to climb and summit Bear Lodge, also known as Devils Tower National Monument; four years after that, she and Jane Showacre made the first "manless" ascent there. Conn and her husband were the forerunners of a growing "dirtbag" movement among climbers and other outdoor recreationists, living out of their truck for years in the 1940s and 1950s while climbing in Wyoming and South Dakota and exploring the Wind and Jewel Caves of South Dakota. However, Conn says that if she were young nowadays, she does not think she would climb. "It's just too mainstream."[33]

Given her nearly off-the-grid status, Conn was the most difficult to find out of all of those that I conducted oral history interviews with during the summer of 2015, between my third and fourth years as an environmental analysis major at Pomona College. Reaching out to Conn, and to the other rock climbers, National Park Service employees, Northern Plains tribal members, and historians was part of a year-long research process that involved innumerable hours spent in the Claremont Colleges Library, the University of Wyoming Library, and the Wyoming State Archives. This work also entailed plenty of sunny afternoons on the back porches of my interview participants, listening to their stories of Bear Lodge. I had come across the complicated history of this tremendous rock formation, located in northeastern Wyoming, by chance: I overheard a climbing partner discussing the Northern Plains tribal opposition to climbing at the site and began cursory research that led to a formative academic and intellectual experience.[34]

This was, in many ways, a personal project: as a rock climber and devotee of our national parks and other public lands, I was deeply troubled to learn about the problematic history of our public lands during a class with Professor Char Miller my third year of college. The history of our national forests, grasslands, parks, and refuges intertwines deeply with the violent removal of Native Americans from their lands and waters, and while awareness of this dark side of our "national treasures" is growing, it largely remains limited to academia. This realization required a personal reexamination of the history of the national parks. It also forced me to think about how I play in these spaces and how I have understood these landscapes for the majority of my life. The controversy over rock climbing at Bear Lodge revealed, in a more recent context, the ongoing silence—intentional or not—surrounding the contentious history of our public lands, recreation, and Native Americans.

Bear Lodge has been, for time immemorial, a sacred site for the multitude of Northern Plains tribes and remains so today. It is also our first national monument, and one of this country's iconic rock-climbing sites. Controver-

sy over the appropriateness and legality of rock climbing on this sacred site exploded in the 1990s, leading to extensive negotiations and lawsuits that nearly reached the Supreme Court. My research and thesis historicized the arguments made by rock climbers, local white residents, and the National Park Service to understand how arguments about spirituality, tradition, and history itself legitimized claims to this space in the present.[35]

Due to changes in the directions of my thesis over the course of research and writing, the final argument rested less on the oral history interviews I conducted than on archival materials from the National Park Service and other sources. Nevertheless, these interviews were foundational to the research process, and many informed further research and questions pursued over the course of my writing. They continue to inform me as I rewrite and transform my thesis into a journal article. Conducting oral history research on such a topic confronted me with the ethical issues of the researcher's positionality versus that of the participants, as well as the responsibility of the researcher to the participants. As my focus was on a moment in history that nonetheless happened within my lifetime, I had to grapple with the fact that people involved in the controversy were, for the most part, still alive, well, and more than willing to give me their opinion about whatever I wrote in my thesis.

Into this fray enters the requirement of the environmental analysis program to make our completed senior theses publicly available online at Scholarship @ Claremont. Unlike student scholars during Professor Miller's undergraduate days, I did not have the opportunity to make claims about a particular community or group of people without them noticing. Part of this was my commitment in my agreement with my interview participants that I would send copies of the thesis upon completion; the other was the fact that my thesis would become available to anyone who chose to look for it with a quick Google search.

If my fellow EA students and I were merely asked to submit our theses to an academic journal, there would certainly be an amount of pressure to produce exemplary scholarship. Yet, hidden behind paywalls and in library corridors, these journals are still mostly read only within academia. The requirement to make our theses available to the general public set the academic and intellectual bar quite high: perhaps the greatest challenge I faced was that I would be making my arguments about the statements and opinions of my subjects public, potentially causing unforeseen impacts on the people who had very generously agreed to let me interview them. In a number of ways, this exacerbated the already-extensive ethical quandaries of oral history and made an already self-critical and exacting undergraduate even more so. Publishing my completed thesis on Scholarship @ Claremont would not be the end of my journey with the topic; I was accountable for what happened next,

and I am still learning, not whether or not, but how much my work has impacted those people and institutions about which I wrote.

My thesis historicized and critiqued the arguments and statements of rock climbers and the National Park Service. I argued that rock climbers and local white residents appropriated the Northern Plains tribes' language of spirituality and tradition. In so doing, these climbers and residents sought to delegitimize tribal claims to this public space and simultaneously legitimize their own use and meanings of Bear Lodge. Despite the obvious efforts on the part of the National Park Service to accommodate tribal beliefs and wishes, and to strike a balance in a highly contentious situation, the Park Service was nevertheless complicit in controlling the discourse of Bear Lodge and in erasing the complex history of the Northern Plains tribal ties to this sacred place.

Two of the people I interviewed are rock climbers and climbing guides with vested economic interests in the continuation of climbing at Bear Lodge. One of these climbers was a litigant involved in the group suing the National Park Service to halt the agency's accommodation of tribal beliefs and practices regarding Bear Lodge. I also interviewed numerous current and former National Park Service employees. As promised, I sent copies of my thesis to all those whom I interviewed, regardless of whether or not information or quotes obtained during a particular participants' interview ultimately appeared in the thesis. I have not heard from either of the two climbing guides, despite several efforts to reach out, while several of the Park Service participants sent feedback. Several were positive, commending my research and arguments. One was concerned about my depiction of the Park Service as complicit—I said as much in the abstract of the thesis—but admitted that once he had read the entire thesis, he understood some of my criticisms of the agency, even though he did not agree with my conclusion.

Those limited comments, and in certain cases silences, were the extent of direct reactions from my participants. Yet the readership reports made available by Scholarship @ Claremont reveal interesting data that has sparked many unanswered—and perhaps unanswerable—questions about downloads, reads, understandings, and utilization of my thesis. According to the report, people in thirty-five countries have downloaded my thesis. This includes people in the United States, Japan, India, Brazil, India, and the Seychelles. The software tracks the institutional association of individuals downloading my thesis, and while individuals at the Claremont Colleges are understandably responsible for the greatest number of downloads, the National Park Service is third on the list of institutions with the most downloads of my thesis. According to the report, the Bureau of Land Management, the US Forest Service, and the Department of Homeland Security have downloaded my thesis, along with individuals at numerous colleges and universities, and even, curiously, Disney. Perhaps a remake of "Close Encounters with the Third Kind" is in the near future?[36]

I certainly could not have, and did not, anticipate such reach because my thesis is publicly available online. Yet the pressure to produce research and writing to the highest academic and intellectual standards that I could achieve, and to be accountable to and respectful of those whom I interviewed and discussed, was eternally present from the moment I learned of this requirement. That my thesis would become public was at once an honor and a challenge. It was my professors and librarians saying that my thoughts and words matter, that despite not yet holding even a bachelor's degree in my hands, I had value as an intellectual, a historian, and a scholar. The public nature of the thesis also meant that my thoughts and words were before the world, and that I had to create an exemplary thesis in which I made convincing arguments backed by sound evidence and theory, and throughout which I was accountable to those whom I discussed in my thesis as well to historical fact.

Such layers of accountability are challenges that shaped my development as a citizen and a scholar throughout my last year of college, and I am continuing to refine my arguments for an article-length publication and for applications to graduate programs in environmental history. While I am currently outside of academia, navigating the working world and personal adventures, the ability, formulated by oral history research and the requirement to make my thesis publicly available, while working across the boundaries of the academic and nonacademic worlds, has proved invaluable. The challenges will continue: while I intend to pursue a PhD in environmental history, I am firmly committed to bridging those boundaries, through exceptional scholarship, intellectual integrity, compassionate and conscientious research, and a dedication to public history and education. These aims were merely distant ideas at the beginning of my research, but they developed over the course of my research, writing, and publication of my senior thesis. When I drove up Jan Conn's driveway in the Black Hills, I was simply a student in search of the past.

Conclusion

No such search is a solo excursion. Whenever librarians, professors, and students launch their research projects, they do so in collaboration with one another. Making that collaborative process more intentional has been one of the goals of the environmental analysis program's senior-thesis project. Another has been to increase student-scholars' awareness of the public nature of their research and the larger audiences to and for whom they are writing. Conscientious citizenship demands no less. It also requires that students be self-aware of the systemic implications of their work and that they understand

why making their scholarship fully accessible online can be a disruptive act. "It is crucial to expose students to the structural considerations and power dynamics that underlie contemporary academia and the associated industries that aid its massive production and consumption of information," Scott Warren and Kim Duckett assert.[37] "Doing so gives these future citizens and scholars the ability to evaluate such systems from moral and ethical stances of their own choosing."[38] The pedagogical impact of giving students agency over their research and the methodological frameworks that structure it, paired with a requirement to post their scholarship online, inculcates an individual sense of responsibility and accountability for one's ideas that, when taken together, adds up to a collective transformation. Put differently, student scholarship is not child's play.

Appendix 21A.
Claremont Colleges Mission Statements

The undergraduate Claremont Colleges mission statements used in the figure 21.1 word cloud:

- Claremont McKenna College, "CMC's Mission and Motto," accessed June 20, 2018, https://www.cmc.edu/about/mission-and-motto.
- Harvey Mudd College, "Mission and Strategic Vision," accessed June 20, 2018, https://www.hmc.edu/about-hmc/mission-vision/.
- Pitzer College, "Mission and Values," accessed June 20, 2018, https://www.pitzer.edu/about/mission-and-values/.
- Pomona College, "Pomona College Mission Statement," accessed June 20, 2018, https://www.pomona.edu/about/pomona-college-mission-statement.
- Scripps College, "About Scripps College," accessed June 20, 2018, http://www.scrippscollege.edu/about/.

Appendix 21B.
Information Literacy in Student Work Rubric—Claremont Colleges Library

Learning Outcome	Level of Achievement			
	Highly Developed 4	**Developed 3**	**Emerging 2**	**Initial 1**
Attribution	Shows a sophisticated level of understanding for when and how to give attribution. • Documents sources consistently and completely • Uses in-text citation and notes correctly and consistently • Cites non-textual sources consistently • Names and labels figures and/or graphs clearly and completely.	Attribution indicates understanding of the rationale for and various mechanisms of citation. • Documents sources throughout with occasional errors or inconsistencies. • Uses in-text citation and notes with occasional errors or inconsistencies • Cites non-textual sources with relative consistency • Usually names and labels figures and/or graphs clearly and completely.	Missteps in attribution interfere with the argument or point to fundamental misunderstandings. • Frequently documents sources incorrectly or leaves out some citations. • Frequent errors and inconsistencies with in-text citation and notes • Does not consistently cite non-textual sources • Names and labels figures and/or graphs inconsistently.	Use of evidence and citation is poor, making it difficult to evaluate the argument or sources. • Displays fundamental and consistent errors in source documentation • Does not include or contains significant inconsistencies with in-text citation and notes • Does not name, title, or cite non-textual sources • Does not name or label figures and/or graphs.

Learning Outcome	Level of Achievement			
	Highly Developed 4	**Developed 3**	**Emerging 2**	**Initial 1**
Evaluation of Sources	Source materials employed demonstrate expertise and sophisticated independent thought. • Demonstrates sophisticated awareness of universe of literature and community of scholarship • Uses a variety of appropriate and authoritative sources • Always distinguishes between types of sources (e.g., scholarly v. popular, fact v. opinion) • Does not over- or under-rely on the ideas of others or the work of a single author • Demonstrates a thorough critical exploration and knowledge of theories and sources selected	Source materials are adequate and appropriate but lack variety or depth. • Explores supporting sources and community of scholarship but might overlook important avenues • Sources are used support claim(s) but may not be the most authoritative source to make claim • Usually distinguishes between types of sources (e.g., scholarly v. popular, fact v. opinion) • May over- or under-rely on the ideas of others or the work of a single author • Demonstrates a preliminary critical exploration and knowledge of theories and sources selected	Source materials used are inadequate. • Exhibits weak awareness of universe of literature or other sources that could strengthen claim(s) or argument(s) • Relies on too few or largely inappropriate sources • Does not consistently distinguish between types of sources (e.g., primary v. secondary, scholarly v. popular, fact v. opinion) • Clearly selected sources out of convenience • Demonstrates little critical exploration and knowledge of theories and sources selected	Source materials are absent or do not contribute to claim(s) or argument(s). • No evidence of awareness of universe of literature or other sources that could strengthen claim(s) or argument(s) • When included, sources are too few or badly inappropriate • No distinction between types of sources (e.g., scholarly v. popular, fact v. opinion) • Does not explore outside sources or present evidence when called for • No evidence of critical exploration and knowledge of theories and sources selected

Learning Outcome	Level of Achievement			
	Highly Developed 4	**Developed 3**	**Emerging 2**	**Initial 1**
Communication of Evidence	Evidence is integrated and synthesized expertly to support claims. • Consistently presents evidence to support claim(s) and argument(s) • Synthesizes and contextualizes evidence appropriately for audience • Uses evidence instrumentally towards rhetorical goals • Distinction between own ideas and ideas of others is consistently clear	Proficient synthesis and integration of evidence. • Generally employs evidence to support claim(s) and argument(s) • May present some evidence without context • Frequently demonstrates using evidence instrumentally toward rhetorical goals • Distinction between own ideas and ideas of others is usually clear	Weak attempts at synthesis or integration. • Sporadically uses evidence to support claim(s) or argument(s) • Frequently fails to put sources into context (e.g. "The World Bank says…") • Usually does not demonstrate using evidence instrumentally toward rhetorical goals • Consistently blurs distinction between own ideas and ideas of others	No evidence of attempt at synthesis or integration. • Claim(s) or argument(s) lack necessary evidence • Fails to contextualize quotes and evidence • No demonstration of using evidence instrumentally toward rhetorical goals • No distinction between own ideas and ideas of others

Information Literacy in Student Work Rubric Scoring Sheet—Claremont Colleges Library

Identification

ID Code _____   Reader Name _____

Term/Year _____   Faculty _____

Could not evaluate information literacy (IL) in this work? Check the box and you're done. ☐

Assignment

    A.   Does the assignment ask students to use evidence outside of assigned course content? *(check one)*
        ☐ Required   ☐ Allowed   ☐ Discouraged
        ☐ No explicit mention   ☐ Assignment not available   ☐ N/A
    B.   This work is a (e.g., research paper, thesis, report, summary, argument, analysis, reflection, media project, other)

Quality of attribution, evaluation, and communication of IL (see rubric for details):

	Highly Developed (4)	Developed (3)	Emerging (2)	Initial (1)	Comments	Totals
Attribution						
Evaluation of Sources						
Communication of Evidence						
					Sum:	

OPTIONAL

This work is a particularly representative example of the following (check any that apply):
    ☐ Very robust bibliography
    ☐ Egregious errors in bibliography, in-text citations, notes
    ☐ Clear and consistent citations
    ☐ Little or no attribution of non-textual elements
    ☐ Chose appropriate sources to support claims
    ☐ Inappropriate source(s) used to support claim

☐ Sources are well-integrated and synthesized
☐ Sources not integrated or synthesized (e.g., "patch writing" or excessive block quoting)
☐ Shows awareness of depth of scholarship in area
☐ Sources lack breadth or depth
☐ Over/Undercited claims
☐ Other _____

Elaboration (optional):

Information Literacy in Student Work Rubric/Scoring Sheet Codebook – Claremont Colleges Library

Identification

Fill out any available details regarding student work.

Can we evaluate information literacy in this work?

Even if no sources are cited or the assignment does not call for outside sources, student work may exhibit information literacy if the student is placing their ideas in a broader context using ideas or information from other sources.

Assignment

A. Expectations about use of evidence outside of assigned course reading or other materials provided by professor (use N/A in the case of thesis or other work without defined assignment parameters).

B. Assignment type allows us to determine how to evaluate works that fall outside the "standard" research paper (e.g. a report, thesis, summary, argument, analysis, reflection, media project, or other type of work)

Quality of attribution, evaluation, and communication of Information Literacy

For each category, check the appropriate box. (Highly Developed, Developed, Emerging, Initial)

- **Attribution** refers to how well and consistently the student cites the ideas of others, including non-traditional sources (like lectures, emails, DVD commentaries) and images/figures.
- **Evaluation** refers to the appropriateness or quality of source materials the student chooses to use to support their rhetorical goals (claims or arguments). This includes materials and sources in their bibliography (if available) as well as those used throughout the work. Do the sources, examples, and evidence selected match the purpose of the type of work and argument the student is creating? Is the student aware of the differences between primary and secondary sources, popular and scholarly sources, or fact and opinion? Have they selected the variety and quality of sources appropriate for their argument and work type?
- **Communication** refers to the use and integration of sources as well as the quality of composition, e.g., whether the student has integrated the evidence they're using and has done so in a way instrumental to their claim(s) and argument(s). Does the student paraphrase, summarize, synthesize, use quotes appropriately? Does the student frame quotations using authoritative sources? How are they using sources to ground their claims? This category also addresses how a student integrates their own ideas with those of others.

OPTIONAL—This work is a particularly rich example of the following (check any that apply):

Check an item when the noted characteristics are present and should be flagged as interesting or rich examples for future analysis or conversation. If you see other rich examples, note them as "Other."

Appendix 21C.
Critical Thinking Rubric

Critical Thinking Draft 10_11_2016

Critical thinking is just one of many valuable skills faculty at Pomona College teach their students. We care not only about teaching this to our students but also determining the degree of progress they are making in learning it, and so whether some pedagogical interventions might be called for.

It turns out that WASC too requires Pomona College assess critical thinking as part of Pomona's accreditation. WASC's interest is not in how many of our seniors are measuring up to our expectations, but rather in whether Pomona College is engaged in the process of assessing and reflecting on how well our students are doing and whether any pedagogical changes are called for.

On p. 2 is a draft of an assessment sheet for evaluating the critical thinking skills of Pomona College's seniors.

Pomona College needs one common rubric for all departments since WASC asks for a college-wide assessment. But we want the assessment to be useful at the departmental level and thus flexible enough to capture the individual aims of each discipline.

The rubric that the TLC has come up with, with input from many departments and more than one committee, can be used by whoever the department decides is the best person assess the work of the Pomona seniors in its majors (e.g., the primary thesis advisor). The senior work might be a thesis, a paper from a senior seminar, or perhaps even an exam – whatever senior work the department determines is amenable to assessment for critical thinking and that occurs during the Fall 2016 - Spring 2017 academic year.

Here is our working definition of critical thinking:

> Critical thinking is the ability to explore issues, ideas, artifacts, and events skillfully and insightfully and on that basis formulate a well-supported opinion or conclusion.

There are different points in the process of intellectual inquiry, as exhibited in a piece of written work, where critical thinking skills are employed:[1]

- Selection or Formulation of a question
- Design or selection of a method(s) for addressing the question
- Interpretation
- Evaluation

And throughout the process of inquiry the following is key to critical thinking:

- Connection of thoughts in a rational manner

---

[1] Not every sort of intellectual inquiry i) has all of these points or ii) proceeds in this order or iii) exhibits critical thinking skills at that point. Instead, critical thinking *can* be exhibited at each of these points. Also, (iv) the same critical thinking skill can be used at more than one point and (v) some of these points overlap (e.g., evaluation occurs at various stages of inquiry).

Critical Thinking Score Sheet for
Senior Student Work

Pomona Student's Name	Reader	Type of Work (e.g., thesis, lit review, seminar paper, etc.)	Term/Year
_____	_____	_____	_____

See pages 3-4 and 8 for a detailed explanation of how one might understand I-V categories as well as the 1-4 scale.

If one or more of these points of inquiry is not relevant to how you assesses critical thinking in written work, please put N/A in that row on the score sheet below.

	Highly Developed 4	Developed 3	Emerging 2	Novice 1
(I) Selection or Formulation of a question				
(II) Design/Selection of Method(s)				
(III) Interpretation				
(IV) Evaluation				
(V) Connection of Thoughts				

Within each department (not across departments) the scorers will need to discuss and determine:

a) What counts as "highly developed" as opposed to "developed," and so on? See p. 8 for some initial suggestions for how one might articulate this. It would help the TLC to receive a short description of what you decided this 1-4 scale meant.

b) What number is the cut off for satisfactory achievement, i.e., below what number would be cause for concern? Please write that number here: _____. It would help the TLC to know why your department picked this number.

Interpretation of I-V
(2 pages)

The bullets points under each category are examples of how one can interpret each category. We do not imagine every category or bullet point applies in every instance. For each category, you will need to **omit** the bullet points that are not relevant, **add** bullet points that are missing, or **revise** bullet points that are below.

(I) Selection or Formulation of a question

- Guides, shapes, and narrows the research/analysis
- Suggests a complex, unobvious answer
- Uses precise, unambiguous language that is neither leading nor biased
- Can be supported by research/analysis
- Focuses on a dilemma or problem that is motivated and significant

(II) Design or selection of a method(s) for addressing the question

- Formulates a hypothesis or answer to the question
- Breaks a problem into sub-problems
- Selects *or* creates the method, language, bodily movement, theory
    > E.g. designs an experiment, selects a movement language or choreography, picks an approach to translation
- Approaches the problem using more than one method or theory
- Derives the importable, testable implications of the theory

(III) Interpretation

- Applies the appropriate method, language, or theory
- Demonstrates an awareness of how (not merely that) information (e.g. data, results, musical or written passages, etc.) can be interpreted in more than one way
- Demonstrates an awareness of how (not merely that) historical, ethical, political, cultural, social, and environmental conditions influence ideas, events, and artifacts
    > For example, how venue, gender, race, class, religion and a variety of other factors affect how one reads a work of art and thus that how the meaning of a single work can change.
- Demonstrates comprehension of the meaning or significance of experiences, sounds, colors, textures, situations, data, events, etc.
- Identifies the *intended* relationships among statements

(IV) Evaluation

- Demonstrates an awareness of the *assumptions* of a given model, theory, technique, language, etc.
    - Demonstrate an understanding of how changing the parameters or assumptions (e.g. of a model) will influence the results
- Demonstrates an awareness of the *limitations* of a given model, theory, technique, language, etc.
- Identifies ways in which an estimation, theory, etc. may be biased or unreliable
- Assesses the credibility and strength of an account, belief, opinion, experience, description of a perception, etc.
- Recognizes missing elements of the evidence or that certain important factors were ignored
- Questions key assumptions (e.g. for plausibility, etc.)
- Identifies bugs in a program
- Distinguishes the intended and actual relationships among statements

- Assesses how useful or appropriate the data are to the research question
- Assesses which technique(s) is most appropriate for establishing causality
- Performs robustness checks of results

(V) Connection of thoughts in a rational manner

- Makes inferences or establishes what the actual relationships are among statements, factors, or variables
- Presents ideas in well-ordered fashion
- Demonstrates an understanding of how an abstract idea, a principle, generalization or model *applies to* a particular or concrete case
- Demonstrates an ability to abstract, generalize, or develop a model *from* concrete or particular cases
- Appropriately compares and contrasts different theoretical perspectives, movement patterns, styles, languages, theories, particular cases, etc.
- Demonstrates an understanding of the relation of the parts to the whole
- Distinguishes cause and effect from correlation
- Demonstrates an understanding of the implications of theory, method, etc.
- Demonstrates how to correctly adapt a theory, method, etc. to *new* situations and information (including grammatical patterns and rules)
- Identifies useful future research that builds on one's results

The following is CHEMISTRY'S current interpretation of I-V, which might be revised in the coming months.

(I) Selection or Formulation of a question [relevant to the literature thesis but not to the experimental thesis]

- Uses extensive analysis of the literature of identify a gap in knowledge
- Guides, shapes, and narrows the research/analysis to develop a question, hypothesis and/or specific aim
- Suggests experimental observations / results that will support a hypothesis or answer a question

(II) Design or selection of a method(s) for addressing the question [relevant to the literature thesis but not to the experimental thesis]

- Selects the appropriate experimental method(s) that will unambiguously address the question, hypothesis and/or specific aim
- Includes the appropriate controls, when necessary
- Provides expected results and interprets what they would mean
- Provides potential problems that may arise and alternative approaches that can be used to address those problems

(III) Interpretation [relevant to experimental thesis but not the literature thesis]

- Demonstrates comprehension of the meaning or significance of the data and observations collected
- Is able to draw appropriate conclusions from the data

(IV) Evaluation [relevant to both the literature thesis and the experimental thesis]

- Demonstrates an awareness of the *assumptions* of a given model, theory, technique, etc.
  - Demonstrate an understanding of how changing the parameters or assumptions (e.g. of a model) will influence the results
- Demonstrates an awareness of the *limitations* of a given model, theory, technique, language, etc.
- Identifies ways in which an estimation, theory, etc. may be biased or unreliable
- Assesses the credibility and strength of experimental results
- Recognizes missing elements of the evidence or that certain important factors were ignored

(V) Connection of thoughts in a rational manner [relevant to both the literature thesis and the experimental thesis]

- Appropriately integrates prior work with proposed or experimentally obtained results
- Presents ideas in well-ordered fashion
- Demonstrates an understanding of why this research is relevant to science and society

The following is ENGLISH'S current interpretation of I-V, which might be revised in the coming months.

(I) Selection or Formulation of a question
- Guides, shapes, and narrows the research/analysis
- Suggests a complex, unobvious answer
- Can be supported by research/analysis
- Focuses on a dilemma or problem that is motivated and significant

(II) Design or selection of a method(s) for addressing the question
- Formulates a hypothesis or answer to the question
- Breaks a problem into sub-problems
- Selects *or* creates the method or theory

(III) Interpretation
- Applies the appropriate method, language, theory
- Identifies the intended relationships among statements

(IV) Evaluation
- Demonstrates an awareness of the *assumptions* of a given model, theory, technique, language, etc.
  - Demonstrate an understanding of how changing the parameters or assumptions (e.g. of a model) will influence the results
- Demonstrates an awareness of the *limitations* of a given model, theory, technique, language, etc.
- Identifies ways in which an estimation, theory, etc. may be biased or unreliable
- Assesses the credibility and strength of an account, belief, opinion, experience, description of a perception, etc.
- Recognizes missing elements of the evidence or that certain important factors were ignored
- Questions key assumptions
- Distinguishes the intended and actual relationships among statements

(V) Connection of thoughts in a rational manner
- Makes inferences or establishes what the actual relationships are among statements
- Presents ideas in well-ordered fashion
- Demonstrates an understanding of how an abstract idea, a principle, generalization or model *applies to* a particular or concrete case
- Demonstrates an ability to abstract, generalize, or develop a model *from* concrete or particular cases
- Demonstrates an understanding of the relation of the parts to the whole
- Demonstrates an understanding of the implications of theory, method, etc.
- Demonstrates how to correctly adapt a theory, method, etc. to *new* situations and information (including grammatical patterns and rules)

The following is ECONOMIC'S current interpretation of I-V, which might be revised in the coming months.

(I) Selection or Formulation of a question

- Guides, shapes, and narrows the research/analysis
- Suggests an unobvious answer
- Uses precise unambiguous language that is neither leading nor biased
- Can be supported by research/analysis
- Focuses on a dilemma or problem that is motivated and significant
- Displays a thorough knowledge of previous research on the question

(II) Design or selection of a method(s) for addressing the question

- Formulates a clear hypothesis or answer to the question
- Selects *or* creates the method or theory that can answer the question
  - E.g. designs an experiment
- Derives the importable testable implications of the theory

(III) Interpretation

- Applies the appropriate method or theory
- Demonstrates an awareness of how (not merely that) data and results can be interpreted in more than one way
- Demonstrates comprehension of the meaning or significance of experiences, situations, data, events, etc.

Assesses how useful or appropriate the data are to the research question

(IV) Evaluation

- Demonstrates an awareness of the *assumptions* of a given model, theory, technique, etc.
  - o Demonstrate an understanding of how changing the parameters or assumptions (e.g. of a model) will influence the results
- Demonstrates an awareness of the *limitations* of a given model, theory, technique, etc.
- Identifies ways in which the estimation, theory, etc. may be biased or unreliable
- Recognizes missing elements of the evidence or that certain important factors were ignored
- Assesses the plausibility of key assumptions
- Identifies the most appropriate technique for establishing causality
- Performs robustness checks of your results

(V) Connection of thoughts in a rational manner

- Makes inferences or establishes what the actual relationships are among factors and variables
- Presents ideas in well-ordered fashion
- Demonstrates an understanding of how an abstract idea, a principle, generalization or model *applies to* a particular or concrete case
- Demonstrates an ability to abstract, generalize, or develop a model *from* concrete or particular cases
- Appropriately compares and contrasts different theoretical perspectives, theories, particular cases, etc.
- Demonstrates an understanding of the relation of the parts to the whole
- Distinguishes cause and effect from correlation
- Demonstrates an understanding of the implications of theory, method, etc.
- Demonstrates how to correctly adapt a theory, method, etc. to *new* situations and information (including grammatical patterns and rules)
- Identifies useful future research that builds on one's results

Different Ways of Interpreting the 1-4 Scale
(not a comprehensive list: these are just suggestions)

Highly Developed 4	Developed 3	Emerging 2	Novice 1

4 = a contender for a departmental prize
3 = not prize worthy, but very good or perhaps ok.
2 = problematic
1 = not acceptable

4 = **very successful** in demonstrating **all** the bullets points in this category
3 = **very successful** in demonstrating **many** of the bullets points in this category **OR somewhat successful** in demonstrating **all** of the bullets points in this category
2 = **very successful** in demonstrating **only one or two** of the bullets points (or the most important bullet points) in this category **OR somewhat successful** in demonstrating **many** of the bullets points in this category
1 = **somewhat successful** in demonstrating **only one or two** the bullets points in this category

4 = shows **exceptional** achievement in all areas of this category (bullet points); document is mature, sophisticated, insightful, and confident
3 = shows **acceptable** achievement in all areas of this category but perhaps only exceptional achievement in one; document is interesting but perhaps ordinary or lacks confidence/sophistication
2 = **underachieved or clumsy** in some of the areas of this category, or acceptable in some areas and completely lacking in others; document shows evidence of underdeveloped thinking, disorganization
1 = **crude and undeveloped** in all/some/many areas in this category; difficult to identify insights, methods, and/or interpretation and analysis

4 = very consistently meets all expectations in this category and does so effectively (for example: ideas are consistently well-ordered; method is applied consistently and at same high level of effectiveness through entire document)
3 = somewhat consistently meets all expectations in this category; is effective when present (i.e. identifies bias in most areas but misses a few; well-ordered ideas except for one or two sections that wander a bit)
2 = inconsistently meets the expectations in this category; may meet all expectations but there are inconsistencies in every area, or may be consistent in one or two areas but scattershot in the rest
1 = only occasionally meets the expectations that belong to the category

4 = extremely effective in this category
3 = moderately effective in this category
2 = occasionally effective in this category
1 = ineffective in this category

Notes

1.   Catherine Fraser Riehle and Merinda Kaye Hensley, "What Do Undergraduate Students Know about Scholarly Communication? A Mixed Methods Research Study," *portal: Libraries and the Academy* 17, no. 1 (2017): 3. https://www.ideals.illinois. edu/handle/2142/95723.

2.   Mark J. Caprio, "Student Publishing: Future Scholars as Change Agents," *OCLC Systems and Services: International Digital Library Perspectives* 30, no. 3 (2014): 147. doi.org/10.1108/OCLC-01-2014-0003.

3.   Mike S. Ribble, Gerald D. Bailey, and Tweed W. Ross, "Digital Citizenship: Addressing Appropriate Technology Behavior," *Learning and Leading with Technology* 32, no. 1 (September 2004): 7, http://files.eric.ed.gov/fulltext/EJ695788.pdf.

4.   Riehle and Hensley, "What Do Undergraduate Students Know?"

5.   Association of College and Research Libraries, *Framework for Information Literacy for Higher Education* (Chicago: Association of College and Research Libraries, 2016), http://www.ala.org/acrl/standards/ilframework.

6.   Thomas P. Mackey and Trudi E. Jacobson, "Reframing Information Literacy as a Metaliteracy," *College and Research Libraries* 72, no. 1 (2011): 70, https://doi. org/10.5860/crl-76r1.

7.   Association of College and Research Libraries, *Framework*, 2–3.

8.   Stephanie Davis-Kahl, "Engaging Undergraduates in Scholarly Communication: Outreach, Education, and Advocacy," *College and Research Libraries News* 73, no. 4 (2012): 212, https://doi.org/10.5860/crln.73.4.8744.

9.   Scholarship @ Claremont website, accessed June 6, 2018, http://scholarship.claremont.edu/.

10.   Jeffrey M. Osborn and Kerry K. Karukstis, "The Benefits of Undergraduate Research, Scholarship, and Creative Activity," in *Broadening Participation in Undergraduate Research: Fostering Excellence and Enhancing the Impact*, ed. Mary K. Boyd and Jodi L. Wesemann (Washington, DC: Council on Undergraduate Research, 2009): 41–53; Kerry K. Karukstis, "Pivotal Junctures in the Undergraduate Research Enterprise: CUR Fellow's Address at CUR's 2012 National Conference at the College of New Jersey," *Council for Undergraduate Research Quarterly* 33, no. 1 (2012): 14–19, https://www.cur.org/assets/1/7/331Fall12KarukstisWeb.pdf; John K. Petrella and Alan Jung, "Undergraduate Research: Importance, Benefits, and Challenges," *International Journal of Exercise Science* 1, no. 3 (2008): 91–95, http:// digitalcommons.wku.edu/ijes/vol1/iss3/1/.

11.   Osborn and Karukstis, "The Benefits of Undergraduate Research," 41.

12.   Boyer Commission on Educating Undergraduates in the Research University, *Reinventing Undergraduate Education* (Stony Brook: State University of New York at Stony Brook, 1998): 24, https://dspace.sunyconnect.suny.edu/handle/1951/26012.

13.   Pomona College, "Timeline: 1914," accessed September 1, 2017, https://www.pomona.edu/timeline/1910s/1914.

14.   Pitzer College, "Mission and Values," accessed June 20, 2018, https://www.pitzer. edu/about/mission-and-values/; Harvey Mudd College, "Mission and Strategic Vision," accessed June 20, 2018, https://www.hmc.edu/about-hmc/mission-vision/; see appendix 21A, "Claremont Colleges Mission Statements."

15. Julia Bauder and Catherine Rod, "Crossing Thresholds: Critical Information Literacy Pedagogy and the ACRL Framework," *College and Undergraduate Libraries* 23, no. 3 (2016): 252–64, https://doi.org/10.1080/10691316.2015.1025323.

16. Bauder and Rod, "Crossing Thresholds."

17. The Undergraduate Research Commons (URC; http://undergraduatecommons.com/) is a portal showcasing outstanding published works authored by thousands of undergraduate students from a variety of academic institutions.

18. Caprio, "Student Publishing"; Amy Buckland, "More Than Consumers: Students as Content Creators," in *Getting the Word Out: Academic Libraries as Scholarly Publishers*, ed. Maria Bonn and Mike Furlough (Chicago: American Library Association, 2015): 193–202.

19. Claremont Colleges Library, "Strategic Initiatives of the Claremont Colleges Library, 2016–2020," accessed September 1, 2017, http://libraries.claremont.edu/site/downloads/_strategic-plan/StrategicInitiatives2016-2020.pdf.

20. Beatriz Maldonado, "Creating a Voice and a Place with Digital Tools," guest post on *Jacqueline Wernimont: Network Weaver, Scholar, Digitrix* (blog), March 8, 2013, https://jwernimont.com/creating/.

21. Data obtained from the manager of Scholarship @ Claremont.

22. Linda Bennett and Dimity Flanagan, "Measuring the Impact of Digitized Theses: A Case Study from the London School of Economics," *Insights* 29, no. 2 (2016): 111–19, https://doi.org/10.1629/uksg.300.

23. Kendyl M. Klein, "Why Don't I Look Like Her? The Impact of Social Media on Female Body Image" (Claremont McKenna College senior thesis 720, 2013), http://scholarship.claremont.edu/cmc_theses/720; Olivia Fleming, "'Why Don't I Look Like Her?' How Instagram Is Ruining Our Self Esteem," *Elle*, November 18, 2014, http://www.elle.com/beauty/tips/a2531/how-instagram-is-ruining-our-self-esteem/; "Kendyl Klein's '14 Senior Thesis Quoted in Elle Magazine on the Impact of Social Media on Female Body Image," Claremont McKenna College Newsroom, January 14, 2015, https://www.cmc.edu/news/kendyl-kleins-13-senior-thesis-quoted-in-elle-magazine-on-the-impact-of-social-media-on-female-body-image; Casey Busher, "Claremont McKenna Alum Uses Dashboard to See Online Citations and Explore Career Options," bepress.com, May 11, 2017, https://www.bepress.com/claremont-mckenna-alum-uses-dashboard-see-online-citations-explore-career-options/.

24. Buckland, "More than Consumers," 197.

25. Char Miller and Char Booth, "Open Access as Undergraduate Pedagogy," *Library Journal*, March 26, 2014, http://lj.libraryjournal.com/2014/03/opinion/backtalk/open-access-as-undergraduate-pedagogy-backtalk/#_.

26. See appendix 21B, "Information Literacy in Student Work Rubric—Claremont Colleges Library," and appendix 21C: "Critical Thinking Rubric."

27. Survey conducted by the Environmental Analysis Department of Pomona College in 2016, available upon request.

28. Benjamin C. Hackenberger, "The San Antonio Wash: Addressing the Gap between Claremont and Upland" (Pomona senior thesis 136, 2015), http://scholarship.claremont.edu/pomona_theses/136/.

29. Hackenberger, "The San Antonio Wash."

30. David Bartholomae, "Inventing the University," *Journal of Basic Writing* 5, no. 1 (1986): 4–23, http://www.jstor.org/stable/43443456; Christopher L. Schroeder, *Reinventing the University* (Logan: Utah State University Press, 2001).

31. Benjamin C. Hackenberger and Char Miller, "Watershed Politics: Groundwater Management and Resource Conservation in Southern California's Pomona Valley," *Journal of Urban History,* OnlineFirst, March 8, 2017, https://doi.org/10.1177/0096144217692986.

32. Frank Lyles, "Climate Change Adaptation for Southern California Groundwater Managers: A Case Study of the Six Basins Aquifer" (Pomona senior thesis 172, 2016), http://scholarship.claremont.edu/pomona_theses/172.

33. Anna Marie Kramer, "The Power of the Tower: Contesting History at Bear Lodge/Devils Tower National Monument," 2016 Claremont Colleges Library Undergraduate Research Award, April 28, 2016, http://scholarship.claremont.edu/cclura_2016/4.

34. Anne Marie Kramer, "The Power of the Tower: Contesting History at Bear Lodge/Devils Tower National Monument" (Pomona senior thesis 151, 2016), http://scholarship.claremont.edu/pomona_theses/151.

35. Kramer, "The Power of the Tower," http://scholarship.claremont.edu/pomona_theses/151.

36. Char Miller, "Landmark Decision: The Antiquities Act, Big-Stick Conservation, and the Modern State," in *The Antiquities Act: A Century of American Archaeology, Historic Preservation, and Nature Conservation*, ed. David Harmon, Francis P. McManamon, and Dwight T. Picaithley (Tucson: University of Arizona Press, 2006), 64–78.

37. Scott Warren and Kim Duckett, "'Why Does Google Scholar Sometimes Ask for Money?' Engaging Science Students in Scholarly Communication and the Economics of Information," *Journal of Library Administration* 50, no. 4 (2010): 369. https://doi.org/10.1080/01930821003667021.

38. Warren and Duckett, "'Why Does Google Scholar?'" 369.

Bibliography

Association of College and Research Libraries. *Framework for Information Literacy for Higher Education*. Chicago: Association of College and Research Libraries, 2016. http://www.ala.org/acrl/standards/ilframework.

Bartholomae, David. "Inventing the University." *Journal of Basic Writing* 5, no. 1 (1986): 4–23. http://www.jstor.org/stable/43443456.

Bauder, Julia, and Catherine Rod. "Crossing Thresholds: Critical Information Literacy Pedagogy and the ACRL Framework." College and Undergraduate Libraries 23, no. 3 (2016): 252–64. https://doi.org/10.1080/10691316.2015.1025323.

Bennett, Linda, and Dimity Flanagan. "Measuring the Impact of Digitized Theses: A Case Study from the London School of Economics." *Insights* 29, no. 2 (2016): 111–19. https://doi.org/10.1629/uksg.300.

Boyer Commission on Educating Undergraduates in the Research University. *Reinventing Undergraduate Education: A Blueprint for America's Research Universi-*

ties. Stony Brook: State University of New York at Stony Brook, 1998. https://dspace.sunyconnect.suny.edu/handle/1951/26012.

Buckland, Amy. "More Than Consumers: Students as Content Creators." In *Getting the Word Out: Academic Libraries as Scholarly Publishers*. Edited by Maria Bonn and Mike Furlough, 193–202. Chicago: American Library Association, 2015.

Busher, Casey. "Claremont McKenna Alum Uses Dashboard to See Online Citations and Explore Career Options." bepress.com, May 11, 2017. https://www.bepress.com/claremont-mckenna-alum-uses-dashboard-see-online-citations-explore-career-options/.

Caprio, Mark J. "Student Publishing: Future Scholars as Change Agents." *OCLC Systems and Services: International Digital Library Perspectives* 30, no. 3 (2014): 144–57. https://doi.org/10.1108/OCLC-01-2014-0003.

Claremont Colleges Library. "Strategic Initiatives of the Claremont Colleges Library, 2016–2020." Accessed September 1, 2017. http://libraries.claremont.edu/site/downloads/_strategic-plan/StrategicInitiatives2016-2020.pdf.

Claremont McKenna College Newsroom. "Kendyl Klein's '14 Senior Thesis Quoted in Elle Magazine on the Impact of Social Media on Female Body Image." January 14, 2015. https://www.cmc.edu/news/kendyl-kleins-13-senior-thesis-quoted-in-elle-magazine-on-the-impact-of-social-media-on-female-body-image.

Davis-Kahl, Stephanie. "Engaging Undergraduates in Scholarly Communication: Outreach, Education, and Advocacy." *College and Research Libraries News* 73, no. 4 (2012): 212–22. https://doi.org/10.5860/crln.73.4.8744.

Fleming, Olivia. "'Why Don't I Look Like Her?' How Instagram Is Ruining Our Self Esteem." *Elle*, November 18, 2014. http://www.elle.com/beauty/tips/a2531/how-instagram-is-ruining-our-self-esteem/.

Hackenberger, Benjamin C. "The San Antonio Wash: Addressing the Gap between Claremont and Upland." Pomona Senior Theses 136 (2015). http://scholarship.claremont.edu/pomona_theses/136/.

Hackenberger, Benjamin C., and Char Miller. "Watershed Politics: Groundwater Management and Resource Conservation in Southern California's Pomona Valley." *Journal of Urban History,* OnlineFirst, March 8, 2017. https://doi.org/10.1177/0096144217692986.

Karukstis, Kerry K. "Pivotal Junctures in the Undergraduate Research Enterprise: CUR Fellow's Address at CUR's 2012 National Conference at the College of New Jersey." *Council for Undergraduate Research Quarterly* 33, no. 1 (2012): 14–19. https://www.cur.org/assets/1/7/331Fall12KarukstisWeb.pdf.

Klein, Kendyl M. "Why Don't I Look Like Her? The Impact of Social Media on Female Body Image." Claremont McKenna College senior thesis 720, 2013. http://scholarship.claremont.edu/cmc_theses/720.

Kramer, Anna Marie. "The Power of the Tower: Contesting History at Bear Lodge/Devils Tower National Monument." 2016 Claremont Colleges Library Undergraduate Research Award, April 28, 2016. http://scholarship.claremont.edu/cclura_2016/4.

———. "The Power of the Tower: Contesting History at Bear Lodge/Devils Tower National Monument." Pomona senior thesis 151, 2016. http://scholarship.claremont.edu/pomona_theses/151.

Lyles, Frank. "Climate Change Adaptation for Southern California Groundwater Managers: A Case Study of the Six Basins Aquifer." Pomona senior thesis 172, 2016. http://scholarship.claremont.edu/pomona_theses/172.

Mackey, Thomas P., and Trudi E. Jacobson. "Reframing Information Literacy as a Metaliteracy." *College and Research Libraries* 72, no. 1 (2011): 62–78. https://doi.org/10.5860/crl-76r1.

Maldonado, Beatriz. "Creating a Voice and a Place with Digital Tools." Guest post on *Jacqueline Wernimont: Network Weaver, Scholar, Digitrix* (blog), March 8, 2013. https://jwernimont.com/creating/.

Miller, Char. "Landmark Decision: The Antiquities Act, Big-Stick Conservation, and the Modern State." In *The Antiquities Act: A Century of American Archaeology, Historic Preservation, and Nature Conservation*. Edited by David Harmon, Francis P. McManamon, and Dwight T. Picaithley, 64–78. Tucson: University of Arizona Press, 2006.

Miller, Char, and Char Booth. "Open Access as Undergraduate Pedagogy." *Library Journal*, March 26, 2014. http://lj.libraryjournal.com/2014/03/opinion/backtalk/open-access-as-undergraduate-pedagogy-backtalk/#_.

Osborn, Jeffrey M., and Kerry K. Karukstis. "The Benefits of Undergraduate Research, Scholarship, and Creative Activity." In *Broadening Participation in Undergraduate Research: Fostering Excellence and Enhancing the Impact*. Edited by Mary K. Boyd and Jodi L. Wesemann, 41–53. Washington, DC: Council on Undergraduate Research, 2009.

Petrella, John K., and Alan Jung. "Undergraduate Research: Importance, Benefits, and Challenges." *International Journal of Exercise Science* 1, no. 3 (2008): 91–95. http://digitalcommons.wku.edu/ijes/vol1/iss3/1/.

Pomona College. "Timeline: 1914." Accessed September 1, 2017. https://www.pomona.edu/timeline/1910s/1914.

Ribble, Mike S., Gerald D. Bailey, and Tweed W. Ross. "Digital Citizenship: Addressing Appropriate Technology Behavior." *Learning and Leading with Technology* 32, no. 1 (September 2004): 6–9. http://files.eric.ed.gov/fulltext/EJ695788.pdf.

Riehle, Catherine Fraser, and Merinda Kaye Hensley. "What Do Undergraduate Students Know about Scholarly Communication? A Mixed Methods Research Study." *portal: Libraries and the Academy* 17, no.1 (2017): 145–78. https://www.ideals.illinois.edu/handle/2142/95723.

Schroeder, Christopher L. *Reinventing the University: Literacies and Legitimacy in the Postmodern Academy*. Logan: Utah State University Press, 2001.

Scholarship @ Claremont website. Accessed June 6, 2018. http://scholarship.claremont.edu/.

Warren, Scott, and Kim Duckett. "'Why Does Google Scholar Sometimes Ask for Money?' Engaging Science Students in Scholarly Communication and the Economics of Information." *Journal of Library Administration* 50, no. 4 (2010): 349–72. https://doi.org/10.1080/01930821003667021.