

Building History Enrollments Through Online Courses for the Professions: Lessons from Teaching the History of Engineering

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HISTORY DEPARTMENTS in universities across the country are facing acute pressure to increase enrollments. Though widely circulated reports of dramatic declines in history classrooms at Ivy League institutions may overstate the extent to which there is a crisis of the humanities across the nation, there is a notable trend of decreasing attendance in history classes. Undergraduates getting history degrees constituted 2.2% of national majors in 2007; the number is now 1.7%, including a 9% drop in majors from 2013 to 2014.¹ The emphasis on STEM education and “practical” majors has not worked to the advantage of history programs. Moreover, this is a time of general disinvestment in public education, with most history departments being asked to do more with less.

The situation is no different at Arizona State University, where I teach. ASU is a large public university with modest endowment support and declining contributions from the state government (about 12% of ASU’s budget comes from the state after our most recent round of cuts in 2014, and Arizona ranks 49th in the nation in per capita spending on higher education²) and our history faculty

has recognized that reduced numbers of majors represent a major threat to our institutional standing. Though there is no direct formula between number of students and faculty lines, it has been clear that recent decreases in enrollment numbers (“butts in seats” in the vernacular) have been tied to administrative decisions to freeze new faculty lines, deny authorization of replacement hires for retirements, and decrease funding for graduate students. I am privileged to work with a collection of wonderful colleagues taking these challenges seriously. We have undertaken a number of efforts to reverse these trends, including restructuring our curriculum, developing partnerships across campus, and—as any of you that have been bombarded by ASU’s frequent ads on public radio are no doubt aware—teaching online.

In this article, I describe an effort to boost history enrollments that I have spearheaded over the past couple of years: teaching the history of engineering online. This class has achieved very successful enrollment numbers: about 700 total students were expected to take the course during the 2016-2017 academic year (it is offered six times a year with enrollment caps of around 125), with continued growth expected in the future. Although some aspects of this course are specific to ASU and might not be able to be replicated elsewhere, I believe that many of its features could be of use to historians across the nation seeking to increase the number of students in their classes. In particular, I would strongly encourage history departments seeking to reach new audiences to consider developing classes in the history of various professions. Engineering is one that happens to be growing rapidly, but similar courses could be imagined in the history of business, psychology, medicine, communications, law, and other fields.

This task matters greatly for at least two reasons. The first is practical: ensuring our self-preservation by satisfying university administrators that history departments offer significant value, meriting continued and hopefully increased investment. There is also a deeper imperative at play, one that speaks to the heart of why so many of us became history professionals in the first place. For those of us that believe history is an essential part of a well-rounded education for any student, be it for reasons of critical thinking, social empathy, or enlightened citizenship, it would be a shame to abdicate this mission simply because our classes are decreasing. If students are not coming to us, we should reach out to them.

Teaching online offers a further benefit for those committed to the value of historical education: reaching audiences we would not otherwise connect with. For the large majority of online students, the choice is not between face-to-face classes and online; it is online education or nothing. Many of them are working mothers and fathers, military veterans, rural residents, and have other reasons preventing them from attending face-to-face classes, such as irregular work schedules, poor transportation options, or even physical disabilities. Ignoring this population would be a mistake.

Moreover, my experiences have convinced me that two of the most common objections to online education miss the mark. The first concern is that online courses are inherently inferior, a sentiment I shared before I tried it for myself. The reality is that well-designed online courses can achieve impressive learning outcomes that rival and in some cases exceed results in face-to-face classes due to factors such as greater student participation and lectures that students can re-watch at their own pace.³ Second, some assume online students are less qualified and diligent than those attending brick-and-mortar institutions. This was not true for me. My online students were incredibly dedicated and capable, with the vast majority completing assignments in a satisfactory manner and a large percent going above and beyond the requirements. They were, on the whole, a delight to teach. I've heard similar stories from many colleagues at ASU, and colleagues at other universities have had comparable experiences.⁴

In what follows, I detail the initial construction and evolution of an online class in the history of engineering. My task was to create an intellectually rigorous course that could be fully online and scaled to meet increasing demand while working on a limited budget. For those facing similar challenges, I describe my experiences below in a chronological narrative that traces my design and teaching of the class. Throughout, I discuss topics of more general interest including designing courses for non-history majors, teaching online, and creating a scalable class that could be taught effectively by other instructors when I was unable to teach it.

Background: Adjusting to Online Education

My first introduction to online teaching occurred in Spring 2014, when I agreed to develop an online history of engineering course

for the Summer term.⁵ At that point, we did not know whether the course would have high enrollments, so I did not factor this into my design. In retrospect, this was extremely fortunate for me, as it allowed me to engage with online teaching before redesigning the course a year later when it became clear that enrollments would be far higher than previously anticipated.

I should clarify at this point that I am discussing an online class, not a Massive Online Open Course (MOOC). MOOCs are a particular subset of online classes that are designed to be widely open and enroll as many students as possible. MOOCs typically have open enrollment, unlimited seats, and either do not offer grades, or perform grading automatically or with peer review. Online courses of the type I developed are not limitlessly open to anyone and they have enrollment caps. All students must be admitted into programs, and there may be prerequisites. Just as in face-to-face classes, grading responsibilities are handled by the instructor, sometimes with the aid of teaching assistants. Peer review could be incorporated into this model in the same way it could be used in a face-to-face class, though this is not a strategy I pursued.

As I began to plan my first online course, I realized I was fairly clueless about the relevant differences between an in-person course and one that was online. Fortunately, my institution has committed significant funds to online course development, and so I was able to attend workshops with instructional designers and other faculty already teaching online to assist with course structure and implementation. Many of these resources are publicly available at <https://teachonline.asu.edu>. This assistance proved invaluable, and as I'll mention again later, I have come to strongly believe that online education requires a significant university commitment to infrastructure (recording studios, course designers, technical staff) in order to achieve quality outcomes. Forcing faculty to learn and manage all of the technology in addition to creating course content and grading assignments is not a sustainable practice.

These workshops stressed a number of themes that have become common in online pedagogy, with the most important point being that simply trying to replicate an on-ground course structure in an online environment would not work.⁶ After much deliberation and consultation, I established the following parameters for the

course: (1) more active learning exercises; (2) fewer lectures; (3) fostering a sense of collaborative learning.

Significantly reducing the amount of lecture in the course represented the biggest adjustment. While I am well aware of several recent critiques of lectures as a pedagogical approach, I am not yet convinced that they should be abandoned.⁷ I use lectures in my face-to-face courses for two main goals: to provide a coherent narrative for students and to cover long periods of time. As a teacher, I like the big picture and using broad sweeps of history to present students with significant contrasts during the course of the semester. When I teach the history of American business, I start with European settlement and proceed to the 2008 housing crisis; when I teach the history of energy, I begin with the domestication of fire and the development of agriculture and end with contemporary renewable energy sources. Because I have not found a textbook that I am satisfied with for either course, I use lectures to provide the chronological background and coherence necessary for students to make sense of the material and then use assigned readings (a combination of primary and secondary sources) go into greater depth on individual topics. By breaking lectures into fifteen-minute segments followed by five to ten minutes of questions, I seek to integrate discussion and keep students engaged.⁸

I find this approach works well on-ground, but it does not seem well suited to online education. I heard from many in the field that students frequently stop watching lectures after ten to fifteen minutes and even if fifty-minute videos were broken into chunks, having twelve or more per week would likely be too many for students to digest.⁹ I therefore abandoned the idea of a long chronological sweep made coherent through my lectures, and instead focused on a more constrained set of topics that could be covered with less background material.¹⁰ Ultimately, I decided to limit myself to three to five lectures of about fifteen minutes each per week.

Reducing the amount of lecture in the class was not, however, simply a reduction in course content. Instead, I viewed it as an opportunity to increase the amount of active learning in the class. And if there is one thing I would highlight about the pedagogical potential of online learning (beyond its increased accessibility for many students), it is the opportunity to integrate active learning

exercises in which all students must participate, as opposed to simply the vocal minority that often dominates discussion during face-to-face classes.¹¹ I'll discuss the structure of my assignments at greater length later in this essay, but here I'll note that they included regular discussion boards, written responses to readings, quizzes on lectures, and video projects.

Finally, I sought to create aspects of my course that replicated the sense of a learning community, rather than a collection of individual engagements with the professor. I believe that one of the strengths of a face-to-face classroom is that students can learn from one another in addition to the instructor, and I wanted to include elements of that model online. Moreover, as I learned from other instructors, many online students are eager to form community with their fellow students and embrace such opportunities.

The two primary ways I sought to achieve a sense of community were through discussion boards and video projects. Rather than having one massive discussion board for the whole class, I divided students into groups of twelve to fourteen so they could get to know one another better and engage in more manageable threads. The next step turned out to be far easier and more effective than I imagined. The very first assignment in the course was for students to upload a one-minute introduction video and then watch and comment on each of the videos of the members of their discussion group. For me as the instructor—and I expect for many of the students as well—putting faces and voices with names immediately transformed how I related to my students in a positive way. They ceased seeming like abstract entities and became individualized people: working mothers pursuing a degree in their limited hours; active members of the military earning credits while stationed at isolated bases; employees of engineering firms hoping to climb the ranks, and more. This activity—a relatively simple one in an age where webcams are cheap and widely available—got the course off to a good start. I later included two more video projects that helped reinforce for both myself and the other students that their interactions were with real people that had distinct backgrounds, personalities, and life experiences. For my students who were taking multiple courses online, video recordings appeared to be a familiar activity and one that did not present technological obstacles.

Version 1: Summer 2014

With these broad perspectives in mind, I developed a six-unit course organized chronologically and thematically. The units were (1) the Erie Canal and early American engineering (early nineteenth century); (2) professional societies and corporations (late nineteenth century); (3) the age of independent inventors (late nineteenth/early twentieth century); (4) engineering and science (first half of twentieth century); (5) engineering and the Cold War (second half of twentieth century); and (6) engineering and sustainability (late twentieth century/early twenty-first century).

Given that students approach online courses with different levels of familiarity with navigating online learning systems (my institution currently uses Blackboard), I was advised to keep each unit as structurally similar as possible so that students could learn the logistics of the course once and then be free to focus on content. Each unit, therefore, ran one week, contained three to five mini-lectures (approximately fifteen minutes each), three assigned readings (an average of twenty pages each), one or two documentaries for students to watch, one or two short writing assignments (50-150 words), and two or three discussion board topics (students were required to post an initial comment of 50-100 words, respond to at least two classmates, and reply to any comments on their posts). I had students complete a midterm after Unit 3 and a final exam after Unit 6. The other major assignment involved a linked set of papers: in the first half of the course, students chose an engineer they were interested in and wrote a four-page biographical paper. They then prepared a five-minute video to share with their fellow classmates that taught them about the history of their engineer. In the second half of the course, students wrote another four-page paper analyzing one of the artifacts their engineer helped construct and then created another five-minute video for discussion with their classmates.

My biggest surprise while teaching the class stemmed from how earnestly the large majority of students engaged with the class. My expectation had been that my students would be a bit less engaged and capable than my on-ground students. This turned out to be incorrect. On average, the quality of engagement was extremely high. In fact, when I got the first batch of papers, I ran them through a variety of anti-plagiarism programs because they so thoroughly

exceeded my expectations. Even for students whose work did not receive top marks, it was clear that most were giving the projects serious effort. As a teacher, this was a highly rewarding group of students to teach, an experience others have noted as well.¹²

Overall, I felt pleased with how this first version of the course went; twenty-two students completed the course, and the large majority of them gave the class positive evaluations. The balance of course activities—readings, lectures, assignments, and discussions—seemed reasonable and most students enjoyed the freedom to study an engineer of their interest. Video projects and discussion boards created a good sense of community for most students. Satisfied, I completed the grading and turned my attention to my research and other classes. I let my department know that I'd be willing to teach the class again in a year or so if it was desired, and gave it little more thought.

Growth, Growth, Growth

About ten months later, I heard a surprising report: my university's online programs had grown to include hundreds of new online engineering majors and a number of engineering programs had made history of engineering a required course. Instead of being a yearly offering for a few dozen students, the course would need to be available to hundreds of students a year. Within a few years, more than a thousand students might take the course annually.

This news clearly entailed a radical rethinking of the course. I had begun to adjust to online teaching, but I had made only moderate attempts to structure the class to appeal to those with little interest in history (it was an elective in its first offering) and had done practically nothing to enable the course to scale to accommodate large groups. I could guide a small number of students to proper sources for individual research projects, for example, but this model could not work for hundreds of students. I could teach the class once a year, but given that I have other teaching interests and obligations, I would need to package it in a way that it could serve students even if I was not teaching it. I realized I would need to build a course structure that would enable a smart history professional to use their broad expertise in historical ideas and topics, and apply them to engineering even if they were not subject experts. Moreover, I acknowledged that in a

small class taught occasionally, I could overlook those aspects of the course that were just so-so the first time around—readings that were longer and more cumbersome than would be ideal; a documentary that felt too dated; lectures that meandered; discussion prompts that only partially worked—but magnifying minor errors across hundreds of students no longer seemed acceptable.

During Summer 2015, I developed the new structure for the course in collaboration with a teaching assistant (TA) and our instructional designers—university staff members familiar with online education and many of the technological tools available to instructors. Our instructional designers recommended applications to enhance Blackboard’s offerings, suggested techniques employed successfully in other classes, edited video recordings, and set up assignments and discussion boards. Without this technological and pedagogical assistance, I could not have focused on course content. I strongly caution any institution against moving into online instruction without a significant commitment to providing instructional designers and extensive technical support, lest they overwhelm faculty members.

My redesign focused on the following priorities and modifications:

Increasing course relevance for non-historians: Because the course switched from an elective to a requirement for most students, I recognized that many would come to the course out of obligation, not inherent interest. To inspire students to care about course material even if they had no particular affinity for history (and with the acknowledgement that many might even actively dislike it), I wanted to frame the course around themes relevant to contemporary practice rather than chronology. I re-organized the six-unit structure from the first course, and created an “enduring question” for each unit that linked past to present. For example, in my unit on the Erie Canal, the enduring question—“How do engineers best learn?”—allowed me to discuss the patterns of learning on the job versus learning in school characteristic of early American engineering. For students—the vast majority of whom are both working and in school—this question is directly germane to their lives and provides a reason for them to care about history. In my unit on engineers and corporations, I asked students to think about the ethical role of engineers as bosses—a matter most could relate to strongly because (a) they have direct

experience with good and bad bosses and (b) most aspire to be in positions of management in the future.¹³ While this structure was specific to engineering, my experience teaching non-history students online and face-to-face is that they are much more drawn into history courses that frame their discussions around thematic rather than chronology, so this approach could be applied to the history of other professions as well. And because many engineering students have not taken history since high school, I kept a series of “here are the big things that happened in American history during the period of study” lectures to help remind them of the timeframe for major events such as the Civil War, industrialization, women’s suffrage, and the Civil Rights Movement. Several students reported being grateful for these reminders.

Streamlining content: The vast majority of online students are extremely busy. They are working full- or part-time, have families, and still choose to pursue higher education despite the sacrifices. As a result, I wanted to be sure I was not wasting their time with extraneous material. This meant tightening (and thereby shortening) the lectures, excluding extraneous readings, and picking assignments very carefully. The most challenging pedagogical decision I made in this light involved choosing to reduce the reading to focus on other learning objectives. In the first version of the course, the students read on average three articles or book chapters per unit (sixty to eighty pages). For a university-level history class, this is already a small number. I decided to reduce it even further in the revised course—to an average of one scholarly article or chapter and two to four primary source readings averaging about five to ten pages each. I made this decision primarily on the grounds of opportunity cost: given finite time, I decided to emphasize active learning exercises over reading. The second reason has to do with the anticipated background of my students: most engineers have not had a great deal of experience learning how to read social science articles effectively and for a number, English is not their first language. I felt, as a result, that I either needed to devote significant effort to helping students learn to read historical works, or I could provide some of the historical background through lectures and documentaries and have them spend more time debating the topics. I chose the latter strategy. I do not expect all other instructors would make the same

choice, and I expect some might even feel I am missing a significant opportunity (perhaps even an obligation) to work with students on critical reading skills. I am sympathetic to this line of argument, but decided to direct my energies toward other learning outcomes.

Reworking lectures: In light of revising the course materials and topics, I re-recorded all my lectures to highlight new content and draw more connections. Based on feedback at an instructional design workshop, I also decided to integrate quiz questions into the lectures themselves. Using a tool called Zaption, each lecture paused approximately every four to five minutes to ask the students a quiz question. The questions themselves were relatively straightforward and mainly intended to ensure that students paid attention. The benefit of this approach, therefore, is not in assessing deep knowledge of the subject; rather, it is a technique to encourage students to remain actively engaged in watching lectures since they know questions can appear randomly. Moreover, Zaption integrated directly into the grade calculations, requiring little instructor time. This step further revealed the benefits of instructional designers. In Fall 2016, Zaption abruptly ended support for their project, forcing us to find a new tool. They recommended PlayPosit and facilitated the transfer of questions to the new tool.

Substituting a research paper with a capstone: Instead of two research papers, I substituted a 300-500 word capstone assignment for each unit (a total of six during the term) (see **Appendix B** for an example). In each capstone assignment, students were asked to integrate course themes from the unit's materials (lectures, documentaries, and readings) while also relating the content to their lives. Capstone assignments served several goals. First, they required students to write regularly, an important component of active learning. Second, they asked students to synthesize readings, lectures, and documentaries, as the questions involved course themes that cut across the unit's individual assignments. Third, this assignment structure maintained the same quantity of student writing compared to two papers while reducing instructor grading time by more than half. Approving topics, reviewing sources, and grading papers in the first version of the course took on average at least thirty minutes per student; grading three capstone assignments on a

20-point scale while leaving a few comments could be accomplished in twelve to fifteen minutes (see **Appendix C** for the grading rubric). And while a research paper involved more complex writing and research, it only peripherally assessed student knowledge of course topics. Given that students wrote more frequently in the latter scenario and were forced to synthesize course content more often, I believe capstones offered comparable educational value.

Asking pre-unit questions: For each unit, I asked students to answer a question about the course theme *before* they had access to course material (see **Appendix A** for an example). In advance of the unit on professional societies, for example, I had students write a few sentences about what they thought was the proper role of professional societies in contemporary practice and whether they planned to join one (I instructed them that there was no correct answer, and I would give full credit to any reasonable response). Only after answering this question would the unit's lectures, readings, documentaries, and discussions become available. I added this feature to place students in a position of active engagement with the material from the very outset. By forcing them to commit to a position in advance, they could then question whether their initial assumptions were correct or not, instead of passively absorbing course materials. Several of the capstones then asked students to reflect explicitly on whether they still believed their initial ideas or had rethought their positions based on course content.

Incorporating video projects: The video projects were one of the most successful parts of my first version of the course because they helped create a collaborative learning environment, and I did not want to eliminate them. But since students were no longer doing research papers, they could not present their findings to their classmates. In addition, related to the earlier point about streamlining the course, I did not want to add an additional assignment simply so that I could incorporate a video project. The answer I came up with was to have students create videos that prepared themselves for the midterm and the final. Working in teams of three or four, they developed an eight-minute video reviewing the previous three units to offer their own perspective on the most important themes and points (see **Appendix D**). The video was to be directed toward

their fellow classmates and help them prepare for the exam. Each discussion group of approximately twelve students, as a result, produced three videos, so each class member participated in the creation of one video and then reviewed and commented on two others. The structure of this assignment, then, integrated active learning exercises (synthesizing class material and teaching it to fellow classmates followed by discussion of the videos) with requiring students to collaborate, and it did so while reinforcing knowledge of course themes and helping students prepare for exams.

Teaching the Class: What Worked

With the support of a TA and instructional designers, I taught the course to 100 students in Fall 2015. Overall, the course went very well. By university metrics, it was a clear success. All available seats were filled at the beginning, and after some dropped as part of the normal shuffling of classes at the beginning of the semester, 86 students completed the course, with a grade distribution of 28 As, 37 Bs; 19 Cs; and 2 Fs (median grade: 85.6). Student evaluations were highly positive, scoring the course a mean average of 4.4 (on a 1-5 scale) and the instructor average of 4.6 (n=42). All students deemed the academic standards for the course to be high, with 71.4% strongly agreeing with this claim and 28.6% agreeing (no students selected the other options of “neutral,” “disagree,” or “strongly disagree”).

Numbers, of course, tell only part of the story. I was also pleased with several qualitative aspects of the course, including a number of surprises:

Positive response to thematic (rather than chronological) focus: Several students noted in their evaluations that they enjoyed the course far more than they expected for a requirement. One student wrote: “The content was surprisingly fun...I was dreading this class, as I’ve never been a fan of history classes, but I found myself really drawn into it.” Another noted: “when I started this class, I failed to see the relevance and worth...I quickly realized this class is much more than just history, history is only used as a tool to come to realizations about the state of affairs now.” The use of enduring questions and analogies to the present helped draw students into a study of the past that they otherwise might have found irrelevant.

Genuine engagement with course material through discussion: The use of discussion boards and capstones forced all students to regularly engage with course material. A pleasant surprise was the large number (at least 30%) of students that consistently went above and beyond the requirements in their engagement with course topics (even though I strive to get good participation in my face-to-face courses, I rarely achieve a higher ratio in that setting). They extended conversations on discussion boards with insightful comments far exceeding the mandatory number of posts. Many wrote very detailed capstone assignments exploring topics in greater depth than required. Moreover, several noted in their evaluations the benefits of collaborating with other students: “The group discussions are awesome too because we get to communicate with one another and pick each other’s brains,” wrote one student, while another stated, “I appreciate the emphasis on discussion, and the message that much of life and academia exists through the lens of perception. There was much emphasis on the fact that we can all learn from one another.” Overall, morale and course engagement were high for most of the students.

Pre-unit question and capstone follow-up revealed changed perspectives: The structure of asking students to answer questions before they accessed course material (pre-unit questions) and then following up on the topic in the capstone assignment succeeded in allowing many students to critically evaluate their assumptions. As an instructor, this is one of my primary goals in any class, and it was, therefore, highly gratifying to see a large percentage of the class willing to consider alternative perspectives. For example, I asked students what they thought the role of professional societies was in the engineering profession and whether they would want to join one before presenting the historical context surrounding their establishment. As part of their capstone, I asked them to revisit their initial position and see if it had changed. For a number, it had; in other cases, students noted at the beginning that they did not have strong opinions, but could now articulate a perspective. Similar exercises in the context of engineers as managers, engineering and invention, engineering and the military, and engineering and sustainability revealed that students were willing to consider new viewpoints. Asking students to state and then reconsider

their opinions, therefore, helped enhance critical engagement and demonstrate the relevance of the material to their lives.

Quality of student engagement: The genuine engagement of students with course material and their willingness to consider new perspectives made this group extremely rewarding to teach. Similar to my class in Summer 2014, the students demonstrated that they were more earnest and engaged with the course on the whole than I often find with on-ground students. While the intellectual quality of each student's discussions and capstones varied, of course, I was inspired by the fact that the overwhelming majority devoted significant time and effort to the course despite the myriad other demands on their time.

Little complaint about group work: The group project component of the video review projects went better than expected. As any instructor knows, group work is a risky proposition. Some groups will work much better than others, and some level of complaining from students is as inevitable as death and taxes. In this case, only one or two of my thirty-two groups ended up having notable difficulties, which was far less than expected (particularly given that they had to coordinate schedules and complete a challenging assignment in a short period of time). Because I strongly believe that working together and seeing each other on video multiple times during the semester played a key role in building a collaborative learning environment, the group projects aided the class substantially.

Handing the Course Over

In undertaking the design of this course, I knew from the beginning that other instructors would use the work I did and take over the teaching. Since Fall 2015, it has been offered nearly every semester and has filled each time. I recognize that this expectation may trouble many history teachers, as it involves the potential loss of intellectual property and the use of non-subject experts. I was not particularly concerned about my own intellectual property since I view teaching as a collaborative activity. I borrow liberally from the good ideas of my colleagues and seek to pass on ideas whenever I can. Moreover, my salary exists in large measure to

educate ASU's students, so I saw this as part of my job description. My main concern stemmed from ensuring the ongoing quality of the course.

Fortunately, the continued growth in enrollments has justified the hiring of a subject matter expert to take over instruction for the course. In Summer 2016, we brought on board a lecturer in history of engineering who has utilized the course design I developed and added his own enhancements to the course. While the position is not tenure-track, it has stability: it can be renewed annually based on continued enrollments and satisfactory performance. Moreover, at ASU, lecturer positions have full benefits and a respectable salary. This, to my mind, is a good outcome: increasing the enrollments of our department has generated the revenue to create a stable position for a promising young professional. In due time, this lecturer will likely take over a tenure-track position elsewhere, and at that point, we expect to be in a position to hire a replacement.

Under our lecturer's guidance, the course appears to be thriving. In fact, the most recent set of course evaluations indicated even higher marks in certain areas than when I taught the course, with students rating the lecturer a 4.7 and the course a 4.5 on a scale of 1-5. More than 90% of students agreed (45.9%) or strongly agreed (45.9%) that the course enhanced their ability to read, write, and think critically. Several students reported being wary of taking a history course, but were pleasantly surprised to find how much they enjoyed it and how much they learned.

Lessons Learned

As I noted at the beginning of this essay, the challenges I faced in building this class are by no means unique. Many historians are grappling with pressures to increase enrollments in classes and some are debating the opportunities and costs of online education. Based on my experiences, here are a number of my take-away lessons from this pedagogical undertaking:

Reach out to non-history majors and meet students halfway: Teaching the history of various professions is one way that historians can increase class enrollments. This class focused on engineers, but there are also large enrollments to be gained from courses aimed at

those in business, communication, medicine, science, and more. Yet working with such students (who are usually fulfilling distribution requirements) suggests the value of designing courses that do not assume an inherent interest in history. I did this through emphasizing thematics over chronology, though I'm sure there are other ways this goal could be achieved as well. Building bridges to their existing interests and remembering to provide cursory reviews of historical periods can help encourage them to be willing to engage the past in ways that they otherwise may not.

Be open to online education: I entered this activity uncertain of the potential of online education, but realized it was important that I gained experience; I left convinced that it has substantial merits. It can help historians reach audiences they would otherwise miss, and the integration of digital teaching tools can enhance learning outcomes. Moreover, it is often the case in many institutions that online education is avoided by tenure-track faculty. Online education does not appear to be going away. If history professionals want to have a voice at the table in discussions about the potential costs and benefits of these platforms, we gain credibility if we have engaged ourselves.

Use video to humanize online students: A challenge of online learning can be that students appear as abstractions recognized solely through usernames. By making my first assignment a one-minute video introduction, I immediately felt a significant shift in my relationship to these students, and I believe they related to each other more openly in discussion boards. Additional video projects throughout the semester reinforced the benefits of putting faces to names. It made teaching the class more rewarding for me and helped classmates engage in more robust discussions. Moreover, both times I have taught this course, I have walked away with deep respect for my online students. Most are extremely busy and are making several sacrifices to pursue higher education. And yet, most earnestly engaged with the class material and showed a willingness to work very hard and entertain new ideas. As a teacher, this is a wonderful combination. I encourage others to see online students as equivalent to face-to-face students, if not a potentially even more dynamic and interesting group to teach.

Emphasize active learning exercises: Teaching online forced me as an instructor to increase the amount of active learning exercises in my class. This has not only benefited my online courses, but I am also working to integrate more of these exercises into my face-to-face courses. This semester, I am partially flipping my lecture classes by pre-recording a fifteen-minute lecture for students to watch before class, thereby giving me more classroom time for group discussions. Engaging with teaching online and seeing the benefits of active learning exercises, as a result, is improving my pedagogy in non-online settings as well.

Talk with others: I could never have created this class without dozens of conversations with colleagues and instructional designers. I learned enormous amounts from others, and this essay is part of my hope to pay this forward by sharing the ideas I've gained. While many teachers have made great strides in online education, there is, without doubt, more to be uncovered, and that process can be accelerated through collaborative discussions.

Notes

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1. James Grossman, "History Isn't a 'Useless' Major. It Teaches Critical Thinking, Something America Needs Plenty More Of," *Los Angeles Times*, 30 May 2016, <<http://www.latimes.com/opinion/op-ed/la-oe-grossman-history-major-in-decline-20160525-snap-story.html>>.

2. Anthony Cave, "Is Arizona the Worst in Higher Education Funding?" *PolitiFact Arizona*, 4 February 2016, <<http://www.politifact.com/arizona/statements/2016/feb/04/michael-m-crow/arizona-worst-higher-education-funding/>>.

3. Barbara Means, Marianne Bakia, and Robert Murphy. *Learning Online: What Research Tells Us About Whether, When, and How* (New York: Routledge, 2014).
4. Carolyn J. Lawes, "Talking Less but Saying More: Teaching U.S. History Online," *The Journal of American History* 101, no. 4 (March 2015): 1204-1214; Suzanne K. McCormack, "Teaching History Online to Today's Community College Students," *The Journal of American History* 101, no. 4 (March 2015): 1215-1221; Doug Ward, "Pushing Through the Perils of Teaching Online," *The Chronicle of Higher Education*, ProfHacker (blog), 27 August 2012, <<https://www.chronicle.com/blogs/profhacker/pushing-through-the-perils-of-teaching-online/42104>>.
5. Summer term online courses run six weeks with the expectation that students allocate 22.5 hours per week to the course; online courses during the Fall and Spring semesters last 7.5 weeks with the expectation that students allocate 18 hours per week to the course.
6. Lawes, "Talking Less but Saying More"; McCormack, "Teaching History Online to Today's Community College Students."
7. For a critique of lectures, see Aleszu Bajak, "Lectures Aren't Just Boring, They're Ineffective, Too, Study Finds," *Science*, 12 May 2014, <<https://www.sciencemag.org/news/2014/05/lectures-arent-just-boring-theyre-ineffective-too-study-finds>>. For a defense of the value of lectures, see Alex Small, "In Defense of the Lecture," *The Chronicle of Higher Education*, 27 May 2014, <<https://www.chronicle.com/article/In-Defense-of-the-Lecture/146797>>.
8. To ensure that lectures do not become a purely passive activity for students, I include significant blocks of time for discussion and activities. In a 75-minute class meeting, for example, I often organize my class around three 15-minute lecture sections with either 10 minutes of discussion after each section, or 5 minutes between the first and second lecture segment, followed by a 20-minute interactive exercise at the end of class.
9. The optimal length for student engagement may be as short as 6-8 minutes, though as I describe later, the use of embedded quizzes can help keep students attentive through longer lectures. Philip Guo, "Optimal Video Length for Online Students," *EdX Blog*, 13 November 2013, <<https://blog.edx.org/optimal-video-length-student-engagement>>.
10. Historians have long engaged in the value of chronological coverage versus in-depth exploration of topics. For a useful overview of current debates and the longer history of these conversations, see Joel M. Sipress and David J. Voelker, "The End of the History Survey Course: The Rise and Fall of the Coverage Model," *The Journal of American History* 97, no. 4 (March 2011): 1050-1066.
11. Bridget Ford and Christopher Endy, "Flipping the Narrative on MOOCs in the Nation's Largest University System," *Process: A Blog for American History*, 26 January 2016, <<https://www.processhistory.org/flipping-the-narrative-on-moocs-in-the-nations-largest-university-system/>>.
12. Accounts previously cited by Dawes, McCormack, and Ward reveal similar findings.

13. For history teachers interested in the history of engineering, the other units I selected were: Unit 2 on professional societies and expanding higher education, where I asked them to consider the role of professional societies today (many were members of engineering professional societies and others have been considering whether to join). Unit 3 examined invention and the role of individuals, corporations, and teams in the creation of new devices, a topic related to Silicon Valley. Unit 4 studied engineers as managers in corporations, asking students to reflect on their relationship to engineers who manage them, and how they might themselves act as bosses in the future. In unit 5, we explored the long relationship between engineering and the military, seeking to understand both the historical linkages and the ethical questions inherent in these collaborations. The final unit, on sustainability, asked students to connect their engineering work to contemporary sustainability challenges.

Appendix A: Pre-Unit Question

Welcome to Unit 5!

Unit 5: Engineering & the Military



In this unit we will cover the following topics:

1. Historical relationships between engineers and the military
2. The consequences of World War II and the Cold War for engineering practice
3. Ethical concerns surrounding the military-industrial-university complex

Unit 5 Question

Do you think universities should participate in confidential research projects that enhance military weaponry? Or do you think it is a violation of their mission to serve the public good and ensure that knowledge is openly distributed? State why you agree with one position more than the other.

Appendix B: Capstone Assignment

Unit 5 Capstone Assignment

This is a three-part capstone. All students must complete all three parts.

Part I

Cowan uses the history of the aviation industry to discuss Cold War engineering and the military-industrial complex. Drawing on this reading and the satellites documentary, identify three historical examples from the aviation industry that reveal a distinctive characteristic of Cold War engineering. Write 1–2 sentences for each example and be sure to specify the feature of Cold War engineering you believe each example illustrates.

Part II

Do you think the SAGE Project was a wise investment of taxpayer money, or do you think the funds would have been better spent elsewhere? If you think it was a wise investment, identify what you believe to be the two strongest reasons to defend this position. In addition, state what you believe to be the strongest reason why it might not have been a wise investment. Alternatively, if you think the funds would have been better spent elsewhere, identify what you believe to be the two strongest reasons to defend this position. In addition, state what you believe to be the strongest reason why it might have been a good investment.

Part III

At the beginning of the unit, you were asked whether you thought it was appropriate or not for universities to be involved in military research. Has your opinion on the topic changed at all during this unit? If so, why? If not, what did you think was the most compelling reason to reconsider your views (even if it was not strong enough to sway you in the end)?

Appendix C: Capstone Grading Rubric

Capstone Grading Scale

19–20: Assignment is exemplary. It contains impressive insight into the topics that move significantly beyond restating points from lectures and readings. Specific examples are used to illustrate arguments. All aspects of the prompt are addressed and there are no grammatical problems.

17–18: Assignment is quite good overall. Compelling answers are offered to the prompt that move beyond restating points from lectures and readings. One or more of the following may be true: an aspect of the prompt is not fully addressed; an aspect of the argument is a bit unclear; examples are too general; some grammatical errors exist.

15–16: Assignment is satisfactory. Answers are offered to the prompt, though they mainly restate points made in lectures and readings. Parts of the answer may be a bit unclear. Two or more of the following may be true: one or more aspects of the prompt are not fully addressed; examples are too general or unclear; several grammatical errors exist.

13–14: Assignment shows significant gaps. Several of the following may be true: answers are unclear or do not directly address the prompt; examples are overly general and do not offer insight into the prompt; multiple aspects of the prompt are not addressed; many grammatical errors exist.

12 or below: Assignment does not demonstrate satisfactory comprehension of the unit material.

Note: there will be a 1–point penalty for each 24 hours late a capstone assignment is submitted.

Appendix D: Video Review Assignment

Video Review Project Guidelines

In teams of 3–5 (3 teams per discussion group) you will create an 8-minute video reviewing the first three units of the course in preparation for the midterm. Your goal is to create an engaging and informative recap of the major themes and topics of the course so far. Your video should be directed at your fellow students—the goal is to help them prepare for the midterm (and yourselves as well, of course, as you make the tough decisions about what to include and what to exclude).

You are welcome to determine the style and substance of your video in whatever way strikes you as most effective. You can use any video software to create the video that you like, though the final version must be uploaded in a format that can be easily viewed by all students (which means that no one should have to download a new player in order to view your video). You are welcome to use present.me, though if you find something else that suits your needs better, that is fine.

I encourage you to use slides in your presentation, but to use as little text as you can (pictures = good; text = bad). This will help your presentation be more engaging and also force you to phrase things in your own words. Outside of the titles for your slides, any quotations you include from the readings, or captions for images, you should have **NO MORE** than ten words per slide.

Requirements:

- Length: 8 minutes (presentations will be penalized for being more than one minute over length; there is no penalty for being shorter than eight minutes, though if it is too short, you may not cover all the information sufficiently)
- Participation: all team members must present for a roughly equal length of time (aim for at least one minute per presenter as a minimum)
- Slide show: slides may not have more than 10 words of text (except for slide titles, quotations or image captions)
- Content: your summary of units 1–3, drawing on the full range of lectures, documentaries, readings, and discussions (though you will, of course, have to make careful selections because you cannot cover everything in your time slot)
- Upload location: your video should be uploaded to the discussion board prompt (same as for the introductory video assignment) so that fellow students can access it and post feedback
- Due date: your video must be uploaded by Saturday, 9/12 at 11:59pm

By default, all members of the team will receive the same grade unless one or more team members is noted by their peers to have done exceptionally more or exceptionally less than the others. There will be an opportunity for such feedback to be posted anonymously after the project is complete.