



CHAPTER 1

Students as Producers

Collaborating toward Deeper Learning

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My Story

In the fall of 2010, I taught a first-year writing seminar for the first time. It is a little unusual for a mathematician to teach a writing seminar, but in the College of Arts and Science at Vanderbilt University, each undergraduate is required to take a first-year writing seminar, and each department is required to offer one. That means that departments not traditionally known for their writing instruction, like mathematics, have to figure out what it means to teach writing to non-majors. I volunteered to teach a seminar in part because I wanted a break from the statistics courses I usually taught, and in part because I wanted to put into practice a variety of teaching approaches I had learned about while working at the Vanderbilt University Center for Teaching.

The course I put together was called “Cryptography: The History and Mathematics of Codes and Codebreaking.” I continue to teach it today, every other fall. It’s a fun course, with an unusual blend of mathematics, puzzle solving, history, current events, and, of course, writing. I didn’t have any experience teaching writing, but I was well read, thanks to my work at the Center for Teaching. I had learned that students often write better when they

write for each other.¹ The theory is that when students write for their instructors, when they run into something they can't quite explain, they leave things a little vague, knowing their instructor, an expert in the field, can fill in the details. But when students write for other students, who don't know anything more than they do, they go the extra mile to explain their thoughts and perspectives more clearly.

That made sense to me, so I built some peer review into my new writing seminar. For one of the course assignments, students had to select a code or cipher from history, one that we hadn't covered much in the course, and write about it—its origin, use, mechanics, and influence. I took the students' papers and posted them on my course blog. The blog at the time wasn't much, just a place for me to share course resources without having to suffer through our course management system. I asked my students to read and comment on a couple of their peers' papers, using a few prompts I provided for this purpose. My students dutifully did so, offering surprisingly thoughtful responses to the prompts I had given them. Knowing their peers would read their essays seemed to motivate my students to write well. Mission accomplished.

It wasn't until after the assignment was over that the fun began. The next week, one of my students walked into class and told me he had been Googling his paper topic. He asked me to do so on the classroom projector. I did, and I was surprised to see that his paper on the Great Paris Cipher was now the number-three result on Google! And this was back in the day of universal Google results, before it personalized one's searches. My student said, "Dr. Bruff, some high school student is going to cite my paper!" He seemed a little worried, but I was excited. To be fair, the Great Paris Cipher is pretty obscure; my student didn't have a lot of competition. But knowing that his work turned up that highly in Google results made him reconsider the quality of his essay.

But the fun wasn't over yet. The next day, another student walked into class and shared with the class, "The dude from my footnotes read my paper!" He had written a paper on something called the Chaocipher, which is perhaps the cheesiest name for a cipher I can imagine. He had cited a particular cryptography researcher who had studied the Chaocipher, and that same researcher had somehow (likely a Google alert on the name of the cipher) found the blog post with the student's paper. He had read the paper and left a very helpful comment on the blog, responding to a few questions the peer reviewers had raised about the paper. I was blown away, and so was my student.

These two experiences in the fall of 2010 convinced me of the power of an idea that I've since come to call "Students as Producers." When we bring this approach to our teaching, we engage students not only as consumers of information, but also as producers of knowledge. Thanks to my course blog, I inadvertently connected my students to audiences beyond the course, including "the dude from my footnotes." This transformed what could have been a

busywork assignment into authentic, meaningful work. And that transformation had an effect on my students, causing them to take the work more seriously and to own it in a way they didn't own other assignments.

The next time I taught the course, I planned ahead to leverage this audience effect. I partnered with Vanderbilt French professor Holly Tucker, who, at the time, edited a group blog called *Wonders and Marvels*.² She had a team of about a dozen scholars and journalists who blogged for the site, writing about curiosities from the history of medicine and science. Student essays exploring the history of cryptography were on-topic for the site, so she invited my students to pitch their essays to her for publication on *Wonders and Marvels*.

Holly spent an hour with my students talking about her site and its readers, giving my students a sense of their audience and what might engage them. My students submitted their first drafts to me for grading and feedback, then revised their essays and resubmitted them for a final grade from me. Then I passed the revised papers over to Holly, who provided another round of feedback. Students weren't required to revise and resubmit a second time, but most did, and Holly published the essays that made the cut. A total of seventeen student essays were published on *Wonders and Marvels* between the 2012 and 2014 offerings of my cryptography seminar,³ and they were seen by hundreds of Holly's readers.

But wait, there's more! Holly was contacted by an editor from io9,⁴ a website that covers science, fiction, and science fiction. io9 wanted to republish one of my student's essays, a piece about the Purple encryption machine used by the Japanese during World War II. Holly contacted me, and I contacted the student, and we all agreed we were comfortable with io9's request. So my student's work went up on the site and has been seen by more than 87,000 readers, as of the time of this writing.⁵ That's quite an audience!

Students as Producers

As an instructor, one can't plan on student work being picked up by an outlet with tens of thousands of readers.⁶ However, there are a variety of choices an instructor can make when designing assignments that tap into this "Students as Producers" idea. My colleagues at the Vanderbilt Center for Teaching and I wanted to understand these choices, so we designated "Students as Producers" as the theme for the 2013–14 academic year. Through a series of workshops, panels, teaching visits, teaching guides, and blog posts, we explored with our faculty and staff ways to help students engage in meaningful, generative work in the courses they take.

For our end-of-year event, we wanted to show our campus what "Students as Producers" could look like, so we held an event we called the Cele-

bration of Learning, an exhibition of twenty-five student projects from across the university: Research by first- and second-year undergraduates conducted within a biology lab course. Original short stories written for a Spanish course. Video documentaries created by future teachers to explore social and philosophical aspects of education. A water conservation education program aimed at children, developed by students in a service-learning course. These were just some of the products of student learning on display at the Celebration of Learning. The projects, posters, presentations, and performances shared at the event represented significant learning experiences for students. They also represented courses that were thoughtfully and intentionally designed by faculty to foster deep learning, and that often involved collaborative work with librarians, technologists, community partners, and others outside the traditional classroom.

Our mission at the Vanderbilt Center for Teaching is to promote university teaching that leads to meaningful student learning. Our work focuses on helping members of the Vanderbilt community become more effective teachers. We go about that work in a variety of ways, including individual consultations, workshops, orientations, panel discussions, learning communities, and partnerships with departments and programs. We weave the “Students as Producers” approach throughout much of that work, but it is perhaps most explicit in the Course Design Institute we hold each May. During the three-day institute, participants design (or redesign) courses that engage students not only as consumers of information, but also as producers of knowledge. We draw on what we’ve learned about the “Students as Producers” approach as we support the institute participants, and, in turn, we learn more about engaging students in this kind of work as we follow up with participants when they implement and assess their new courses.

I first heard the term “student as producer” in a keynote by Mike Neary of the University of Lincoln at a 2011 conference in Ireland. Mike Neary was Dean of Teaching and Learning at Lincoln and directed Lincoln’s Student as Producer initiative.⁷ He argued that students should move from being the object of the educational process to its subject. That is, students should have an active role in shaping their own educational experience and should be engaged in knowledge production alongside university faculty and staff. The work at Lincoln was a campus-wide effort to build research and research-like activities into the undergraduate curriculum. It was initially funded by an external grant, but it took on a life of its own as the “student as producer” idea resonated with faculty there.

Listening to Mike Neary describe the work at Lincoln, it occurred to me that students on my campus were frequently involved in knowledge production in various cocurricular settings, such as undergraduate research, internships, entrepreneurial activities, and student organizations. What ap-

pealed to me about the University of Lincoln's initiative, and what we tried to explore through our "Students as Producers" work at Vanderbilt, is the involvement of students as producers in more traditional academic settings, such as semester-long courses and library-based research. That seemed like more of a challenge, but also an opportunity to transform learning experiences that traditionally involved connecting students to existing information into ones that engaged students in knowledge production and, thus, deeper learning.

The University of Lincoln and Vanderbilt University were not the only higher education institutions to hit upon this idea. As part of its 2013 Flexible Learning Initiative, the University of British Columbia provided resources for undergraduate course transformation. Among the themes that emerged from the proposals was the idea of students as producers of content.⁸ In fact, my colleagues at the UBC Centre for Teaching, Learning, and Technology asked me to speak on their campus in the summer of 2014 about the Vanderbilt "Students as Producers" initiative. Back in the States, Georgetown University's Students as Scholars initiative tapped into the same idea.⁹ Many of the Students as Scholars activities focused on undergraduate research and creative projects outside of the classroom, but the initiative also featured an internal grant program aimed at building this kind of work into regular courses. And faculty at a number of institutions are involved in developing what are known as course-based undergraduate research experiences (CUREs) in biology, thanks in part to organizations like CUREnet.¹⁰ Thanks to these efforts and others, the 2014 *Horizon Report*, an annual report from the New Media Consortium and Educause, identified the shift from students as consumers to students as creators as one of six key trends in technology in higher education.¹¹

Essential Elements

The notion of engaging students as producers may not be new, but I have found the "Students as Producers" framing to be particularly useful in talking with faculty and staff about the design of learning experiences that move students from the object of education to its subject. And our ongoing work in this area at the Vanderbilt Center for Teaching has revealed a few dynamics typically at play in courses and projects that adopt the "Students as Producers" approach. The idea of students as producers plays out differently in different teaching and disciplinary contexts—sometimes students are producers, sometimes scholars, creators, researchers, performers, designers, or problem solvers—but there are a few elements that seem to define a "Students as Producers" assignment.

Open-Ended Problems

If we give our students a problem for which the correct answer is known and the path to reaching that answer is well laid out, having students solve that problem might be useful in some situations, but it won't prepare them for the kind of hard problems they will encounter when they leave us. If we want to prepare our students to take what they've learned in our courses and apply it to new context and new problems (a process called *transfer* in the literature on teaching and learning),¹² we have to give them the chance to practice solving hard problems now. Engaging students as producers typically involves having them tackle *open-ended problems* of some kind, problems where the answer isn't fully known, problems that permit multiple possible solution approaches, problems where failure is quite possible.

Holly Tucker, professor of French at Vanderbilt and my collaborator on the cryptography writing project, started her honors seminar, "Leeches and Lancets: Early Medicine in Cultural Contexts," in a fairly traditional way, with readings and discussions each week. However, the second half of the course was what Tucker called a "collaborative lab," in which students worked in groups to create public-facing websites exploring fertility and birth control, witchcraft and medicine, and poison. The students selected topics, identified relevant resources, constructed arguments, and determined how to present their work through various digital tools. Tucker hosted the students' work on a website called *Imagining the Past*, a site that she built with fellow French professor Lynn Ramey to provide a platform for public-facing student projects.

Helping students engage in this kind of open-ended work required a different instructional approach for Tucker. "I was there—not as an intractable 'expert' but instead as a guide," she wrote.¹³ "My job was to guide them toward appropriate resources and to ask the right questions at the right time—as well as help shape tasks and assignments to help them move their projects forward." Class time changed, too, as students worked in groups during class to research their projects and build out their websites. Since that work was central to the students' learning in the course (and preparing them for future transfer to other projects), Holly moved that work into the shared, collaborative space of the classroom. This gave students the chance to practice tackling problems and questions where the way forward wasn't always clear.

The second half of Tucker's course felt to the students more like a lab course. Over in the biology department, where students traditionally take lab courses, lab coordinator Steve Baskauf spent several years overhauling the "cookbook" style labs he was using into inquiry-based labs in which students did original biology research. This wasn't a special course; it was the second-semester intro biology lab. Providing early-career students the chance

to tackle open research questions within a single semester meant selecting those questions for students with care and providing students a lot of support, largely in the form of well-trained teaching assistants. But more often than not, students in Steve's labs are able to conduct original research and get at least provisional results.

Baskauf has his students present their work at the end of the course in a poster session open to the campus. I've been a few times, and I've enjoyed hearing about the students' work. The first time I attended, I noticed a pattern in the students' presentations. They were all working with simple organisms—algae, bacteria, plants, insects, and so on. They had all designed some kind of experiment to test some hypothesis using these organisms. Without exception, every student group I talked to said, at some point in their presentation, something very much like, "And then they all died." Baskauf summarized my experience with some understatement: "There are always a fair number of failures."¹⁴ Every group had the experience of a failed experiment, and every group had the chance to go back to the drawing board and try something different. Those second attempts didn't all work, but the chance to try again, to learn from a mistake and engineer a solution, that was invaluable.

The chance to confront failure, to learn from it, to keep working a solution, that's what open-ended problems provide for students. It's hard work, for both students and instructors, but it's important to provide students these opportunities to prepare them for hard problems they will face in the future.

Authentic Audiences

Consider the traditional five-page research paper. A student spends a week or more working on a document that's read by just one person on the entire planet—the instructor. What's the point? Sure, practicing a particular set of skills in gathering, evaluating, and synthesizing information and receiving feedback on that practice is certainly useful. But if we are the only audience for our students' work, we have missed an opportunity to move beyond what they may see as "busywork" and to motivate them to create something of lasting value.

While teaching an introduction to Portuguese language course at Vanderbilt a couple of years ago, doctoral student Tim Foster decided to provide his students with an authentic language production task. He showed his students the Portuguese Wikipedia page for Nashville, the city in which Vanderbilt is located. There wasn't much to it at the time, much less than the English version of the page, which helped his students get past a misconception they had that language-specific versions of Wikipedia were just translations of English language Wikipedia pages. To drive home this point—and give

his students some authentic language production practice—Foster had them write content for the Portuguese Wikipedia page for Nashville. Foster and his students spent a week brainstorming potential content for the page, then researching information about the city of Nashville, then summarizing that information in the target language in ways consistent with Wikipedia writing practice (neutral tone of voice and so on). The result was a much more robust representation of the city of Nashville on Portuguese Wikipedia.

If my cryptography student was excited when he saw his paper show up in Google search results, you can imagine how motivated Foster's students were to know that their work would appear on Wikipedia. They knew how often they consulted “the Free Encyclopedia.” Portuguese speakers across the world interested in learning more about Nashville would read and hopefully benefit from their work. Some of his students were so excited by this prospect that they went above and beyond what was asked of them in the assignment, adding additional data to the Nashville page. “I don't think I would have seen that extra effort had this been something that just got turned in to me,” Foster said.¹⁵ “I think students want their work to be impactful.”

Increased student motivation is one reason to have students produce work for authentic audiences. Another is that by asking students to represent what they are learning for an authentic audience, students get the opportunity to shape and refine their own understanding of what they are learning.¹⁶ Consider a podcast assignment used by Vanderbilt health policy professor Gilbert Gonzales, a participant in one of our Course Design Institutes. Gonzales wanted his students to encounter recent health policy research articles, understand the research they conveyed, and make sense of its implications for policy and personal health-care decisions. He could have asked students to do so in a traditional five-page paper, but instead, he asked his students to create fifteen-to-twenty-minute podcast episodes in the style of National Public Radio stories. Each student selected an article from a list provided by Gonzales, then worked to produce creative audio stories summarizing the research and making clear its implications. Some interviewed local faculty with relevant expertise, others interviewed students (“man on the street” style) or health-care providers, and still others put together audio dramas that helped communicate their findings.

Gonzales shared the results on his SoundCloud page, Health Policy Radio with Gilbert Gonzales.¹⁷ Not only were the student-produced podcast episodes available to anyone searching SoundCloud or iTunes for health policy content, Gonzales shared the episodes with his Twitter network and with the researchers the students cited, many of whom were quite excited to hear the students' summaries of their work. Just as Holly Tucker's *Wonders and Marvels* readers presented an authentic audience for my cryptography students that helped shape their writing, the Health Policy Radio podcast provided

Gonzales's students with a real audience outside the course. By representing their understanding of the health policy research they were studying through audio, they had to more deeply understand that research and its implications. And knowing their work would be public made a difference. "I think that really raised the stakes on the quality of the work," Gonzales said, "because they knew that whatever they submitted to me at the end would be available for the world to hear."¹⁸

Student Autonomy

Much of the "Students as Producers" approach to learning design involves finding ways to motivate students to engage in meaningful, generative work, the kind of work that leads to deeper learning. Open-ended problems can be motivating, as can authentic audiences. Also motivating, as we know from psychological science research: having a degree of autonomy in the work one does.¹⁹ When we give students some choices in what work they do or in how they go about that work, we help them embrace the work as their own and engage more deeply in it.

Consider that other course I teach, the one that isn't quite as interesting as my cryptography course—my introduction to statistics. It usually enrolls about a hundred students, most of whom aren't particularly excited to be taking a statistics course. The course has always featured an application project of some kind, in which students find or generate some authentic data and then ask and answer questions of the data using the statistical techniques they have learned in the course. In years past, the deliverable for this project was a five-page paper. That was fine, but a few years ago, I realized the increasing importance of data visualization in a variety of professional contexts, and so I replaced that traditional assignment with an infographic project. Students still had to apply statistical techniques to real-world data, but now they also had to communicate their results in visually meaningful ways, paying careful attention to size, color, positioning, and more to share the stories their data analysis uncovered.

This is challenging work for students, mainly because most of them haven't thought too hard about visual communication strategies. To get them a little more excited to take on this project, I let them pick the topic, the questions, and the data. For what follows, it is important to know that I am not a sports guy. I will occasionally notice that Vanderbilt football has a game coming up, but if my children aren't on the field, it's a safe bet I'm not paying attention. That said, the last time I taught this statistics course, almost half of my students chose sports for their topics. Sports is a great topic for a project like this. There's a recent but strong tradition of statistics in baseball (saber-

metrics, as it is known), and a wide variety of interesting sports-related questions can be addressed through basic statistical techniques—Is there such a thing as a home field advantage in baseball? Does offense or defense matter more in basketball?—and other sports questions.

I would never pick sports for a topic for myself, but many of my students did. And because they picked a topic that they found interesting, they brought more energy and enthusiasm for the work. And I believe that many of them produced stronger infographics—with more intentional visualizations—because they took their research questions so seriously.

Topic choice is one way to give students more autonomy in the work they do. Medium choice is another. Consider my Vanderbilt colleague Larisa DeSantis, who teaches in our earth and environmental science program. In most of her courses, she asks her students to produce some creative work communicating something they've learned in her course. She has had students make podcasts, children's books, lesson plans for middle school teachers, and more.²⁰ One of her students, a member of a campus a cappella singing group, created a YouTube video in which he explained the expansion of grasslands during the Miocene epoch through a song with six-part harmony.²¹ He sang all six parts himself, and DeSantis tells me his science was 100 percent accurate.

Giving students the option to decide what they produce for an assignment or project can feel a little risky to an instructor, since it can be challenging to support a student working in an unfamiliar medium and it can be hard to grade a more open-ended assignment. But allowing students to leverage their existing knowledge and skills (in, say, lesson plan design by preservice teachers or six-part harmony by a music major) can lead them to create work that is interesting, compelling, and worth sharing. And by encouraging students to find personal or professional connections to the material in a course or other learning experience, we help students see the relevance of what they are learning beyond the immediate university context.

A Call to Action

Steve Baskauf's students leave their biology lab with a firsthand experience of the process of science and how important learning from failure is to that process. Tim Foster's students left his course with a deeper understanding of Wikipedia and how it functions as a crowdsourced encyclopedia. And my statistics students pay more attention to the ways spatial and color relationships can convey meaning in data visualizations they encounter. We often want our students to be more savvy consumers of information, whether they are reading a scientific research article or using Wikipedia to teach them-

selves something or trying to make sense of a chart in an annual report. Engaging students as producers of knowledge helps to equip them to be better consumers of information. Whether or not Gilbert Gonzales's students go on to make more podcasts (and they might—it's a useful skill!), they will be more critical consumers of podcasts and other audio storytelling in the future.

Making something helps you understand that thing more deeply. This is one reason to ask students to take on these nontraditional projects. Another is that doing so prepares students to make a difference in their professional and personal lives when they leave us. We want our students to be problem solvers, to take what we have taught them and do useful things with it. That requires giving them the chance to practice doing so and opportunities to see themselves as researchers, designers, creators, performers, and innovators. And that means giving students open-ended problems, putting them in front of real audiences, and helping them find their own connections to what we are teaching them.

Designing such learning experiences and supporting students as they move through them is not easy. Doing so often requires what Bass calls a "team-based design," in which instructors, librarians, technologists, teaching center staff, and others collaborate in the design, implementation, and assessment of meaningful student learning experiences.²² I can speak to the collaborative role of teaching center staff, but this volume attests to the growing importance of librarians and libraries in engaging students as producers of knowledge. Libraries can be laboratories, where students and faculty go to learn and practice the skills they need to take on open-ended problems. Libraries can be forums, where students and their projects are connected to authentic audiences on campus and beyond. Libraries can be archives, where the products of student work are made both public and persistent. And libraries, especially their special collections, can be sources of rich student projects.

I want to share one more story that features all of these collaborative roles. The Buchanan Library Fellows Program at Vanderbilt University provides support for undergraduates to take on immersive projects of strategic value to the library, mentored by both librarians and faculty members. Ellen Dement was a 2017 fellow who worked with Mary Anne Caton, library consultant for educational and interpretive programs, and Kevin Murphy, professor and chair of history of art. Murphy led an effort by the Vanderbilt Fine Arts Gallery to acquire a collection of almost 180 architectural drawings of the Woolworth Building in New York City by the office of its architect, Cass Gilbert. When it opened in 1913, the Woolworth Building was the height of innovation and the world's tallest building for almost two decades, and it fascinated architects, artists, and the general public alike. Although other collections of similar Woolworth documents exist, none are both well cataloged and available online. Dement's task as a library fellow was to create an

online exhibit focused on the Vanderbilt document collection, one that would be useful to historians and students of architecture, including students in a course taught by Murphy called “The Skyscraper: Modern Urban Icon.”²³

Dement spent the semester learning and using Scalar, an open-source platform for creating online exhibits and stories, to build an exhibit around photographs and catalog information from the Vanderbilt collection. She had never used Scalar before, but she learned it well enough, with help and support from Caton as well as director and curator of visual resources Millicent Fulmer, to teach Murphy’s students to use it the following semester. (Library as laboratory.) Caton had selected Scalar for the project, in part because it provided the nonlinear, multimedia exhibit space the project needed and in part because it played well with other online resources, allowing the creation of a public exhibit that drew on items in other digital library connections. (Library as forum.) Caton also helped design the data structure for the Scalar exhibit to conform to the right standards so that the project could live beyond the following semester, when Murphy’s skyscraper students were to add to and enhance Dement’s initial Woolworth exhibit, and even migrate from Scalar to other platforms, if the need was there over time. (Library as archive.) And while the Woolworth documents weren’t actually part of the library’s special collections (they live at the fine arts gallery), the individual student project and the collaborative class project came about because of a local campus collection. (Library as inspiration.)

The Woolworth Building project was possible because of the collaboration that launched it—faculty, librarians, students, and gallerists, not to mention all the technologists that helped to create Scalar. In our work exploring the “Students as Producers” idea, we have seen many creative student projects guided and supported by faculty members, but those instructors almost never acted alone. Holly Tucker worked with a faculty colleague, a graduate assistant, and a web hosting company to build out the *Imagining the Past* site. Gilbert Gonzales got the idea for his podcast assignment at our Course Design Institute, worked with a graduate assistant to learn the technology and teach it to his students, then shared the word about his students’ work through his extensive Twitter network. And to make his inquiry-based labs work, Steve Baskauf and his fellow lab staff members recruit, train, and mentor a team of talented graduate teaching assistants.

Collaboration plays a critical role in engaging students as producers of knowledge, and libraries are increasingly both collaborators and sites of collaboration. Faculty and students need new tools and new skills to create these nontraditional and often digital projects, and they need help finding, building, and sustaining platforms for sharing student work and connecting it with authentic audiences. Libraries and librarians are uniquely positioned to provide this kind of collaboration, support, and leadership. I am excited

by the student scholarship represented by the contributions this volume, and by the future student work that will be guided and facilitated by faculty, staff, librarians, and others who are inspired by this volume.

Notes

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