

## A Potions Lesson: Experiential Learning in the History Classroom

*Good ink is made from white wine and the common type from water; it is better if it is puddle water. Add an ounce of mashed nutgalls to a pint of water and boil until a third is dissolved. Strain, mix an ounce of copperas [ferrous sulfate] or better yet vitriol, and add a quarter ounce of Arabic gum, stir well and move in strained lukewarm water. Repeat as necessary.*

– Andrés Flórez, *Doctrina cristiana del ermitaño y el niño* (1552)

Alex Hidalgo  
*Texas Christian University*

IN THE EARLY MODERN ERA, Spanish missionaries, cosmographers, chroniclers, and physicians wrote major studies on botany, ethnography, navigation, Indigenous languages, war, and history, aided by capable, though often reluctant, Indigenous informants. They penned this rich body of scholarship using iron gall ink—a mixture of tannins, sulfates, and gum—that facilitated the transmission of ideas in print and manuscript format, as well as the administration of the vast empire. Analysis of ink opens a window onto a laboratory of botanical knowledge that resulted from observation, practice, and artisanal innovation. The “potions lesson” assignment described in this article allows undergraduate and graduate students to make ink using recipes that circulated as marginal notes in notarial records and in grammar and writing manuals such as Dominican friar Andrés Flórez’s standard formula outlined in the introductory epigraph.<sup>1</sup> The lesson addresses the way individuals of

diverse ethnic backgrounds negotiated their relationship with animals, plants, and inorganic matter, and how they framed their understanding of these categories. Likewise, it engages Iberian bookmaking traditions closely tied to manuscript culture, and the relationship between imperial ambition and the production of knowledge.

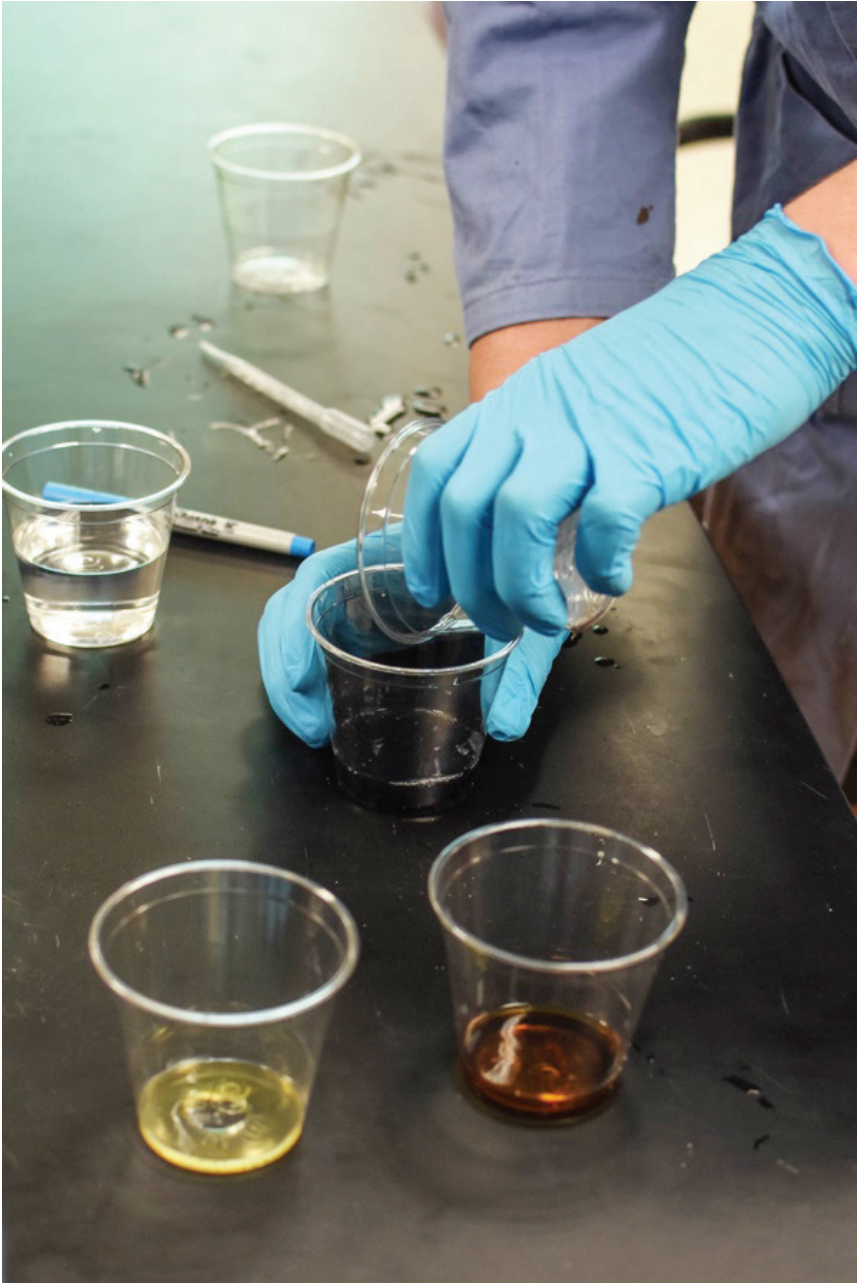
### **The Case for Experiential Learning**

The potions lesson experiment forms part of an assignment in my course offering, “Secrets of Nature in the Iberian World,” a junior seminar that explores the way people in the early modern period negotiated their relationships with animals, climate, land, disease, plants, and water, and the way they framed their understandings of these categories. Students considered the roles of women and men who molded and shaped the environment to suit individual and collective needs across North, Central, and South America, the Caribbean, and parts of Asia. A combination of primary sources, including maps, correspondence, medical reports, botanical treatises, and chronicles, as well as scholarship drawn from the work of social and environmental historians, geographers, historians of medicine and science, art historians, and ethnohistorians, helped students consider who had access to nature’s secrets and how these individuals wielded that knowledge.

The course centers on an experiential model with a focus on hands-on learning. In addition to readings and discussions, students engaged with the past through a series of activities in labs, special collections, and museums. Experiential pedagogy in its simplest form encompasses “educational activities undertaken outside the classroom or university,” a philosophy with a long history in the U.S. that stretches back to the early twentieth century.<sup>2</sup> Bill Proudman observed that guided reflection and analysis “impels students towards opportunities for taking initiative, responsibility, and decision making.”<sup>3</sup> For students in the humanities, the scope of experiential learning often centers on internships that seek to professionalize students in various fields, including archives and libraries, museums, editing, teaching, policymaking, business, and government.<sup>4</sup> Assignments or class sessions that involve groups of students working outside the classroom represent less common examples, though effective models scattered across the educational landscape demonstrate ways we can retool our teaching kit.

At Rare Book School, Terry Belanger encouraged students to learn by doing: not only to touch and inspect prints, magazines, books, broadsides, and engravings, but also to print, etch, cut, fold, and stamp materials as part of learning about bookish processes. Other innovative programs such as the Making and Knowing Project at Columbia University, a pedagogical initiative led by historian of science Pamela Smith, brings together students, humanities scholars, chemists, librarians, and computer scientists to replicate the experiments of a sixteenth-century book of secrets from France.<sup>5</sup> Individual assignments such as Corinna Zeltsman's activity to dye with cochineal, a parasite that grows on cacti and produces a vibrant red color, help students learn about New World commodities, forced labor, and tribute, while also signaling the possibilities of what experiential learning can do to enhance the classroom.<sup>6</sup> Advanced researchers benefit from Heather Wolfe's introductory course on English paleography at the Folger Library, where they learn about sixteenth- and seventeenth-century writing by working with original sources while engaging with the material aspects of writing, including making iron gall ink.<sup>7</sup> Both critical bibliography and the study of the book as material object represent an opportunity to diversify the classroom by engaging students with hands-on learning.

This lesson formed part of a unit on plants that considered the relationship between colonialism and botanical knowledge. The Spanish Empire actively sought to learn about the properties of plants in order to exploit them for commercial purposes—what scholars call “economic botany.”<sup>8</sup> Students read in advance articles by Paula De Vos and Millie Gimmel in order to historicize the study of plants in the Iberian world.<sup>9</sup> In class, we analyzed a facsimile of the *Codex de la Cruz Badiano*, a Mesoamerican herbal manuscript written and illustrated by two Indigenous botanists in 1550 that helped students see the priorities that shaped the classification of plants.<sup>10</sup> In addition, I distributed short descriptions of plants written by Francisco Hernández, a sixteenth-century Spanish physician who traveled through New Spain collecting plants for a study of New World botany commissioned by the king of Spain, so that students could compare findings.<sup>11</sup> We discussed the role of Indigenous informants who often cooperated with clerics, physicians, provincial bureaucrats, and other Iberian actors, but who also jealously



**Figure 1:** Mixing Ingredients. Photo courtesy of Sarah Miller.

guarded their knowledge and withheld information from the Spanish actors who sought to exploit it. Many of the examples used in class, including the recipe to make ink, originated in my research on Indigenous mapmaking in central and southern Mexico. Cartographic materials, the physical elements of mapmaking such as paper and ink and other colorants, highlight discrete groups of healers, artists, and scribes who actively experimented with plants and their properties, demonstrating a profound understanding of the natural world.

Because the assignment analyzes the sixteenth century at the height of Iberian exploration and because the composition of the ink circulated across Europe and subsequently the New World, one can easily adapt it to fit a range of classes. Adaptable to surveys of Latin American history and culture to more advanced classes situated in early modern Europe and the Atlantic world, the lesson addresses the Spanish reliance on writing and notaries to colonize and administer their vast overseas empire. Art historians may find the ease with which one can obtain and mix the materials in the recipe appropriate to illustrate technologies used to make pigment and dyes, while literature scholars may prefer to highlight the Iberian world's thriving manuscript culture and its role in the circulation of ideas.

### **The Experiment**

Running the potions lesson experiment requires materials and a physical space (lab or classroom) to mix the components. The three main ingredients used to make iron gall ink—gum Arabic, nutgalls, and tannic acid—are commonly sold in the U.S. in powdered form.<sup>12</sup> In addition, I ordered 12-14" white goose quills, along with X-Acto knives, to shape them into writing instruments.<sup>13</sup> My preference for the white goose quills has to do with size and sturdiness, but they come in different shapes and colors. For instance, 4-6" duck quills could be substituted to minimize costs. Incorporating different types of paper, such as multi-purpose, cotton, or rag paper, will allow students to see the way ink reacts to different fibers.<sup>14</sup> Multi-purpose paper is easily accessed with minimal costs, while heavier cotton paper can be located through any office supply store or a campus bookstore for under ten dollars. The handmade rag paper, the type used during the early modern period, has to be ordered in advance



**Figure 2:** Making Quills. Photo courtesy of Sarah Miller.

from a specialty papermaker—in this case, the University of Iowa’s Center for the Book.<sup>15</sup> For those choosing to include a scriptorium workshop to use the ink and quills in a more formal setting, candles create a striking visual experience that pushes students to consider issues of historical time and scribal work conditions.<sup>16</sup>

Executing the experiment can be done in one of several ways. In my case, I collaborated with Kayla Green a bio-inorganic chemist at my university working on treatments for degenerative disease, who has generously hosted my classes in her lab. My colleague’s interest in building bridges between chemistry and the community through educational programs for adults has helped me consider the way science informs humanistic inquiry. She has patiently guided the students as they have learned to maneuver the experience of using latex gloves, goggles, and lab coats, along with working with various containers and scales used to weigh and measure (**Figure 1**). A pared-down version of the assignment could be set in a campus kitchenette where small groups of students take turns to mix the ingredients (having a sink and running water is useful). After they have measured and mixed the ingredients, paying close attention to the way the elements react to one another, each student receives an ostrich feather, an X-Acto knife, and instructions on how to make a quill (**Figure 2**). Having paper handy for students to try out their instruments is essential. The goal is to consider writing as a multilayered process that includes elements of experimentation and artisanal knowledge tied to plants, minerals, and animals.

The lesson can conclude at the of end of the experiment with a short follow-up discussion during the next class meeting about craft secrets, economic botany, and the chemistry lab. Others may choose to have students store their ink in a small jar in order to use it in a follow-up class session for the scriptorium by candlelight portion of the assignment. This task can easily take place in a classroom and is designed for students to use the quill and ink to write on paper. Students worked by candlelight (**Figure 3**), transcribing paleographical exercises drawn from Esteban de Terreros y Pando’s eighteenth-century manual, *Paleografía española* (1758).<sup>17</sup> Naturally, the selection of the assigned text will vary depending on the goals of the class or, in some cases, instructors may wish to simply have students write a letter to someone. The purpose is to have them reflect on late medieval and early modern technology



**Figure 3:** Scriptorium by Candlelight. Photo courtesy of TCU AddRan College.

and its relationship with writing. The absence of light, in particular, plays an important role in helping students think about time and the hours of the day, the labor associated with bookmaking, and the circumstances of living in an era before electricity.

Student reflections on the assignment suggest that the experience of spending time outside the classroom greatly refreshed the learning environment. For one student, “it facilitated a great opportunity to get to know and interact with classmates in a more casual and interactive setting.” For another, “the novelty of the lab was half the fun, the other half was getting to experiment with different natural substances to come up with the right consistency of ink and practicing with the ink and quill.” In some cases, the assignment invited reflection. “I never thought about the trial-and-error process it took to where we are today,” said a member of the class, while another noted that we “take for granted how much easier writing is in the modern world.” One student learned an important secret of craftwork, noting very simply, “I had difficulties making the quill because I was trying to move too fast and realized how important it was to take your time.” Indeed, making an effective quill represented

the most difficult task of the assignment. “Quills proved to be somewhat unwieldy writing instruments and the ink wanted to run all over the rough parchment,” noted one student about the way ink spread quickly across the fibers of the rag paper, a process that led to blotting.

### **Conclusion**

The potions lesson described above represents a modest effort to advance learning in three key areas. First, that the history of the book in the Iberian world is more than the history of print. While the printing press played an important part in the spread of knowledge in Europe and the Americas, works of significant value related to history, botany, astrology, navigation, and ethnography circulated in manuscript form. Likewise, writing with iron gall ink represented the most important function of the imperial state, which sought to thoroughly document every aspect of life in the New World and other parts of Spain’s overseas territories. Second, learning about the process of writing helps to recover knowledge of lost skills to gain a fuller appreciation of the past. Observation, experimentation, and repetition played important roles when selecting plants and minerals to mix materials, when using cutting tools to shape a quill, or even when learning how to balance the volume of ink set to the page. The student comments, in particular, really drove this message home. Lastly, the assignment enhances the teaching curriculum in the humanities by asking students to take an active role in the learning process. Working in a chemistry lab pushes students to reconsider what it means to study the past beyond lectures and discussions, expanding the concept of history far outside the traditional classroom.

## Notes

1. Andrés Flórez, *Doctrina cristiana del ermitaño y el niño* (1552), as quoted in Antonio Mut Calafell, “Fórmulas españolas de la tinta caligráfica negra de los siglos XIII a XIX y otras relacionadas con la tinta (reavivar escritos, contra las manchas y goma glasa),” in *El papel y las tintas en la transmisión de la información*, Primeras jornadas archivísticas del 12 al 16 de mayo de 1992 (Palos de la Frontera, Spain: Diputación Provincial de Huelva, 1994), 160.

2. Steven Weiland, “Emerson, Experience, and Experiential Learning,” *Peabody Journal of Education* 58, no. 3 (April 1981): 161. On the history of experiential education in the U.S., see Jay W. Roberts, “Disney, Dewey, and the Death of Experience in Education,” *Education and Culture* 21, no. 2 (2006): 12-30.

3. Steve Chapman, Pam McPhee, and Bill Proudman, “What is Experiential Education?” *Journal of Experiential Education* 15, no. 2 (August 1992): 20.

4. Veronica Donahue DiConti, “Experiential Education in a Knowledge-Based Economy: Is It Time to Reexamine the Liberal Arts?” *The Journal of General Education* 53, no. 3-4 (2004): 167-183.

5. See the Making and Knowing Project: Intersections of Craft Making and Scientific Knowing at <<https://www.makingandknowing.org>>; and Pamela H. Smith, Naomi Rosenkranz, Tianna Helena Uchacz, Tillmann Taape, Clément Godbarge, Sophie Pitman, Jenny Boulboulle, Joel Klein, Donna Bilak, Marc Smith, and Terry Catapano, eds., *Secrets of Craft and Nature in Renaissance France: A Digital Critical Edition of BnF Ms. Fr. 640* (New York: Making and Knowing Project, 2020), <<https://edition640.makingandknowing.org>>. In addition, other important initiatives that seek to engage with early modern knowledge by recreating recipes and formulas include Marissa Nicosia and Alyssa Connell’s, “Cooking in the Archives: Updating Early Modern Recipes (1600-1800) in a Modern Kitchen” at <<https://www.rarecooking.com>>, the Folger Library’s “Before ‘Farm to Table’: Early Modern Foodways and Cultures” at <<https://www.folger.edu/before-farm-to-table-early-modern-foodways-cultures>>, and “Burgundian Black,” a collaboration between humanities scholars, museum curators, and textile artists who examine fifteenth- and sixteenth-century Flemish dyeing and color-making techniques at <<https://artechno.wp.hum.uu.nl/workshops/burgundian-black/>>.

6. Corinna Zeltsman, Twitter post, February 4, 2020, <<https://twitter.com/czeltsman/status/1224858473667747842>>.

7. Heather Wolfe, “Introduction to Early Modern English Paleography,” Folgerpedia, <[https://folgerpedia.folger.edu/Introduction\\_to\\_Early\\_Modern\\_English\\_Paleography\\_\(skills\\_course\)](https://folgerpedia.folger.edu/Introduction_to_Early_Modern_English_Paleography_(skills_course))>.

8. Paula De Vos, “The Science of Spices: Empiricism and Economic Botany in the Early Spanish Empire,” *Journal of World History* 17, no. 4 (December 2006): 399-427. For further reading, see Daniela Bleichmar, *Visible Empire: Botanical Expeditions and Visual Culture in the Hispanic Enlightenment* (Chicago, IL: The University of Chicago Press, 2012); Paula De Vos, “Natural History and the Pursuit of Empire in Eighteenth-Century Spain,” *Eighteenth-Century Studies* 40, no. 2 (Winter 2007): 209-239; Antonio Barrera-Osorio, *Experiencing Nature:*

*The Spanish American Empire and the Early Scientific Revolution* (Austin, TX: University of Texas Press, 2006); and Londa Schiebinger, *Plants and Empire: Colonial Bioprospecting in the Atlantic World* (Cambridge, MA: Harvard University Press, 2007).

9. De Vos, “The Science of Spices,” 399-427; and Millie Gimmel, “Reading Medicine in the Codex de la Cruz Badiano,” *Journal of the History of Ideas* 69, no. 2 (April 2008): 169-192.

10. Martín de la Cruz, *The Badianus Manuscript (Codex Barberini, Latin 241) Vatican Library: An Aztec Herbal of 1552*, ed. Emily Walcott Emmart (Baltimore, MD: Johns Hopkins University Press, 1940).

11. Simon Varey, ed., *The Mexican Treasury: The Writings of Dr. Francisco Hernández*, trans. Rafael Chabrán, Cynthia L. Chamberlin, and Simon Varey (Stanford, CA: Stanford University Press, 2000).

12. Whole nutgalls are more difficult to acquire since they typically ship from overseas and require a four- to six-week lead time, but using them adds an important step in the process—that of crushing material in a mortar.

13. The quills I purchased came in packets of three for \$16.95 from the Arte of the Booke at <<https://arteofthebooke.com>>. The X-Acto #1 precision knife costs about \$3.79 per piece, but can be ordered in bulk through various office supply catalogs.

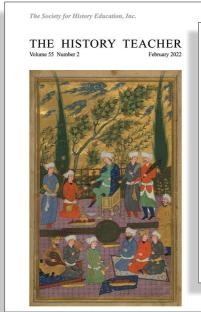
14. A recent Twitter post by Marissa Nicosia, an early modern scholar of English drama and historical recipes, prompted a useful thread among instructors with experience in these sorts of activities and identified various options to acquire ink, quills, and related materials. See Marissa Nicosia, Twitter post, September 26, 2019, <[https://twitter.com/Nicosia\\_Marissa/status/1173676026687344645](https://twitter.com/Nicosia_Marissa/status/1173676026687344645)>.

15. The rag paper was acquired through the University of Iowa Center for the Book at <<https://uicb.uiowa.edu/store/handmade-paper/chancery>>.

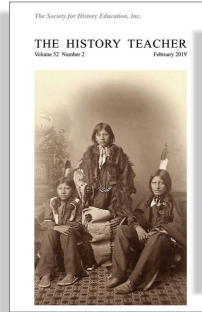
16. At the Dollar Store, I found a case of a dozen glass jar candles for \$12 that sit perfectly on a flat surface and don't spill wax. Since many institutions have restrictions on the use of candles, one may also use the slightly more expensive option of flameless candles.

17. Esteban de Terreros y Pando, *Paleografía española, que contiene todos los modos conocidos que ha habido de escribir en España desde su principio y fundación hasta el presente, á fin de facilitar el registro de los Archivos, y lectura de los manuscritos, y pertenencias de cada particular; juntamente con una historia sucinta del idioma común de Castilla y demás lenguas, ó dialectos, que se conocen como propios en estos Reynos: substituida en la obra del espectáculo de la naturaleza en vez de la paleografía francesa* (Madrid, Spain: Oficina de Joachin Ibarra, 1758).

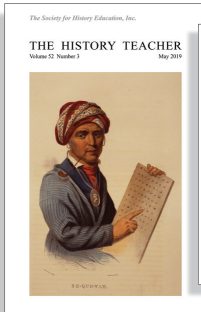
**American Historical Association Members** receive 15% off *The History Teacher*  
Add a subscription to your AHA Membership at [historians.org](http://historians.org)



Vol. 55, No. 2  
World History & Extracting Evidence  
200 pages | 6 x 9 | paperback  
full-color front and back covers



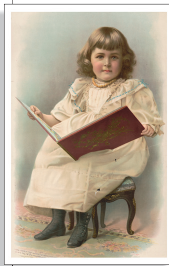
Vol. 52, No. 2  
Indigenous & Post-Colonial Voices  
178 pages | 6 x 9 | paperback  
full-color front and back covers



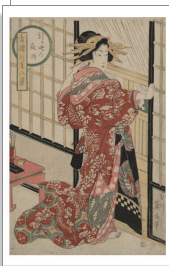
Vol. 52, No. 3  
Writing in History  
180 pages | 6 x 9 | paperback  
full-color front and back covers



Vol. 52, No. 4  
Textbooks, Tradebooks, & Narratives  
200 pages | 6 x 9 | paperback  
full-color front and back covers



Vol. 49, No. 3  
Yesterday, Today, & Tomorrow  
160 pages | 6 x 9 | paperback  
full-color front and back covers



Vol. 56, No. 3  
Teaching for and about Social Justice  
164 pages | 6 x 9 | paperback  
full-color front cover and b/w back cover



**The History Teacher**  
by the SOCIETY FOR HISTORY EDUCATION

Order issues with discount code: AHAMEMBER  
[thehistoryteacher.org/join](http://thehistoryteacher.org/join)