White paper NEH IATDH “Advanced digital editing: modeling the text and making the edition”

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1 Project summary

[Project goals, outcomes, and primary collaborators]

1.1 Project goals

This white paper documents the two-week in-person NEH Institute "Advanced digital editing: modeling the text and making the edition", which ran from July 11 to July 22, 2022 at the University of Pittsburgh (PA). Originally planned for the summer of 2020, the Institute had to be postponed twice because of the Covid-19 pandemic.

The concept of “advanced digital editing” as promoted by the Institute is based on the idea that innovative digital scholarly editions are primarily driven by research questions rather than shaped by existing templates, content management systems, or frameworks. After all, software that has been made by and for other research projects inevitably defines and constrains the way researchers conceptualize, model, and present their text(s). The Institute’s main goal was to empower its participants to make edition decisions on their own terms, informed by an understanding of what is possible technically, and of how to achieve it. Accordingly, the Institute emphasized methodology over “tooling up” in order to ensure a foundational training in digital editing.

There already exists a wide variety of workshops, tutorials, and teaching materials to help textual scholars get started with marking up their texts in TEI XML in order to publish them on line. Because that sort of entry-level training is relatively accessible, our Institute was targeted at researchers who were already familiar with TEI XML markup and wished, building on that familiarity, to learn how their TEI XML documents can be turned into a customized digital edition that supports innovative research. Because creating these advanced digital editions requires diverse expertise, the Institute brought together a pool of instructors and guest lecturers from different backgrounds. The curriculum enriched the core focus on the theory and methods of digital editions with the teaching of such baseline technical skills as Git version management, working on the command line, and applying software development Best Practices.

Researchers who seek to create digital editions typically already have the necessary subject-area expertise, as well as a knowledge of theory of edition that comes with having used editions created by others. What those researchers often lack is an understanding of project management—and where, after all, would a textual scholar have access to that sort of knowledge? It may sometimes seem as if projects don’t require management decisions because researchers who write traditional journal articles may not think about planning, preparing, submitting, revising, and ultimately publishing those articles as a type of project
management. Digital editions, however, can and do fail without mindful project management. This is especially true of collaborative projects, but also of individual ones, and digital editions offer a natural context for scholars to learn about planning, creating, and sustaining research results in a digital environment. For those reasons our Institute foregrounded project management as a core topic, and participant Dan Schwartz, who arrived at the Institute with prior project-management engagement, found the Institute’s “more thorough and systematic approach to project planning [...] particularly helpful.”

1.2 Project collaborators

Our pedagogical priorities and methods (see below) required a large and diverse instructional staff. In a few cases instructors who had agreed to participate when we applied for NEH funding in 2019 were no longer available when we met in 2022, but we were able to find highly qualified replacements, and our eventual core instructional team consisted of:

- Clifford Anderson: Institute Instructor; Director of Digital Research at the Center of Theological Inquiry in Princeton, NJ and Chief Digital Strategist at the Vanderbilt University Library.
- David J. Birnbaum: Principal Investigator; Professor of Slavic Languages, Literatures, and Cultures, University of Pittsburgh. David was the Principal Investigator for our 2017 Institute.
- Elli Bleeker: Institute Instructor; Researcher at the Huygens Institute for the History of the Netherlands. Elli was a participant in our 2017 Institute.
- Hugh Cayless: Institute Instructor; Digital Humanities Senior Programmer, Duke University. Hugh was an Instructor in our 2017 Institute.
- Mason Gobat: Institute Assistant; undergraduate student at the University of Pittsburgh. Mason had worked as a Teaching Assistant in David’s course in computational Digital Humanities.
- Ronald Haentjens Dekker: Institute Instructor; Researcher at the Huygens Institute for the History of the Netherlands. Ronald was an Instructor in our 2017 Institute.
- Gabi Keane: Institute Assistant; will begin graduate study at Stanford University (English and Digital Humanities) in September 2023. Gabi was the Senior Institute Assistant at our 2017 Institute.
- Leif-Jöran Olsson: Institute Instructor; Research Engineer at the University of Gothenburg. Leif-Jöran was an Instructor in our 2017 Institute.
- Chelcie Rowell: Institute Instructor; Head of Digital Scholarship, Tisch Library, Tufts University.
- Emma Schwarz: Senior Institute Assistant; graduate student in Slavic Languages and Literatures at the University of Pittsburgh. Emma had worked as a Graduate Teaching Assistant in David’s course in computational Digital Humanities.
The curriculum was enhanced by guest presentations by the following specialists:

- Elisa Beshero-Bondar: Guest Lecturer on network analysis; Program Chair and Professor of Digital Humanities, Digital Media, Arts, and Technology, Penn State Erie, The Behrend College. Elisa was a participant in our 2017 Institute. Elisa was kind enough to attend the entire second week, “elving” (see below) and consulting on participant projects.
- Chelsea Gunn: Guest Lecturer on sustainability; Teaching Assistant Professor, School of Computing and Information, University of Pittsburgh.
- Shea Higgins: Guest Lecturer on user experience (UX) and user interface (UI); Assistant Director of Communications, International Parkinson and Movement Disorder Society.
- Patrick Juola: Guest Lecturer on stylometry and authorship attribution; Professor of Computer Science, Duquesne University.
- Jeffrey Witt: Guest Lecturer on International Image Interoperability Framework (IIIF); Associate Professor of Philosophy, Loyola University Maryland.

1.3 Participants

As we write above, the target audience for our Institute was persons involved in a variety of ways in the design and implementation of digital editions. By “variety of ways” we mean that although some participants might think of themselves primarily as researchers, and others as developers, and others as managers, we wanted to avoid the sort of compartmentalization that can occur when people with one area of responsibility in a project do not consider it useful to understand, in a meaningful way, what happens in other areas of responsibility. For that reason we looked for a professionally diverse participant group: researchers, developers, and managers; faculty, students, staff, and independent scholars. We took the “Advanced” in Institutes for Advanced Topics in the Digital Humanities seriously by not admitting those who were completely new to XML technologies; we required some knowledge of and experience with textual editions and TEI XML, but no programming or other development experience.

We advertised the Institute broadly on Digital Humanities and textual scholarship mailing lists and through the professional networks of the Institute Instructors. Most applications that we received were from persons who were based in North America, but we also accepted several from abroad, ultimately admitting 26 persons, one more than the 25 we had originally proposed. Because we had originally planned to convene the Institute in summer 2020 and had to postpone for two years because of Covid-19, we notified those accepted in 2020 that their acceptances remained valid and they did not have to reapply. But because we also (correctly) anticipated that some would need to withdraw because of changes in their personal or professional circumstances, we advertised a new application process early
in 2022 and applied the same selection criteria to fill any vacancies.

1.4 Principal outcomes

Participant learning, which developed continuously during the two-week intensive in-person sessions, is the primary outcome of the grant. Some effects of this type of learning are immediate, especially for participants who are beginning new projects or able to adapt the management of their ongoing projects in response to new information and skills. Other effects emerge more slowly, such as the publication of digital editions edited or managed by participants, the impact of those editions on the participants’ fields of study, and the transmission by our participants of methodological learning to their students and colleagues. The participant surveys in Appendix IV provide some early insights into potential longer-range outcomes of participation in our Institute. Yet another outcome is our publication of durable resources, such as our curriculum, presentation slides, and tutorials from our sessions (https://pittsburgh-neh-institute.github.io/Institute-Materials-2020/); our eXistentializer bootstrapping utility (https://github.com/Pittsburgh-NEH-Institute/eXistentializer); and code for the sample digital edition, which we called the laboratory edition; (https://github.com/Pittsburgh-NEH-Institute/hoaXed). These materials, developed by the instructors, assistants, and lecturers for the Institute, are published in accessible locations under an open license to encourage reuse.

2 Project origins and goals

[The primary purpose of this section is to introduce readers to your project, describe how it came to be, and summarize its impact on the field.]

This grant built on the 2017 NEH Institute for Advanced Topics in the Digital Humanities “Make your edition: models and methods for digital textual scholarship”, which we ran at the University of Pittsburgh from July 10 to July 29, 2017 (https://securegrants.neh.gov/publicquery/main.aspx?f=1&gn=HT-251001-16). Many of the instructors of our 2022 Institute were veterans of the 2017 Institute, including David J. Birnbaum, Hugh Cayless, Ronald Haentjens Dekker, and Leif-Jöran Olsson. One encouraging outcome of our 2017 Institute is that Elli Bleeke, then a participant, and Gabi Keane, then the Senior Institute Assistant, returned in 2022 as Institute Instructors. It is significant that one quarter of our core instructional team were previously involved as learners, as an original objective was to “improve DH pedagogy” with a train-the-trainer teaching style and pedagogical review session.

The 2017 and 2022 Institutes had similar outcome goals: to help researchers learn to build editions around the individual features of texts and around project-specific research goals, without sacrificing functionality to a homogenizing existing framework. Our 2017 curricu-
lum, like that of our 2022 Institute, had a combined focus on acquiring hands-on computational skills and exploring advanced edition theory. The positive feedback from the 2017 Institute participants—communicated directly after the Institute and in a follow-up survey—confirmed both the Institute's success and the ongoing need for this type of digital editing training. We took this feedback, along with our own experiences, into account when designing the program for the 2022 Institute.

In the application for our 2022 Institute we identified the following principal aspects of our pedagogical philosophy:

- Research-driven digital editions
- Modeling and pipelining
- Transferable and sustainable skills
- Project management
- “Cooking up” a laboratory edition

In the rest of this portion of our white paper we discuss these and related concepts and principles in more detail, with reflection on how their implementation worked out in practice. Where relevant, we describe how the 2022 Institute relates to its 2017 counterpart.

2.1 Research-driven editions

As we observed in our original application:

> Digital editions that support innovative research ... are not made by dropping new content into a content management system or framework that provides a predefined set of interactions. Because digital workstation editions are based on research agendas that will differ from project to project, those that open new scholarly possibilities start from the research questions and conceptualize, design, and implement the affordances they require.

When we introduced the Ghost Hoax laboratory edition at the start of the Institute we emphasized first, and in detail, the core research goals that it was designed to support. We also emphasized that our identification and discussion of research goals with the participants before we began to build the edition together mirrored the way we had developed it ourselves before the start of the Institute. Finally, as we added features and functionality over the two weeks that the Institute met, we introduced each new aspect of the edition by identifying and exploring the specific research tasks that it was designed to support.

In our 2017 Institute we had made an explicit decision not to develop a shared edition together because we wanted to emphasize that effective editions are built to support a variety of research goals. We did not want to present the goals motivating one edition in a way that
might suggest that they were some sort of universal edition template. To further communicate that mindful editions may differ from one another, in both 2017 and 2022 we devoted a session to exemplary digital editions. There we foregrounded diverse editions that were similar in quality and effectiveness, but extremely varied in the user experiences they provided. Our goal was to demonstrate that there was no single optimal framework for a digital edition, and that an effective edition requires that research goals (which are necessarily varied) precede design and development decisions and implementation.

So why use a shared laboratory edition in 2022? This time we prioritized hands-on development that transforms research goals into a functioning digital edition. In 2017 we explored the pipeline steps required to take a well-theorized research edition from inception to publication, but we stopped short of demonstrating how, in detail, one does that. In 2022 participants started to practice implementing those pipeline steps with materials that were not their own, but that nonetheless allowed for a robust research-driven approach, clearing away barriers to the development of their own projects once the two-week initial learning period was over. The concepts, technologies, and skills overlap significantly, but 2022 participants acquired hands-on experience integrating them into an effective workflow. Project management was an essential addition to help avoid weak links in the pipeline; common pain points can seem insurmountable without strategic management skills.

This goal required us to choose a sample edition and a technology stack without compromising our message that there is no best approach or best software, and what matters is letting research guide our decisions. We intended the laboratory edition to be exemplary with respect to the primacy of research goals but illustrative with respect to specific design and implementation. In order to encourage participants to maintain their focus on their own research goals and decisions, we incorporated reflection activities into the sessions, where participants focused on elaborating their own edition goals.

### 2.2 The editorial workflow as a pipeline

We used the concept of a computational pipeline to subdivide an editorial workflow into small, separate, successive, integrated, and coordinated tasks. The concept, derived from software development, offers an efficient framework for Digital Humanities work—not only for the software development aspects, but also for the research and planning. Several Institute Instructors use pipelining in their own research and teaching, and we applied it successfully in the 2017 Institute, where it was identified by participants as “one of the most valuable takeaways” (page 12). Furthermore, in his 2021 book *Publishing scholarly editions: archives, computing, and experience* from Cambridge University Press, Christopher Ohge, a participant in our 2017 institute, explains the pipeline as the act of translating the intellectual process of making an edition into a successful workflow (page 16-17). In a typical computational pipeline, the output of one task forms the input for the next. Each task in the
pipeline has a specific objective, operates independently of the preceding and subsequent task, and could theoretically be handled in a different way and by a different tool as long as the replacement understands the same input and produces the same output. If, in some future, a certain tool becomes outdated it can then be replaced by another one without requiring adjustments elsewhere in the pipeline. Within the context of digital editing, tasks may include editorial activities like the selection, transcription, or collation of textual materials; planning activities that identify research products that will support the intended research results; or the creation of graphic visualizations that *tell the story the editor wants to tell* about the text. Below is an example of pipelining in digital editions, in this case a graphic representation of the Gothenburg model of textual collation, illustrating how multiple textual witnesses pass through several stages in the pipeline before emerging in a published digital edition (source: http://www.digitalhumanities.org/dhq/vol/14/3/000489/000489.html):

Thinking about editing as a modular pipeline introduces an independence and flexibility in the editorial stages. We wanted participants to understand that there is no single, universally correct workflow of digital editing: which editorial tasks make up their workflow and which tools are used to handle a certain task depend on their research questions and the objectives of their edition. Instead of being constrained by the product features of existing frameworks and tools, pipelining allows researchers to make informed decisions about their editorial methods that are guided by their scholarly agendas. It allows them to choose data models and technologies that are suitable for their specific research goals and to create a flexible workflow in which they can intervene at any moment. Intervention at a stage in the pipeline might entail, for example, updating XML to include more metadata, creating function libraries, or optimizing indexing for search and retrieval.

### 2.3 Learning while doing: the laboratory edition

In order to implement an effective computational pipeline for digital editing in the brief Institute period of two weeks, participants worked together with instructors on a small-scale digital edition, which we called the *laboratory edition*. The laboratory edition is based on
the undergraduate honors research project of Institute Instructor Gabi Keane, entitled *Ghost hoaxes and media in nineteenth-century London*. It comprises roughly forty TEI-encoded articles from nineteenth-century British newspapers and periodicals about ghost sightings and hoaxes in the greater London area. The instructors first built the digital edition before the start of the 2022 Institute, storing the data and code in the Institute’s GitHub repository, where it was divided across multiple successive stages of development. This setup allowed instructors to *fast forward* the development in situations where it was not realistic to complete an entire task in the development pipeline in the available time.

As an example of how that workflow unfolded, on Day Three of the first week participants learned how to build a list of all titles in the dataset using XQuery. They could pull both the TEI XML data and the eXist-db application infrastructure from the Institute GitHub repository, run the code on their own laptops, and tinker with it as they experimented with the development. The next day participants elaborated on that initial title list by transforming their *model* into an HTML page, creating a *view* stage in the pipeline. The instructors demonstrated how to handle a certain task in the edition’s workflow, gave participants some hands-on experience with carrying out that task themselves, and reflected on what was done, how it contributed to the edition’s research goals, and what step in the pipeline would follow.

### 2.4 Computational skills

The 2017 Institute lasted three weeks, the first of which was an optional *bootcamp* for computational groundwork skills, such as using the command line, getting to know your file system (with separate breakout sessions for Windows and Mac/Linux), version control with Git, and basic programming with Python. Almost all participants signed up for this optional foundational bootcamp and reported that they found it uniquely valuable. At the same time, the length and intensity of the three-week 2017 Institute was challenging for both participants and instructors, which motivated our decision to shorten the new Institute to two weeks and to incorporate the basic computational skills into the rest of the Institute’s curriculum (see section 6, *Computational groundwork*). Although the available time decreased, our core objectives remained the same: to promote a digital editing method that is driven primarily by research questions, that engages the researcher actively (even if to varying degrees) in all phases of the project, and that results in a sustainable product that supports innovative research.

Deciding which computational skills to prioritize, especially when time is limited, is a recurring challenge for educators in the field of Digital Humanities. Technologies are constantly evolving, which threatens the sustainability of both the toolkit and the learning. For both the 2017 and the 2022 Institutes, then, we had to find a middle road: we wanted participants to become familiar with state-of-the-art technologies that are in wide use, we wanted
them to learn how to select tools and technologies based on their research agendas, and we wanted to empower them to think independently about the role of tooling decisions in the editorial workflow. At the same time, the limited duration of the Institute required us to be strict about priorities: What did the participants need to know immediately, what could be postponed, and how could we help them gain the confidence to continue their research at home?

Among those decisions:

- We considered command-line fundamentals, including using Git at the command line, paramount. Experienced Digital Humanities developers may use graphical interfaces (e.g., the Windows File Explorer, the Mac Finder, various Git graphical clients) for good reason, but there are some operations that cannot be performed except at the command line. Using a graphical tool by choice is not the same as using a graphical tool because one has never learned to operate on the command line; the latter situation means never being able to operate as an expert. Participants who were new to using the command line could not become experts in two weeks, but they learned that becoming an expert was within their reach.

- We sacrificed bootcamp skills that were not immediately needed for our specific digital edition goals in 2022. That meant, for example, no Jupyter Notebooks, no Python, no LAMP (or WAMP or MAMP) architecture, no “how HTTP works”. We sacrificed markup languages other than XML, such as LMNL and TAGML.

- We reduced digital edition activities that were not priorities for the laboratory edition, so that, for example, we reduced collation from an intensive, hands-on activity (which required Python) in 2017 to a presentation and demonstration in 2022. We used regular expressions in a limited way and for specific purposes in 2022, unlike in 2017, when we devoted two sessions to intensive practice with them.

At the same time there were also topics that required more attention in 2022 than in 2017 because they were vital to participating actively in the hands-on development of the laboratory edition. Most importantly, XQuery and eXist-db had been small topics in our 2017 Institute, but because in 2022 our participants learned to build all parts of a digital edition using precisely those technologies, we increased substantially the amount of time and attention we allocated to them. We nonetheless tried to emphasize a consistent message that all tooling decisions will eventually become obsolete, and XQuery and eXist-db were a priority in our Institute not because those specific technologies were learning outcome goals in their own right, but because building an edition required tooling decisions and XQuery and eXist-db were an appropriate foundational toolkit, even if not the only one possible.

A two- or three-week intensive Institute with regular hands-on activities in 9:00–5:30 ses-
sessions five days a week is inevitably tiring, but we were grateful to see that for most instructors and participants it appeared to be tiring in a way that was more exhilarating than fatiguing. At both Institutes participants asked for extra weekend sessions and the instructional team responded positively to those requests. In 2017 we ran an (optional, but well-attended) extra Saturday session on XQuery because participants asked for it, and in 2022 we ran an (optional, but well-attended) extra Sunday session on HTML and CSS, which were important technologies for implementing the laboratory edition.

A core message of our Institute was that editions (and the choice of tools used to develop and deploy them) will differ because research goals will vary, and, from a project-management perspective, so will the administrative and technical resources available. Because we did not attempt to build anything illustrative together with the participants in 2017, that Institute was able to be more tool-agnostic than our 2022 Institute. At the same time, despite the primacy of XQuery and eXist-db among the technologies in 2022, the principal learning goal of the Institute was about theorizing and implementing digital editions, and not about tooling up on specific technologies.

2.5 Project management

Researchers who create digital editions are usually able to acquire the subject-area expertise they need, both the domain expertise that is part of the textual tradition they study and general training in theory of edition. In our 2017 Institute we prioritized helping them acquire technological expertise that would enable them to participate meaningfully in implementation decisions involving their digital editions. We regard this as helping to dissolve the traditional boundary—or even barrier—between researchers and developers. We were aware, though, from our own experience as researcher-developers and from our observation of projects around us that project management remains a weakness in the skill set of many textual scholars. This is understandable because project management isn’t part of traditional subject-area degree programs, but even single-person, unfunded projects require mindful management if they are to accomplish their goals, and that need increases once collaborators and budgets become part of the planning.

With this in mind, in 2022 we incorporated a specialist in project management into our core instructional team and allocated several Institute sessions to expanding participants’ understanding of project management. When done well, project management is a collaboration among the project manager, the researcher, and the developer, where each role is vital and distinct. It is nonetheless possible (and common) for a person to participate in more than one, or even all of those roles. These sessions emphasized to those frequently in the researcher role that the project manager and developer roles are not ancillary, and a successful product is a result of the interdependence of all three. To the participants who found themselves in project manager or developer roles, the sessions contextualized their
roles in a productively interdependent collaboration and practiced skills and activities they could incorporate to better engage researchers in collaboration.

The Institute sessions that focused on project management (both presentations and hands-on individual and small-group activities) saw lively engagement by participants, and we reproduce below feedback we received from two of them specifically about how our Institute contributed to their understanding of the role of project management in digital-edition projects:

- Francesca Giannetti, a Digital Humanities Librarian at Rutgers University, found that our discussion session on “Making collaboration work” helped her optimize some of her project management practices. Her pedagogical edition project, Correspondence of the Rutgers College War Service Bureau, brings on undergraduate researchers as collaborators, in pursuit of their skill development as well as the creation of a shared institutional historical resource. Francesca found that her existing workflows sometimes created barriers for both herself and her students, and to realign the goals of the project with the work required by students she decided to let the students’ skills guide their contributions. For example, an undergraduate intern’s interest in front-end JavaScript development became an opportunity for truly collaborative project development, rather than a situation in which Francesca found herself assigning work for the student to complete. Francesca’s understanding of the technical details did not need to be comprehensive in order for the collaboration to work, but her awareness of her role as a project manager, responsive to and responsible for all the project’s goals and outcomes, allowed for an enhanced collaborative experience even in a time-limited way.

- Eliza Alexander Wilcox, a graduate student at the University of Tennessee, attended as a contributor to the Maria Edgeworth Letters project. Their goal in attending was “to better understand the systems [our project team was] going to need,” as well as to cement the project’s next steps after transcription and encoding were complete. Eliza Alexander left with a greater understanding of project management and with specific ideas about how to improve the Edgeworth project’s long-term sustainability. Their first task was to transition the team’s editing workflow to Git and GitHub, for which they needed to translate the “doability” of the tools to non-technical counterparts who were unfamiliar with version-control software. With a strong understanding of version control and the team’s strengths and preferences, Eliza Alexander and their collaborators were able to move their team’s archival editing project into version management relatively early in the transcription and encoding process, at a stage when editorial intervention would have the greatest positive impact on long-term edition outcomes. Instead of becoming the only team member responsible for maintaining version control, they created shared best practices that
everyone could use to facilitate ongoing collaboration.

2.6 The cooking show

The day-to-day program of the Institute, discussed in more detail in section 3, below, followed the editorial workflow of planning and implementing the laboratory edition. We began each day with a project management check-in, so that participants understood how the daily activities tied into the larger picture of developing the edition. Being aware that one does not build a digital edition within a time span of two weeks, we prepared a set of documents or code for each stage of development, so that participants were able to obtain hands-on practice in all stages of the development without having to worry about not being able to finish in time for the next day. We based this model on television cooking shows, where the chef puts a cake into one oven and then immediately opens a different oven, pulls out a completely baked cake, and demonstrates how to finish it with icing.

The holistic experience of participating in all stages of development helped prepare participants to make edition decisions on their own terms and to participate fully, from concept to deployment, in the creation of their own innovative digital scholarly editions. Indeed, as participant Fred Rowland, Learning and Research Services Librarian at Temple University, reflects, “the Institute provided a broad overview, both conceptual and technical, which helped me to see how my current work, rather narrow, fits into a more expansive Digital Humanities project.”

2.7 “Elving” and sticky notes

Anyone who has taught a hands-on coding workshop has had the experience of having a participant get stuck, and a different participant get stuck at a different moment, and then more. Stopping an activity to unstick one person at a time means both losing the attention of the rest and failing to complete the activity. We managed this situation by engaging a large instructional staff with a high level of technical expertise and teaching experience, almost all of whom were present at all sessions. This meant that while the instructor conducting a presentation could continue without interruption, a participant who ran into a problem could signal for help and one of the other instructors could walk over, fix the problem, and help the participant fast-forward and rejoin the session in progress. The Santa-inspired jocular term we used for helping on the floor was elving, that is, operating as part of a team of workshop assistants who ensure that all activities are completed. We cannot overestimate the value of this type of organization, and of the importance we attached to ensuring that although only one instructor might be presenting from the front of the room at a given time, the entire rest of the team was regularly circulating in the auditorium to provide individual assistance.

One technique we found useful for keeping everyone engaged involved distributing to each
participant red and green sticky notes. While working on a task, participants who needed help could stick the red note to the back of their laptop to signal that they were stuck, while those who completed the activity successfully could use the green note to signal success. Instructors would circulate during the activity (elving), watching for red sticky notes. Participants with green sticky notes could look around and help a neighbor, learning more about troubleshooting in the process; those red-sticky-note neighbors could look around and ask for help, without waiting for an instructor to come to them. The sticky-note rituals provide a clear but unobtrusive way of asking for help that participants appreciated as less conspicuous than raising their hands. The instructor running the session was able to survey the red and green notes, adjust the time for the activity as needed, and see when the participants had all finished without having to ask repeatedly whether everyone was done.

What is it about sticky notes that makes them a successful tool for this type of learning? Our integration of this type of feedback recognizes, in a formal but unobtrusive way, that getting stuck is, alongside completing a task, one of two equally expected outcomes. That the instructors are always on their feet, circulating among the participants and watching for red sticky notes serves as a constant implicit offer to help. That participants can observe one another’s sticky notes encourages those who are stuck to ask for help from those who aren’t, and it encourages those who complete a task to offer to help those who are stuck. When participants help other participants both are learning; the ones who are stuck get helped to a solution and the ones who provide the help do so by reflecting mindfully on how and why they arrived at a successful solution themselves.

3 Project activities

[The primary purpose of this section is to help readers understand how you did your project. This is particularly helpful for project managers looking for insight into project design. It’s also an opportunity to give credit to project participants.]

3.1 Pre-Institute preparation

Though the two Covid-19-related extension periods included some preparation, the most significant preparation period began in Fall 2021. We anticipated that we would be able to host in-person events in Summer 2022, so we began working on the laboratory edition ahead of the official (that is, budgeted) spring preparation period. With our initial project planning, wireframing, and drafting underway, we also set out to identify and implement the technical tools we would use both for writing our code and for teaching. Each tool we used needed to be usable in a classroom environment, so we evaluated code editors, software packages, and project management strategies with both the edition’s and the participants’ needs in mind. To better document our choices and ensure we could make pedagogical use of the tasks we found challenging, we used GitHub’s “Issues” and “Projects” tabs to
keep notes, discuss work asynchronously, and document bugs.

The choices we made (technical, theoretical, and semantic) continued to follow us throughout the development period and throughout the instruction. As David and Gabi were the main developers of the laboratory edition, the decisions they made were relatively easy to implement consistently. As other instructors began contributing in April, these choices became more challenging to maintain, and in some cases justify, as others had a more complete knowledge of Best Practice from which our team could draw. For every programmer, there is a unique style of commenting, using naming conventions, and even line indentation—this is expected, but can be difficult to explain to those learning a programming language for the first time, when most mistakes they make are syntax errors they would find indistinguishable from stylistic choices. It can be challenging to code in front of people and adhere to a style guide, and seeing a variety of programming and writing styles can emphasize what is a non-breaking preference and which mistakes will be breaking syntax errors.

We chose to update our online materials after the conclusion of the Institute to regularize the commenting and naming conventions for the convenience of users who were not present at our in-person events, and therefore had not been exposed to discussion of how and why coding styles may vary.

In the weeks before the Institute, the development team added the final features to the Hoax edition application and began to add teaching materials to the shared site. The GitHub Pages schedule and site were generated from a single XML file using an XSLT stylesheet (https://github.com/Pittsburgh-NEH-Institute/Institute-Materials-2020/tree/gh-pages/schedule), to ensure that all changes to the schedule were reflected across the site. This allowed anyone on the project team to make updates to the schedule and materials centrally, without concerns about site reliability or inconsistency. Instructors uploaded their slide decks and teaching materials to GitHub as well, where they could link them from the project site quickly. This level of flexibility was essential as we modified lessons and topics on the fly, but it also created a valuable resource that participants could return to after the Institute ended.

3.2 Institute sessions

The full schedule of events can be found in Appendix I. The day-to-day program of the Institute was designed to strike a balance between theory and practice, between reflection and action. One full day of coding sessions would most probably fatigue the Institute's participants, as would a full day of only plenary discussions. To this end, we created four categories of sessions — presentations, talk lab, code lab, and discussion — and made sure that the daily programs included all four. Presentations could be highly practical, requiring participants to code along with the instructor; they could be short theoretical introductions of subsequent code labs; or longer sessions on edition-specific topics, such as sustainability or
Stylometry for digital editions. The talk lab and discussion sessions were designed for reflection: working in small groups or all together, participants would explore topics like translating their research goals into a work plan. During code lab sessions participants worked alone or in groups on small assignments, such as “create a branch in GitHub” or “create an SVG visualization for the laboratory edition”.

We titled each week according to our cooking show metaphor and the applicable themes. Week One was “Mise en place: Planning your recipe, preparing your workstation, gathering tools.” We focused on helping participants create an effective workflow or pipeline for their own projects by modeling the workflow we used for the laboratory edition. We were able to guide participants through the choices and tradeoffs, along with the difficult errors and troubleshooting that are common when undertaking this kind of project. This title refers to the back-end work required before one can complete front-end development, such as setting up a database and creating the underlying structures of the application.

In the first few days, goals included introducing the laboratory edition, installing software, and acquiring and practicing computational groundwork skills. While software installations can be time consuming and tedious, the collective experience of trying (and sometimes failing) to install software is an excellent first team-building activity. We chose to complete all software installation in the group setting to encourage successful installers to assist others, to immerse participants in the culture of troubleshooting, and to ensure that no one fell behind due to a software problem.

We also prioritized early exposure to XQuery, as we anticipated that it would be one of the most challenging topics for many participants. As participants began using XQuery to explore texts in eXist-db, we used the system of red and green sticky notes mentioned in section 2.7 to keep them engaged with live coding without slowing significantly at each stage. Several instructors guided XQuery lessons, so participants were exposed to different development styles and approaches. Some participants were already familiar with XSLT, while others had some experience with other programming languages, so instructors were careful to draw examples and explain paradigms in terms that all participants could understand. By Day Four, participants were ready for an XQuery-intensive day exploring the Model - View - Controller architecture and putting it into practice in their application.

Project management played an important part in developing the laboratory edition. While not always emphasized in Digital Humanities curricula, project management techniques have significant impact on the research products they create. Participants were encouraged to think about their own research questions and projects during the daily project management check-ins, as well as to take stock of the laboratory edition’s progress and next steps.

The first week wrapped up with a focus on collaboration, including Git and GitHub as col-
laborative tools. Although the search interface code for the laboratory edition involved complexities that could not be learned fully in the available time, we focused, in a tool-agnostic way, on how the underlying concepts (e.g., faceted searching) supported our edition priorities. The final day of Week One emphasized technical growth, collaborative efforts, and future possibilities for participant editions.

Week Two was titled “Bon appétit!: Plating, styling, and serving” to emphasize the front-end development and hands-on laboratory edition work we would be completing in that week. These activities included intensive code-alongs, where participants went from XML text to functional application features using just XQuery in eXist-db in a ninety-minute session. These features were informed by sessions on writing HTML and CSS, supplemented by the optional Sunday meeting (see section 3.4), along with a special-topic session on user-oriented design.

In addition to the application features we built for the laboratory edition, which included a reading view and SVG visualization, we explored the alternatives to custom eXist-db applications currently available. In our session, “Digital edition frameworks (cake from a mix)” we surveyed some popular and useful tools for creating an edition out of the box and the existing projects that make use of them, with an eye towards long-term project sustainability.

Data visualization was a significant focus of Week Two, as it can be an essential tool for providing context and creating meaning in digital editions. In keeping with our research-first perspective on edition design, we introduced visualizations in the context of research goals, and not (as is common elsewhere) organized by type of graph. Because letting the story you want to tell determine your visualization requires critical thought and imaginative design, we emphasized not how to create specific charts or graphs, but how to make research-driven visualization decisions. We also illustrated, through a sample visualization in the laboratory edition, how the ability to render basic shapes in SVG may be as useful and effective as (and more accessible than) a JavaScript graphing library.

Application program interfaces, or the guidelines by which a program or resource can be accessed by other computers, were discussed in two contexts: using public APIs and creating a public API. Participants learned to integrate a public API key for a mapping tool called Mapbox, as we demonstrated how the laboratory edition’s mapping feature was built. With some beginner-friendly JavaScript, the project’s mapping tool came together quickly. While we did not cover JavaScript as a technical skill, we hoped to demonstrate to participants how their growing technical literacy could help them use public APIs in their own work. When talking about API design for participants, we covered how we’d been using APIs all week, along with the priorities and drawbacks one must consider when imagining how others might want to use or access their data.
We wrapped up Week Two with reflections on project management, edition choices, and research outcomes, talking about both the laboratory edition and the pedagogical choices the instructional team made. Participants delivered presentations on their own edition projects, inviting reflection about how their perspectives may have evolved over the course of the Institute.

### 3.3 Special topics sessions

We supplemented the core topics of the Institute, which focused on theorizing, designing, and building the laboratory edition, with what we called “special topic sessions”. These were small, stand-alone, sessions taught by invited experts, some applicable to any digital edition project and others that were vital to certain types of research, although not part of the specific goals of the laboratory edition. These five sessions were:

- **Sustainability with Chelsea Gunn.** Chelsea, who is now a Teaching Assistant Professor of Information Sciences at the University of Pittsburgh, was Project Manager of the NEH-funded Socio-Technical Sustainability Roadmap Project. Humanities scholars are not always aware that digital editions raise issues of sustainability that are not a traditional aspect of publication on paper, and Chelsea's special session served to highlight the importance of planning for sustainability.

- **Stylometry with Patrick Juola.** Patrick is a Professor of Computer Science at Duquesne University and Director of the Evaluating Variations in Language (EVL) laboratory, a research center and consultancy that specializes in stylometric authorship attribution. Patrick’s presentation provided a unique opportunity for participants to focus on the relationships among language and authorship and how they can be explored and represented in the context of digital editions.

- **User-oriented design principles with Shea Higgins.** Shea, a communications specialist working in industry, guided our participants through a range of UX (user experience) considerations. Effective communicative design, which is vital to a successful user experience with a digital publication, involves artistic and cognitive considerations that are not part of the traditional training of humanities researchers or software developers. Shea also guided Gabi and David’s UX decisions as we developed and built the laboratory edition.

- **Network analysis with Elisa Beshero-Bondar.** Elisa is Chair of TEI Council and Professor of Digital Humanities and Director of the Digital Media, Arts, and Technology program at Penn State Erie, The Behrend College. Networks of persons are common in certain types of digital edition projects (such as corpora of correspondence), and Elisa's understanding of networks beyond connections among persons offers unique insights into relationships that are relevant to some types of edition-based humanities research questions.
• IIIF with Jeffrey Witt. Jeffrey is Associate Professor of Philosophy at Loyola University Maryland and the Director of the Scholastic Commentaries and Texts Archive and Lombard Press. Jeffrey’s perspective on digital editions as primarily editions of data (rather than of documents), and his integration of digital images and image fragments (using IIIF) into those editions, provided a unique opportunity for our participants to think about digital editions in an excitingly innovative way.

3.4 Optional sessions

The range of theoretical and technical topics involved in creating effective digital editions is obviously greater than we could reasonably accommodate in the two weeks of the Institute. For that reason, our core curriculum was designed to prioritize fundamental generalizable knowledge and skills.

We knew from our 2017 experience that despite the intensity of the Institute (Monday–Friday, 9:00–5:30 for two weeks), we could expect that at least some participants would be eager to devote more time to more learning, and in this case there were multiple requests for greater attention to HTML and CSS. Web technologies are part of how digital editions communicate with users, and we had incorporated introductory sessions on those technologies into our basic curriculum. In response to requests, we ran an optional three-hour session on these topics Sunday afternoon, attended by approximately half of the Institute participants.

4 Project outcomes

[The primary purpose of this section is to help readers understand what you did or created during the course of your project.]

The durable products of our 2022 NEH Institute can be divided into two categories:

• Educational material on digital editing, consisting of presentations, hands-on assignments, tutorials, and a practical method for teaching digital editing in a collaborative way.
• The laboratory edition, an eXist-db application consisting of a TEI XML dataset and the code used to present and interpret the data.

4.1 Educational material

The educational material of the 2022 Institute consists of slide sets (PDF) and markdown files used by the instructors during their presentations. They were made available online on the Institute’s website before each session, so participants could follow along during the plenary sessions, use them as a point of reference during the hands-on coding lessons, or
read up on them in their spare time. The presentation slides remain available on the Institute's website (https://pittsburgh-neh-institute.github.io/Institute-Materials-2020/).

Along with the slide sets of each presentation, we provide the participants—and any future users of the Institute’s website—with an extensive set of resources for self-study on edition theory as well as digital edition development. This includes:

- An extensive list of bibliographical references for further reading on digital edition theory, and a selection of exemplary digital editions, i.e., digital editions that illustrate the Institute’s principle of innovative, research-driven editing;
- A variety of sources on the use of XQuery for humanities projects, ranging from theory and specifications to practical tutorials and exercises;
- Detailed micro-tutorials on configuring eXist-db, the XML database used in the Institute;
- Step-by-step guides for developing an eXist-db app similar to the laboratory edition app created during the Institute.

Taken together, the curriculum of the Institute constitutes a practical method for creating advanced digital editions. In the course of two weeks, participants are introduced to—and learn to work with—technologies and skills required to build a digital edition without depending on pre-existing frameworks and inspired by their own research questions. As the curriculum follows step-by-step the development of the laboratory edition, it represents a computational pipeline or workflow for digital editing that can be used for teaching or repurposed for other edition projects (for more on repurposing the Institute’s materials, see below).

As mentioned above in our discussion of computational pipelines, the individual stages in this editorial workflow can be adapted or removed according to the edition’s objectives and the research goals of the scholar creating it. There is no requirement of specific tools or software to handle a stage: each stage in our workflow can be handled by different tools. As a product, the workflow created during the Institute provides a useful starting point for those about to embark on a new digital editing project.

4.2 The Hoax app: a laboratory edition

The laboratory edition “Hoax: ghosts in 19th-century British press” (https://hoax.obdurodon.org/) was encoded and created in support of Institute Instructor Gabi Keane’s undergraduate thesis project. The roughly forty TEI-encoded documents were a manageable corpus for teaching, given the brevity of each English-language article and its light, but research-focused, encoding. The Hoax project’s original implementation used a combination of XQuery and XSLT in an eXist-db application, and the project team chose to start from scratch with a pure XQuery approach when creating the laboratory version of the edition,
as we did not plan to teach XSLT, nor did we want to require or expect participants to know XSLT as a prerequisite. Restarting with Institute goals in mind also allowed us to document our project planning and code writing more robustly in a public GitHub repository, where participants could see the full commit history.

With the laboratory edition, we aimed to make full use of our cooking-show strategy, whereby fully formed, working code could emerge at the end of a session. Participants could see each step, complete real-time troubleshooting, and end up with an executable XQuery module at the end of the lesson. We began the first week by looking at the materials together; seeing the final product, and talking about the approaches we might take as a group to build each piece. Throughout the Institute, we used the data to complete coding activities as a group, providing participants with a snapshot of the project via separate Git repositories they could retrieve from GitHub. This was an opportunity to practice the muscle-memory parts of creating a workflow as well: how to open a command line, pull changes from a remote repository, and begin working in a code editor.

When it came to the early stages of project planning, Gabi was able to explain why and how they selected the documents and how their markup related to the research question. They were also able to provide insight into what they might do differently, after learning through building the edition. This feedback and reflection generated discussion among participants about their own project reflections, with some concluding that they needed to return to the markup editor to improve the quality of their data before proceeding with next steps. The hands-on practice with someone else’s data was an essential learning opportunity, as it gave participants an up-close look at what it takes to implement a pipeline without the stress of making usable progress on their own work.

The Hoax app also provided a shared codebase that made troubleshooting simpler for participants and instructors. While “elving” around the classroom, we could identify common errors that we would then replicate on the large screen at the front of the room. We could demonstrate a solution, and in the process normalize the error experience and share strategies for troubleshooting that participants could implement in their own work after the Institute.

4.3 Reuse and repurposing

All Institute material is intended to be repurposed by others and made freely available under an open license as a resource via the Institute’s website (<https://pittsburgh-neh-institute.github.io/Institute-Materials-2020/> ) and the Institute’s GitHub repository (<https://github.com/Pittsburgh-NEH-Institute/Institute-Materials-2020>). This repurposing of material is consistent with the policy of the 2017 Institute. Christopher Ohge, who participated in the 2017 Institute, reported to us for our previous white paper that he in-
cluded Institute materials in his own teaching (pages 8-9). As for the 2022 Institute, participant Francesca Giannetti wrote that she was grateful for the continued availability of the material on the website and that she “keep[s] coming back to” some of the presentations, especially those on documentation and on project management. Similarly, Fred Rowland stated that “the ongoing availability of the Institute website is invaluable”.

Some of the teaching materials, such as the project management sessions, the introductions to Git and GitHub, and the sessions on working on the command line, are more generic and will require little or no change before repurposing. Other presentations refer specifically to the laboratory edition, but are nonetheless generalizable at a high level. The dataset is made available in the GitHub repository of the Institute, so (future) users should have no problem following along with the Institute’s teaching material that refers to this specific dataset.

4.4 Technical and pedagogical products

[Guiding questions: What technical decisions did you make during the design of your project? For example, what platform are you hosting your project on? What code libraries or packages did you build upon and where can others find them? How did you decide on metadata standards? How did you identify a repository system for the project’s digital assets?]

The focus of our Institute was on digital editions in a broad sense, rather than on a particular digital-edition platform or technology. Nonetheless, the commitment to a hands-on planning and development experience required us to make platform and tooling decisions so as to provide a shared context for our collaborative work. Our commitment to open science led us to select exclusively open-source software and no-cost, open-access hosting venues, including:

- eXist-db integration with VS Code: Language Server and Client for XQuery/eXistdb, free (no license specified), https://github.com/wolfgangmm/existdb-langserver
- eXist-db app bootstrap utility: eXistentializer, GPL 3 license, https://github.com/Pittsburgh-NEH-Institute/eXistentializer
- Version control: Git, GPL, https://git-scm.com/
- Source-code hosting: GitHub, license not applicable, https://github.com
Our data (available as part of our complete hoaXed application, at [https://github.com/Pittsburgh-NEH-Institute/hoaXed](https://github.com/Pittsburgh-NEH-Institute/hoaXed), GPL 3 license) was transcribed with OCR and corrected manually by Gabi Keane, one of our Institute Instructors, from newspapers in the public domain. We chose TEI XML markup to prepare our sources because TEI code and documentation ([https://tei-c.org/](https://tei-c.org/) and [https://github.com/TEIC/TEI](https://github.com/TEIC/TEI)) are available under an open license (CC-BY and BSD-2) and TEI is broadly used within the Digital Humanities community.

5 Project evaluation and impact

[The primary purpose of this section is to reflect on the achievements and challenges that your project faced.]

5.1 Learning programming when programming is not the focus

One of the features of our 2022 Institute that distinguished it from our 2017 Institute was that in 2022 we wanted the participants to follow along (including coding with us) as we built a digital edition together from data to deployment. Building an application requires a decision to use specific technologies, yet, at the same time, the focus of the 2022 Institute was not on a specific technology, but on learning to think computationally about modeling a digital edition. How, then, could we help the participants learn the programming skills they would need to code along with us as we built the edition without sacrificing theory-of-edition time to application- and framework-specific programming tutorials and practice? The primary XML technology employed in our edition was XQuery as implemented in the eXist-db document database and application platform, which meant that we needed to teach XQuery without making XQuery the focus of the Institute.

We anticipated this challenge and addressed it in the curriculum by including measured, targeted XQuery units in our syllabus. The most important skill for learning a programming language, though, is learning how to Look Stuff Up. Fortunately, the editor of the Programming for Humanists book series, Professor Laura Mandell (then Director of CoDHR, the Center of Digital Humanities Research at TAMU), had generously offered to contribute copies for all Institute participants and instructors of *XQuery for humanists*, a recent text and reference book that she had edited. One of the authors of *XQuery for humanists*, Cliff Anderson, was a core Instructor in our Institute. We noticed during the Institute that many participants brought their copies of Cliff’s book to our sessions each day and referred to them frequently, and the conspicuous bookmarks and dog-eared pages confirmed that they were using the book to study XQuery on their own as a supplement to our in-person group activities. Our conversation with Professor Mandell that led to her offer of these books was an afterthought that turned out to have a major positive impact on the success of our Institute. One of the lessons we learned, then, is that we should have planned to make those books
available from the beginning and made arrangements to obtain and provide them in our original proposal, whether as a contribution from TAMU CoDHR or as a line item in our NEH budget proposal.

There are two other relevant XQuery books. The first, *eXist: a NoSQL document database and application platform* by Adam Retter and Erik Siegel, was published by O'Reilly (a leading publisher of technology books) in 2015. Although the printed book is still available for purchase, O'Reilly is not committed to keeping it in print and they returned the copyright to the authors, who generously permitted us to distribute PDF copies at no cost to all Institute participants and instructors. The other is Priscilla Walmsley’s *XQuery: search across a variety of XML data*, also published by O'Reilly, which is the most comprehensive XQuery reference book in print. Unfortunately, we were not able to offer copies of this book to our participants.

The lesson learned, then, is that were we to apply today for an Institute where the main focus was not on coding but where participants nevertheless needed to attain a certain baseline proficiency in writing their own code, we would identify appropriate text and reference books and include the cost of purchasing them for all participants and instructors in our application.

5.2 Navigating NEH IATDH and Digital Editions funding opportunities

We applied for funding initially under an NEH IATDH call for applications, but our Institute was ultimately supported jointly by the NEH IATDH program and the Digital Editions program, which is part of the NEH Division of Research Programs. That these two NEH offices had combined their efforts in order to support our proposal came as a welcome surprise, and the lesson learned is that we should have asked our NEH Program Officer about other NEH opportunities when we consulted with her about the IATDH. Digital Humanities often crosses traditional disciplinary and methodological boundaries, yet the idea that our proposal might cross funding rubrics within the NEH had not occurred to us until the NEH drew our attention to it through the award decision.

5.3 Commitment to open science

Digital Humanities as a community of practice is sensitive to and supportive of open science: open data, open-access publication of research results, and open-source software. This led us to choose, as data for our laboratory edition, documents that were in the public domain, and it led us to publish the code and documentation (including all Institute instructional materials) that we developed ourselves under a GPL 3.0 license and the research resources and results represented by our laboratory edition under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.
License details regarding the Institute toolkit are available in Section 4.4. The instructors had prior experience with these tools in their own projects and in teaching on a smaller scale, and the success of our use of these tools in the Institute confirmed that we were able to teach collaboratively in an ambitious, far-reaching, coding-intensive course without requiring methods or resources that would compromise our open-science priorities.

5.4 Using Slack as a community-building tool

We chose to use Slack (https://slack.com/) for communication (announcements and chat) within the Institute. Slack is a freemium platform, that is, it provides basic services at no cost and charges a fee for enhanced services (such as longer retention of older messages). Our Institute selected Slack, which is owned by the large cloud-services corporation Salesforce, because it is a messaging service with long experience in the software-development ecosystem and therefore something Institute participants are likely to encounter in their own collaborative development work. There is an open-source collaboration tool called Mattermost, but to use the free version of this software we would have needed to host it on our own server. Because self-hosting was not a realistic option for us, the other alternative to Slack was Discord (a privately-owned company, also widely used in the software-development industry), which would also have offered a useful opportunity for our participants to gain experience with an industry-standard tool. We selected Slack because Discord targets primarily the gaming community, though it has come to be used more broadly. Having to make a decision about a shared messaging platform helped us focus on the importance of choosing one that offered adequate no-cost services and that our participants were likely to encounter in their own future collaborative development work. From that perspective, the choice between Slack and Discord was less important than making a decision and using it as the principal means of communication among Institute participants and instructors.

5.5 Role of the host institution

The Principal Investigator and most of the other instructors were involved in our 2017 IATDH, and we were fortunate to be able to apply what we learned from that earlier experience to managing the logistics of our new IATDH. With almost fifty instructors, participants, assistants, and guest lecturers and a two-week duration it was inevitable that not everything would go smoothly, and close cooperation between the Institute instructional staff and several offices at the host University was vital to resolving issues quickly and effectively, so that the Institute team could focus on the content of the Institute without becoming distracted by the logistics.

Our University grant officers worked closely with us on both our initial grant application
and our subsequent application for a no-cost extension, especially with respect to preparing the Institute budgets and alerting us to issues we might not otherwise have known to consider. Our NEH Program Officer provided vital information about distinguishing budget categories that were and were not subject to indirect charges, which helped our University grant officers prepare a budget that would deliver as much value as possible to our participants. Current and former members of our University made themselves available as guest lecturers. Our Dean’s Office and the University Library System underwrote the cost of a catered reception where Institute participants were able to meet and interact with members of our University’s broader Digital Humanities community.

The run-of-the-mill logistical challenges that arose were often individual and urgent: a participant’s room key failed to work late at night; a participant’s meal card showed no credit when the participant was in line at the University cafeteria; a participant’s room was flooded because of an air-conditioning malfunction; etc. The close cooperation of the University Events Office (with responsibility for instructional space, housing, and meals and catering), the Dean’s Office Event Coordinator (the liaison between our Institute staff and the University Events Office), and the Institute Instructors and Assistants allowed us to respond as quickly and effectively as possible. The principal takeaway is that with an event of this complexity we should expect the unexpected, and close coordination and communication among those three levels can mitigate disruption and contribute to a prompt and effective resolution.

5.6 Meeting in person in the Age of Covid-19

Our Institute had originally been planned for summer 2020 and was postponed twice because of Covid-19 travel and meeting constraints, ultimately convening only in summer 2022, when Covid-19 was still very much a concern both in general and at the host University. Our NEH Program Officer had invited us to consider moving the Institute online, but the Institute was planned as an intensive in-person, hands-on experience, to which we remained committed.

The Institute Instructors all had extensive prior experience with teaching coding-intensive courses and workshops, including at our 2017 NEH IADTH, in which most of the instructional team had participated, as well as in regular University courses in computational Digital Humanities and in intensive one- or two-week Institutes elsewhere. An inevitable consideration with hands-on coding activities for new learners, many of whom do not have prior experience with the technologies, is that individual issues arise that require individual and immediate attention: someone’s code doesn’t do what is expected for reasons that are not clear immediately, and that person is unable to proceed until the problem is resolved.

We met the need for intervention in situations like this by providing a large instructional
team (we had seven core instructors in residence plus two student assistants who had prior experience as teaching assistants in this type of course), so that while one of us was teaching and leading a hands-on activity from the front of the auditorium, the rest of the instructors and assistants were circulating in the room and helping participants resolve individual sticking points as they arose. Our ratio of approximately one instructor for every three students meant that an activity did not have to stop for all participants each time one participant required individual attention.

Live coding along with the instructors constituted the largest part of every day’s activities, and the individual, ad hoc breakout attention described above, which is vital to the success of this type of learning, is not realistic in an online environment. Moving our Institute online, then, would inevitably have reduced the opportunity for the instructional team to provide immediate expert attention to individual questions and problems, and would have replaced much of the participatory learning with spectator observation. Instruction in our Institute did involve demonstration, of course, but the demonstration was closely interwoven with hands-on participant coding, and we needed to be able to deploy the rest of the instructional team to address individual needs at any time.

We considered the factors above when we decided to postpone our Institute from summer 2020 to summer 2021 so that we could hold it in person, and again when we decided on a second postponement, until summer 2022. Our experience, when the Institute finally met, of providing the sort of immediate, individualized attention we describe above confirms that the postponements made it possible for us to offer a learning opportunity that could not have been achieved except in person. Our goal of helping all of our participants, including those who had no meaningful prior programming experience, to begin to use the same professional development tools that we do in our own work was ambitious. Our prior experience had shown that meeting in person, as we had originally planned, was crucial to making that type of learning possible for our participants.

6 Project continuation and long-term impact

6.1 Future plans

As Chelsea Gunn, project manager of the Sustaining DH Institute workshops and one of our guest lecturers, emphasized for our participants, ending a project requires early planning decisions. Projects like this Institute may take several years to complete even without the interference of a global pandemic. With the publication of this white paper and the online tutorial materials available at https://github.com/Pittsburgh-NEH-Institute/hoaXed we intend to put this project to rest. All materials currently offered on GitHub will continue to be available for use, re-use, and distribution under existing open licenses, but without further expansion or extension by us. The project team does not intend to offer additional
releases, bug fixes, or patches.

Materials for this institute can be found at https://github.com/Pittsburgh-NEH-Institute and will be mirrored by the D-Scholarship repository at the University of Pittsburgh.

In follow-up interviews and surveys, participants reminded us that they are often among the only editions-oriented digital humanists at their home institutions. For that reason, bounce-back activities, such as follow-up meetings, would provide a welcome opportunity to continue building community. Bounce-back activities may also appeal to participants from our 2017 Institute, who are now five years out from the original curriculum. While we are not in a position to apply for further funding to organize these kinds of events ourselves, we agree that digital editing is an ever-evolving field and that an ongoing demand exists for advanced educational and community-building opportunities.

6.2 The collaboration gap

In the 2017 Institute white paper, we write: “While textual scholars may not do all of their own coding, being able to participate in the technological development improves understanding within the team and helps distinguish collaboration from compartmentalization” (4). We continue there that scholars can collaborate effectively with their developer partners only if they have some understanding of the technologies involved. If a scholar’s tools are a black box provided by a collaborator, the scholar is alienated from the role of the technology in arriving at research conclusions. If, instead, a researcher has an understanding of the technical implementation of their ideas, they can comment, critique, and evaluate research products as a partner and collaborator.

The distinction between collaboration and compartmentalization is an important concept in our theory of digital editing, as the research question must be an essential part of the planning and implementation of the entire edition. However, we found that this distinction is not made only through the project leader’s or team members’ general understanding of technical requirements; it also requires their engagement with robust project management practices.

Griffin and Hayler’s 2018 “Collaboration in Digital Humanities research – persisting silences” in Digital humanities quarterly (DHQ) points out that “collaboration has become increasingly taken for granted. However, we would like to suggest that it remains under-developed in both theory and practice, particularly with regard to partnerships that occur between academic and non-academic (typically technical) collaborators” (Griffin Hayler, par. 4). Even our participants who did not have traditional collaborators at the time of our Institute could identify important steps in their projects when they would need to engage with outside assistance, be that their university’s information technology department, a consultant, or someone who wished to use their data. These collaborations, titled “human-human
interactions” in the article’s typology, are always required to some extent by scholarship’s ongoing dialogue with previous research and work, but become more frequent and fraught in the context of Digital Humanities (Griffin Hayler, par. 9). Coordinating work and technical resources requires a different set of skills than those we use to write articles. Moreover, the computer is its own kind of collaborator, with implicit assumptions and backgrounds that are essential to understanding its output, termed “[h]uman-machine/material interactions” (Griffin Hayler, par 9). Reframing one’s work as an ongoing collaboration, including with one’s tools and past and future selves, can challenge some of the implicit assumptions that cause problems in later steps.

There is an emerging awareness of the gap between how important scholars recognize collaboration to be and the hands-on project management skills and resources available to them. In the 2021 DHQ article “Innovation through collaboration in humanities research”, a study of cross-disciplinary projects that received Humanities Without Walls research grants, the authors found that “the need most consistently identified by interviewees was for project managers—people with responsibilities dedicated to keeping the projects moving forward” (Bonn et al., para. 33). Many of our own participants echoed these needs: those who were collaborating already felt underprepared for their role in the collaboration, and those who were working alone felt overwhelmed by the prospect of bringing others, who might participate in a highly specialized role, into their workflows. The challenges of interdisciplinary collaboration “are often forgotten or left unarticulated, rendering them as a surprise for each new generation of scholars who might therefore reasonably feel that they, alone, encounter such difficulties” (Griffin and Hayler, para. 11).

While drafting the proposal for our 2022 Institute, we identified the need for explicit project management training as a constitutive framework for any collaborative edition-making project. Our own experiences as participants in the 2018 Socio-Technical Sustainability roadmap workshops informed this need as well (https://sites.haa.pitt.edu/sustainabilityroadmap/). We “baked in” project management training at every step of laboratory edition development, rather than as a distinct lesson, to emphasize its continuing evolution and responsiveness throughout project development. We wanted to highlight that project management was an essential part of the life cycle, rather than something one engaged with at the beginning and end, or only at specific milestones. Using the laboratory edition’s development and management as examples, the researchers who made it could comment on what was most challenging, effective, and productive for their team. This approach generated discussion on collaboration and project management throughout the two-week period, which frequently spilled over into conversations over coffee or meals.

Participants felt that the strategies they learned during the Institute were helpful in reframing their collaborative practices. One participant told us:
It may seem simple, but the concept of regular meetings with clearly defined agendas for each meeting has been something I’ve done constantly since the Institute. I often let meetings slide before because my digital project was usually last place in the pecking order (by necessity), but now, I keep up with meetings if only to say, “I (sometimes “we,” but usually “I”) didn't get this done, but let’s set it a new deadline and/or delegate parts of it; also, here’s a time when I will check in via email between now and our next meeting to give you a progress report.” Otherwise, I end up putting off tasks for longer.

There is, as Griffin and Hayler observe, a silence around the theory and practice of project management that is pervasive and isolating. Our participant acknowledges the simplicity of their new strategy, something they might have been doing all along, but had never learned or thought about consciously.

Project management conversations happened every day during our Institute and it is this consistency and integration that had the greatest impact in helping participants reframe their thinking about collaboration. The pedagogical lesson learned is that those who wish to teach the kinds of skills researchers need to undertake collaborative, extended projects should consider the social and organizational practices as subjects to be covered alongside technical and theoretical material. We saw in our feedback that many people are looking for more formal training on project management skills, particularly early-career scholars who may not have this kind of work modeled for them explicitly by advisors or colleagues whose own work products are largely individual.

6.3 Computational groundwork

The 2017 Institute “Make your edition: models and methods for digital textual scholarship” featured an optional one week “bootcamp” on the computational groundwork we would use in the following weeks to help participants create their editions. This groundwork, focusing on filesystem maintenance, command line skills, programming, and software tools, provided participants with a baseline for engaging with ever-changing Best Practices and new software without engendering a dependence on the specific technologies we selected for use during the Institute itself. We reflected in the white paper that the experience was “enough to make substantial progress toward real productivity, and more than enough to demystify the command line and help digital humanists recognize that they are capable of participating actively in developing the technological resources they need to build editions according to their research specifications” (5). In section 2.4 of the present report we highlight the differences in approach between the 2017 and 2022 Institutes, and why we chose not to separate computational groundwork into its own week.
Most people use computers the way they use their cars: they don’t know or care how an internal combustion engine works. Humanities scholars may engage with their computers constantly without understanding the organization of their filesystems or the way programs run, because this kind of education about the tools we use is not prioritized. The tools we choose contain implicit assumptions, and when we don’t understand those assumptions, we unwittingly make them part of our research outcomes. For that reason, “an understanding of machines as collaborators in knowledge production, and an awareness of the impacts of materiality on such production, becomes a disciplinary as well as philosophical concern” (Griffin and Hayler, par. 27). This understanding is a lofty aspiration for most of us; we don’t expect or need to understand exactly how the undersea Internet cables work to use them effectively to access digitized archives we otherwise could not expect to visit in person. We might need to understand how queries are parsed by the database holding those archives, though, if we want to write the most effective and efficient queries we can to retrieve those sources.

Computational groundwork skills can be a useful addition, or provided pre-requisite, to any training that seeks to further the research methods of those engaged in the computational Digital Humanities. While such skills are not inherently more difficult to learn than any other software tool, they can be challenging without real-time assistance. By choosing to cultivate generalized software learning in a group setting, researchers can prepare to troubleshoot the kinds of technical challenges that they will experience on their own and with students and collaborators. Not only are participants learning how to work at the command line, they are learning how to teach themselves new commands for other tools they may need to use. As a provided pre-requisite, this part of the curriculum fosters diversity and equity by leveling up those who may not otherwise have the resources to enroll in a separate course devoted to computational groundwork skills.

### 6.4 General advice

The 2017 white paper featured general advice for project directors before, during, and after an Institute ([https://securegrants.neh.gov/publicquery/main.aspx?f=1&gn=HT-251001-16](https://securegrants.neh.gov/publicquery/main.aspx?f=1&gn=HT-251001-16), pp. 18–19). We continued to find this advice useful and appropriate in the context of our 2022 Institute, and we encourage those reading here to visit the 2017 white paper to see a complete list of comments and suggestions there. Below we contribute a few additions to the “running an IATDH” advice genre.

#### 6.4.1 Before

- Identify all software requirements and their dependencies in the context of Institute priorities. Criteria might include outcome results; the balance of leveraging existing tools vs building to your own specifications; and such ethical considerations such as open source, open data, etc. Prepare, test, and document installation procedures for
different audiences, targeting users who may not have much prior experience with software installation.

- Communicate minimum hardware and software requirements to participants.
- If you’re planning to develop any software collaboratively during your Institute, build and document the entire process in advance and test across different operating systems.
- Plan communication tools (announcements, discussion) in advance. Give thought to ease of use, data retention, and accessibility of the tools you choose.
- Identify any relevant books or materials you want to purchase or otherwise acquire for participants. Include items for purchase in your application as a budget line item, with a written justification for each requirement.
- Communicate the degree to which you plan to make Institute real-time sessions available online via video conferencing software, including information about when and how online participation may fall short of the in-person experience. Participants who cannot attend some or all of the sessions should know what they can reasonably expect.
- For longer Institutes, prepare and provide restaurant and tourism guidance for participants. Your university may offer this kind of guide to all visitors, but it can be immensely helpful for those coming from out-of-town to get a local take. Productive rest and recreation can be a boon to participant learning.
- Budget to invite a large instructional team and compensate them appropriately for truly adequate preparation and on-site contributions. Some overlap of expertise areas reduces the risk that unexpected changes will disrupt instruction. All instructors will be present and teaching during all sessions, whether as a lecturer or by assisting participants.

6.4.2 During

- Prepare to be flexible about the unexpected. For example, be creative about modifying your curriculum if interruption in a guest speaker’s schedule requires rearranging your sessions.
- Regardless of how much material you prepare ahead of time, you will write and rewrite lesson plans and presentations throughout the Institute. Be open to collaborative changes that can happen only when your entire instructional team is together in person. Expect, and be prepared to respond to, participant requests for supplementary content.
- With the previous advice in mind, set aside time before and (frequently) during the Institute to meet with the entire instructional team. If you aim for collaborative teaching, establish shared standards for presentations and materials that everyone can use.
• Solicit participant feedback daily and be prepared to respond to it. This can be a survey, a channel in your messaging app, or a daily email.

6.4.3 After

• Evaluate slides, session notes, and example code to determine what might translate well to long-term usable materials. If anything can be made into a tutorial that participants or their colleagues can refer back to, consider investing time in revising those materials.

• Record any challenges or adaptations made to your plans soon after the Institute period ends. While these changes might seem small at the time, patterns can emerge during the report writing phases.

7 Appendices

7.1 Detailed day plans

Week 1: Mise en place: Planning your recipe, preparing your workstation, gathering tools.

Day 1: Fundamentals. The Institute opens with a high-level view of the types of engagement required by a textual editor, beginning (always!) from the research questions and leading to the production of an actual edition. In session two we introduce the computational pipeline as a way of modeling project development. We begin the afternoon by installing the software packages required for our Institute. Finally, we discuss some exemplary digital editions and start using XQuery to explore XML.

Session 1: Getting started.

• Introductions. (15 minutes, presentation)

• Research questions and choosing our technologies. (30 minutes, presentation)

• Discuss two-week schedule and day plans. (15 minutes, presentation)

• Review laboratory outcome goals and explore participant goals for their own editions. (30 minutes, talk lab)

Session 2: The edition as a computational pipeline.

• We introduce the computational pipeline as a way of modeling the development of a digital edition. (30 minutes, presentation)
Initial stages: TEI XML (base view), exploring with XPath, and exploratory data analysis (EDA) with Shakespeare. (30 minutes, presentation)

Transformation: how do I transform, what do I transform to? We also introduce the model-view-controller (MVC) architecture we’ll use in app development later. (30 minutes, presentation)

**Session 3: Selecting your tools and software installation best practices.**

- Software installation instructions. (90 minutes, code lab)

**Session 4: XQuery and digital editions.**

- Exemplary digital editions. (45 minutes, discussion)
- Exploratory data analysis in eXide (Shakespeare data). (45 minutes, code lab)

**Day 2: Project management and planning the edition.** After the first day’s emphasis on theory, model, and method, day two concentrates on baseline technical topics needed to translate edition goals into an implementation plan. We begin the day with Agile project management, after which the version control system Git, its online collaboration environment GitHub, and project file management best practice are introduced. We continue to develop our XQuery skills, introducing and practicing FLWOR, in anticipation of applying them to edition development. In a special topic session, Chelsea Gunn presents on project sustainability.

**Session 1: Project management.**

- Discussion of project management practices. (90 minutes, talk lab)

**Session 2: Git, GitHub, and Markdown.**

- Git: introduce and begin to use version control software. (30 minutes, presentation)
- GitHub: code management, issues, projects, and Markdown. (30 minutes, presentation)
- XQuery: introduce FLWOR (Ghost Hoax data). (30 minutes, presentation)

**Session 3: File management.**

- File management and command line basics. (60 minutes, code lab)
- XQuery: practice FLWOR (Shakespeare data). (30 minutes, code lab)
Session 4: Special topic: Sustainability with Chelsea Gunn.

- Planning for a sustainable digital edition. (90 minutes, presentation)

Day 3: Moving from model to implementation. The third day is devoted to developing the digital editing workflow as a computational pipeline. Session one extends the command-line skills introduced Tuesday. In session two we discuss applications of modeling to our laboratory edition, explore alternatives to TEI, and encode a sample document together. In the afternoon, we return to XQuery to create our first computational step in the pipeline. In a special topic session, Patrick Juola introduces stylometry as an example of integrating statistical description and evaluation into the perspectives exposed within an edition.

Session 1: Command line.

- Command line basics. (20 minutes, code lab)
- Working on the command line (25 minutes, code lab)
- Generating your GitHub personal access token (15 minutes, code lab)
- Practice Git on the command line (30 minutes, code lab)

Session 2: Modeling the data for the edition.

- TEI XML in context: rationales, alternatives. (30 minutes, presentation)
- Encoding data in TEI XML together in small groups. (40 minutes, code lab)
- Building a title list with XQuery: Plan goals, pipeline, and find the data. (20 minutes, discussion)

Session 3: Creating a pipeline with XQuery: you are the controller (Ghost Hoax data).

- Translating your research goals into your work plan. (30 minutes, talk lab)
- Building a title list with XQuery: Construct model in model namespace. (60 minutes, code lab)

Session 4: Special topic: Stylometry with Patrick Juola.

- Stylometric authorship attribution. (90 minutes, presentation)

Day 4: XQuery in XML databases. In the morning, we guide participants through installing an application into eXist-db and exploring its indexes. In the afternoon, participants practice these new skills by developing their own XQuery to be implemented later in an eXist-db
application framework. Next, we begin writing the controller, which stitches together the data, the models, and eventually, the views. The final session of the day will focus on collation.

**Session 1: XML databases and indexes.**

- Databases have at minimum data and a method of querying that data. Indexes enable direct and fast retrieval for querying the data. (30 minutes, presentation)
- Indexing and profiling. Examine indexes and profiles in Monex. (30 minutes, code lab)
- Using Lucene indexes. What are facets and fields? (30 minutes, code lab)

**Session 2: Developing the model to support a feature.**

- Building a title list with XQuery: Create the view: transform the model to HTML. (30 minutes, code lab)
- Participants work together on preliminary code to develop into a feature. (60 minutes, code lab)

**Session 3: The controller.**

- Project management check-in: Where are we in the project? Planning for the next step. (20 minutes, talk lab)
- What is a controller? Why do we need it? What factors determine controller design? (15 minutes, discussion)
- Explore how the out-of-the-box controller works, along with what it can and cannot do. (15 minutes, presentation)
- URL rewriting: configure the controller to return the combined model plus view (title-list query). (10 minutes, code lab)
- Configure controller to return just the model (title-list query). (10 minutes, code lab)
- The full controller pipeline: returning the view (title-list query). (20 minutes, code lab)

**Session 4: Collation.**
• What is collation? How can we implement it in a dataset? (45 minutes, presentation)

• Participant project presentations. (45 minutes, discussion)

**Day 5: Collaborating on the edition.** In session one we hold our daily project management check-in and configure Yeoman and VSCode to work with eXist-db. In session two we introduce Git branches and guide participants through debugging and resolving merge conflicts in Git. Having introduced facets and fields on Thursday, we present the search feature for the laboratory edition in its final form and discuss the implementation. We end the day with additional practice with XQuery and the command line. We then hold a slide slam, where participants create and present slides about their current projects to the group.

**Session 1: Setting up an app with Yeoman and VSCode sync.**
• Project management tasks. (20 minutes, presentation)
• Yeoman and VSCode. (70 minutes, code lab)

**Session 2: Git and GitHub in Real Life.**
• Branches and you. (40 minutes, presentation)
• Practice with branches. (20 minutes, code lab)
• Create merge conflicts on purpose to gain familiarity with resolving them (without being thrown into a vim black hole). (30 minutes, code lab)

**Session 3: Search functionality.**
• Facet theory. (15 minutes, presentation)
• Facets and fields in eXist-db searching. (30 minutes, presentation)
• Facets and you: thinking about your search interface. (45 minutes, talk lab)

**Session 4: Catchup session.**
• XQuery: taking stock. (30 minutes, code lab)
• Command line tips and tricks. (30 minutes, code lab)
• Slide slam. (30 minutes, talk lab)

**Supplementary session: Web technologies.**
In response to participant requests, we held an optional, impromptu three-hour session on web technologies (HTML and CSS) on Sunday, combining presentation with hands-on practice.

**Week 2: Bon appétit!: Plating, styling, and serving.**

**Day 1: Planning for deployment.** In week two, participants prepare the laboratory edition for publication, exposing the functionalities of querying, filtering, analyzing, and transforming textual data. In session one, we take stock of the progress of our collaborative edition and the work plan for completion. In session two we survey publication options like TEI Publisher and CETEicean with comparative reference to GitHub Pages and the laboratory edition eXist-db implementation. In the afternoon, we learn how to use HTML and CSS fundamentals to support view development in the following days. The special topic session is a presentation on user experience and design by guest lecturer Shea Higgins.

**Session 1: Retrospective and plans.**

- Looking back on week 1. (20 minutes, discussion)

- Assess the laboratory edition project’s current state and look ahead at our tasks for the week. (30 minutes, talk lab)

- Making collaboration work. (40 minutes, discussion)

**Session 2: Digital edition frameworks (cake from a mix).**

- CETEicean, TEI Publisher, EVT, GitHub Pages, GitHub Actions, and their ilk. (90 minutes, presentation).

**Session 3: HTML and CSS.**

- HTML basics. (30 minutes, code lab)

- CSS basics. (30 minutes, code lab)

- Flexbox basics. (30 minutes, code lab)

**Session 4: Special topic: User-oriented design principles with Shea Higgins.**

- User experience (UX) and user interface (UI). (90 minutes, presentation)

**Day 2: Implementing publication strategies.** The morning is devoted to typeswitch, an operator that helps us mimic XSLT template processing in XQuery. With typeswitch, we
begin to develop the view components of the laboratory edition’s MVC architecture. In session two, participants return to the application in eXist-db and gain experience with application requirements for search and reading view features. To close out the day, we work on XQuery problems and concepts that may arise in real life project issues.

**Session 1: XQuery: model and view from the ground up.**
- Enhancing the title list model. (45 minutes, code lab)
- Adapt the view to the model using typeswitch. (45 minutes, code lab)

**Session 2: Search function.**
- Walking through how to build a search interface. (90 minutes, code lab)

**Session 3: Putting MVC together: building the reading view.**
- The Model in action (article reading-view query). (30 minutes, code lab)
- The View in action (article reading-view query). (30 minutes, code lab)
- The Model, View, and Controller in action (article reading-view query). (30 minutes, code lab)

**Session 4: XQuery topics + review.**
- Using regular expressions to clean and encode our data. (30 minutes, code lab)
- Find all the TEI elements used / attribute values used / etc. (30 minutes, code lab)
- GeoJSON for maps. (30 minutes, code lab)

**Day 3: Visualization and interactivity.** On day three participants learn to communicate information about data through interactive graphs and charts. In session one we introduce Scalable Vector Graphics (SVG), an XML technology that allows users to create data-driven charts and graphs with XQuery. The afternoon’s small-group hands-on session, with all instructors providing guidance, integrates these techniques into the edition for publication, as participants develop responsive, user-oriented visualizations exported and transformed from the laboratory edition data. Guest lecturer Elisa Beshero-Bondar teaches an extended special topic session on network analysis with text.

**Session 1: SVG basics.**
- What is SVG and how does it work? (15 minutes, presentation)
● The SVG coordinate space. (10 minutes, code lab)

● SVG housekeeping. (15 minutes, code lab)

● SVG basic shapes. (25 minutes, code lab)

● Planning a sample visualization. (25 minutes, talk lab)

**Session 2: Creating SVG visualizations for the edition.**

● Scope of variables. (15 minutes, code lab)

● Create the model. (30 minutes, code lab)

● Implement the planned visualization using the model. (45 minutes, code lab)

**Session 3: Special topic: Introducing network analysis with Elisa Beshero-Bondar.**

● What is network analysis? How is it used? (25 minutes, presentation)

● Creating the model as tab-separated values (TSV) using XQuery. (50 minutes, presentation)

● Install Cytoscape. (15 minutes, code lab)

**Session 4: Special topic: Using Cytoscape to visualize network relationships with Elisa Beshero-Bondar.**

● Import TSV and explore network analysis data. (30 minutes, code lab)

● Style nodes and edges, create sub-networks from a complex network, and explore export formats from Cytoscape. (45 minutes, code lab)

● (TEI) graphing for eXist-db. (15 minutes, presentation)

**Day 4: Data access and APIs.** The morning sessions focus on accommodating both the developer-user and the eventual end-user. First, we live code the map feature using a Mapbox JS library. In the second session we introduce Application Programming Interfaces (APIs). Next, participants learn to collaborate using Github projects and implement semantic versioning. A special topic session by Jeffrey Witt on the International Image Interoperability Framework (IIIF), a community-focused Linked Open Data (LOD) standard for image sharing, closes the day.

**Session 1: Visualizing our geodata and integrating external APIs.**
● Write the model for our geodata and explore how visual information can be displayed. (15 minutes, talk lab)

● Choose the right mapping tools for your project. (15 minutes, talk lab)

● Integrate basic map functionality into the app using a mapping JavaScript library. (60 minutes, presentation)

Session 2: Application programming interfaces (API).

● What is an Application Programming Interface (API)? (30 minutes, presentation)

● Our verb and noun choices, how we made them, what we might have done differently. (30 minutes, presentation)

● Documenting our decisions. (30 minutes, talk lab)

Session 3: Review and practice: version control and project management with Git and GitHub.

● GitHub Projects. (20 minutes, code lab)

● Releases and semantic versioning. (20 minutes, presentation)

● Project management reflections. (15 minutes, discussion)

● Planning our own projects. (35 minutes, talk lab)

Session 4: Special topic: IIIF with Jeffrey Witt.

● International Image Interoperability Framework (IIIF) and Linked Open Data (LOD). (90 minutes, presentation)

Day 5: Finishing up (dessert and coffee?). In the first two sessions, instructors and participants discuss and reflect on the modeling and implementation choices made in development of the laboratory edition. During afternoon sessions, participants have the opportunity to present to the whole group about their application of Institute concepts in their own editions.

Session 1: Modeling choices.

● Why we did what we did, and how we decided to do it. (15 minutes, discussion)

● What we’d do differently. (15 minutes, discussion)
● What we’d do next. (15 minutes, discussion)

● Examining modeling choices from exemplary editions using what we know now. (45 minutes, talk lab)

**Session 2: Implementation choices.**

● Why use eXist-db? (20 minutes, discussion)

● Why use MVC? (20 minutes, discussion)

● Why not XSLT? Can I use XSLT? (20 minutes, discussion)

● Why is the API organized by verb? (10 minutes, discussion)

● Why use Git and GitHub? What are some management alternatives? (10 minutes, discussion)

● Why use VSCode? What could we have used instead? (10 minutes, discussion)

**Session 3: Your edition.**

● Workshop participant editions. (90 minutes, talk lab)

**Session 4: Your edition.**

● Participants present their editions. (90 minutes, talk lab)

### 7.2 Participant profiles

*Participant demographics, selection criteria, and application announcement distribution*

In January 2020 we invited applications to an Institute to be held that summer, for which we admitted twenty-five participants, only to have to postpone (ultimately for two years) because of Covid-19 travel and meeting restrictions. All applicants who had been accepted initially were automatically invited to participate in 2022, when we were finally able to meet, but six were no longer available because of changes in their personal or professional circumstances. To fill the resulting vacancies we advertised for additional applications in January 2022, eventually accepting a total of twenty-six participants.

The text of the announcement, which is available on our Institute website at [https://pittsburgh-neh-institute.github.io/Institute-Materials-2020/call/](https://pittsburgh-neh-institute.github.io/Institute-Materials-2020/call/), and which identifies the mailing lists on which it was circulated, is reproduced below. This is the original announcement, which includes the names of instructors and assistants who were later unavailable because of changes in their personal or professional circumstances, and whose positions were ultimately filled by others:
Call for applications: "Advanced digital editing: modeling the text and making the edition". A summer 2020 NEH Institute for Advanced Topics in the Digital Humanities

Application deadline: Applications are due Friday, February 28, 2020. Applicants will be notified of acceptance by Monday, March 23, 2020

Institute dates: Monday, July 6 through Friday, July 17, 2020

Synopsis: The University of Pittsburgh is pleased to invite applications to an NEH Institute for Advanced Topics in the Digital Humanities for summer 2020 entitled "Advanced digital editing: modeling the text and making the edition". The target audience for this two-week workshop is textual scholars who are already comfortable editing their digital texts in TEI XML or comparable alternatives; the goal of the Institute is to assist them in moving beyond textual editing to imagining, creating, and publishing research-driven, theoretically and methodologically innovative digital editions.

Rationale: Digital humanists already have access to workshops and tutorials to help them learn to transcribe, edit, and tag a text in preparation for publishing a digital edition. These training resources play a vital role in empowering editors to formalize and instantiate their interpretations as markup, so as to make them available for subsequent analysis. Nonetheless, sophisticated markup expertise alone is not enough to make an edition; learning nothing more than tagging may leave scholars staring at their angle brackets and wondering what to do next. Understanding how to turn a set of tagged texts into a customized, goal-oriented research edition is crucial for scholars who wish to ask original questions of their documents and produce innovative editions. Digital humanists cannot build editions that break methodological ground solely on the basis of solutions prepared largely by others. For that reason, the focus of this Institute is on the creation of digital editions motivated by project-specific research questions and implemented from a perspective driven first by theory of edition, second by editorial methodology, and necessarily but less importantly by specific toolkits. In this respect we foreground not learning a particular programming language, technology, or framework, but learning to think and act digitally about the process of creating a digital edition. Because tools and technologies come and go, the Institute emphasizes learning to translate original, technology-informed thinking about editions into implementations of those editions, rather than on “tooling up” in the context of currently popular frameworks. In this respect, the Institute recognizes thinking digitally in ways driven by project-specific research goals as the most important feature of sustainable Digital Humanities training and education.

Program: The Institute will introduce textual and manuscript scholars to a powerful
and broad-reaching set of digital methods and technologies, grounded in a context that prioritizes a research-driven theory of edition. Participants will engage with the entire editorial process, from document analysis to editing to publication, leading to the production and publication of a collaborative edition. Throughout the Institute, participants will discuss how the theoretical and practical skills they are acquiring will be applied in their own work, culminating in the final day’s presentations and review of the collaborative process. The Institute will meet at the main (Oakland) campus of the University of Pittsburgh from Monday, July 6, 2020 through Friday, July 17, 2020 and will draw on an international faculty of distinguished scholars, practitioners, and teachers of digital philology from several collaborating institutions.

Instructors

- Birnbaum, David J. (University of Pittsburgh; Institute Director)
- Bleeker, Elli (Royal Netherlands Academy of Arts and Sciences)
- Cayless, Hugh (Duke University)
- Haentjens Dekker, Ronald (Royal Netherlands Academy of Arts and Sciences)
- Keane, Gabi (University of Pittsburgh)
- Kulsdom, Astrid (Royal Netherlands Academy of Arts and Sciences)
- Olsson, Leif-Jöran (University of Gothenburg)
- Wicentowski, Joseph (US Department of State)

Guest instructors

- Beshero-Bondar, Elisa (University of Pittsburgh, social network analysis)
- Juola, Patrick (Duquesne University; stylometry and authorship attribution)
- Langmead, Alison (University of Pittsburgh, sustainability)
- Higgins, Shea (University of Pittsburgh, architecture, UX, UI, and visualization)
- Witt, Jeffrey (Loyola University Maryland; IIIF)

The instructors will be assisted by

- Schwarz, Emma (Senior Institute Assistant, University of Pittsburgh)
- Watkins, Samantha (Sam) (Institute Assistant, University of Pittsburgh)
Details

- Applicants should already be familiar with digital textual editing in TEI XML or similar technologies and should be seeking guidance and training in how to move their texts into innovative digital editions that will enable them to explore project-specific research questions. Evidence of meaningful prior hands-on digital textual editing experience is required, but prior experience in programming for textual exploration and publication is not. For budgetary reasons, preference will be given to applications from within North America.

- Participants accepted to the Institute will receive a travel allowance, complimentary accommodation in single-occupancy dormitory rooms with private bath, and a complimentary meal plan in the University Dining Services in lieu of per diem.

- Participants must bring their own laptops, which must run one of the following operating systems: Mac OS X (10.11 [El Capitan] or later), Windows 10 (version 1909 or later), or GNU/Linux (any distribution); mobile and cloud-based operating systems, such as iOS and Chrome OS, are not supported. We welcome scholars at all career levels from graduate students through senior faculty. Applications to the Institute should include the following:

  - A one- to two-page statement about how participation in the Institute will enhance the scholarly and professional goals of the applicant. This statement should describe the digital edition project that the applicant plans to pursue or undertake, with special attention to the research questions motivating the creation of that edition. Preference will be shown to applications that articulate a clear understanding of the textual research potential of digital scholarly editions.

  - A one-page description of the applicant’s experience with textual editing. Prior experience in programming for text processing is neither required nor expected, but those who have such experience should describe it here. If participants have prior experience with X-technologies for transformation and publication (XSLT, XQuery) they should list it here as well. Brief CV (maximum of two pages), concentrating on textual editing and Digital Humanities experience.

  - Participants are required to participate full-time in the Institute for the two weeks that they are in residence and must confirm that they will not undertake other significant commitments during the Institute period. Participants should plan to arrive on Sunday, July 5, 2020 and depart on Saturday, July 18,
All application materials should be submitted by email as a single PDF file to djbpitt+neh@pitt.edu. The deadline for applications is Friday, February 28, 2020, and applicants will be notified about acceptance by Monday, March 23, 2020. Questions may be directed to djbpitt+neh@pitt.edu.

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The principal selection criteria, described in more detail in the text of the announcement, above, were 1) some prior knowledge of and experience with XML and 2) a serious commitment to creating digital editions. We also prioritized including a mixture of faculty, post-docs, graduate students, independent scholars, and librarians and other alt-ac digital humanists.

The final list of participants was distributed as follows:

- Faculty: 11
- Post-doc: 4
- Graduate student: 4
- Librarian and other alt-ac: 4
- Independent scholar: 3
- Studying or working in the US: 22
- Studying or working outside the US: 4
7.3 Daily feedback

At the end of each day, we sent a survey to participants via our shared Slack workspace. The surveys asked new questions each day to encourage thoughtful and critical responses to the specific sessions and topics covered. The questions ranged from casual check-in to theoretical baselines to technical skill self-grading—for example, Day One gauged software installation progress, understanding of computational pipelines, and pacing. With the feedback provided, both written comments and numerical scales, we could adjust our pacing and detect patterns in common issues, questions, or requests.

We chose to keep these surveys anonymous so that participants could feel comfortable sharing their honest opinions. The anonymity made it impossible for us to respond individually to comments, and for that reason it was important to vary the avenues for feedback and questions to avoid losing track of someone who was struggling to keep up. To offset this risk, we offered one-to-one consulting time with any instructor during breaks, evenings, or weekends. This was possible in part because of the hands-on troubleshooting or “elving” we did continuously: participants were prevented from falling behind in a significant way and were creating relationships with instructors simultaneously. We felt that any survey feedback that revealed a major gap in someone’s knowledge or experience could reasonably also be detected throughout the course of the day, or in private consultation with an instructor.

Participants found two topics most consistently difficult: Git and XQuery. In some feedback, participants expressed frustration that we were teaching a more difficult approach to version management software than what was necessary for the size of their project. At the same time, “Git” was the most frequent response to the question “What do you want to learn more about?” on the day it was first introduced. We knew from previous experiences teaching Git that it would require several days of exposure for new users to feel that the benefits justified the effort, which is why we introduced it early and built in practice using it on the command line. XQuery also tended to be a widely requested and often misunderstood topic, with participants answering the questions “the topic I understood the least”, “the topic I can use the most”, and the topic “I would like to learn more about” with some variation of the XQuery topics covered.

Feedback from the second week revealed a particular desire for more depth in the following “special topics” areas: network analysis and Cytoscape (taught by Elisa Beshero-Bondar) and IIIF (taught by Jeffrey Witt). Participants also identified a desire for collation education, a topic we’d significantly reduced from the 2017 Institute’s materials, this time taught as a single session by Ronald Haentjens Dekker.
7.4 January 2023 participant evaluations of 2022 NEH Institute

About six months after the conclusion of the Institute, we wrote to participants asking for their feedback. The survey form consisted of two sections: first, five reflective questions on participants’ overall experience during and following the Institute; second, eight Likert scale questions that asked participants to rank how likely they were to use the technologies covered during the Institute in their own work. We received responses from eight participants, and those responses are collected anonymously below.

Question 1

How did our in-person collaborative learning during the Institute inform your thinking about your own edition work?

Responses to question 1

1. Informal conversations and short peer presentations significantly broadened my perspective on how and why people create digital editions, and how the "why" shapes the "how."

2. I enjoyed the extended window of tinkering with edition-associated technologies. It was also, frankly, a time to think through more traditional, non-technological questions pertaining to my edition. (It is challenging for me to find this time during the academic year.) I came away with two main take-aways: 1) I need to find a way to bring a logical term to my work on this edition, even though I won't get to encode and publish everything in the analog collection. I can achieve this by sticking to a clear scope, and not getting distracted by "nice-to-haves." Having an open-ended project lifecycle has been making it hard to advance. 2) I would like to be more creative and trusting in terms of engaging with student collaborators. I had initially foreseen a rather limited role for student work, but if I can shift some of the vision board type interface work to students who will know more about such things than I will, the project will be better served. Also, it is okay not to act on all aspects of a wireframe exercise. Generating lots of ideas is the point of such exercises. Decisions, limitations, and priorities come into consideration later.

3. The institute provided a broad overview, both conceptual and technical, which helped me to see how my current work, rather narrow, fits into a more expansive Digital Humanities project. The planning and implementation of the two-week institute were excellent and the ongoing availability of the institute website is invaluable. The instructors were top-notch. Kudos to the Institute!
4. Above all, discussions with other digital humanists helped me limit the scope of my project and define exactly what I needed to propose to my university's library. (My project is still nascent.) Chatting about others' experiences with their own projects was invaluable.

5. It gave me a potential model for working with collaborators, though I don't know how realistic it is given varying levels of tech literacy.

6. The most important thing that being in person (finally!) offered me was the reminder that it takes many different skill sets to build a good edition, even if such expertise all in one place is extraordinarily hard to come by. I don't want to suggest that a lack of access (or frequent access) should stop people from attempting this work more than it already does. In fact, I mean for this comment to be encouraging rather than discouraging: it reminds me that I don't need to know everything myself, but rather to know to whom to go and how to build the right network (of people, in this case!). This NEH Institute and similar opportunities are rare but INCREDIBLY valuable. I cannot articulate that enough. I am wondering if some of us could write an application for a working group with bi-annual (every other year) one-week meetings.

Question 2

Which project management method demonstrated during the Institute has been most useful in your work?

Responses to question 2

1. It drove home the importance of people on a team being more cross-trained and less siloed, both so they can communicate and understand better and to reduce the chance of a project failing because of the loss of a team member.

2. I found the sketching assignment to be of great value because it freed me from the question of "can I do it?" and allowed me to think in terms of what kind of interface would best serve the material and the types of audience I envision engaging with.

3. Though I have not implemented it yet, I was excited to learn how XQuery and exist-db can be used to extract and re-purpose elements of the primary source. This illuminated for me the full value of xml encoding.

4. Being asked to consider how and when the project will end at the outset has been immensely helpful. I had not seriously considered who might take care of my project after I leave my postdoctoral position.
5. Honestly, I haven’t used any of them yet.

6. It may seem simple, but the concept of regular meetings with clearly-defined agendas for each meeting has been something I’ve done constantly since the Institute. I often let meetings slide before because my digital project was usually last place in the pecking order (by necessity), but now, I keep up with meetings if only to say, "I (sometimes "we," but usually "I") didn't get this done, but let’s set it a new deadline and/or delegate parts of it; also, here’s a time when I will check in via email between now and our next meeting to give you a progress report." Otherwise, I end up putting off tasks for longer.

7. The Institute offered a more thorough and systematic approach to up-front project planning than I had encountered before. I found this particularly helpful.

Question 3
How do you think differently about your research questions when you have programmatic access, such as with XQuery, to your XML-encoded texts?

Responses to question 3

1. I came to the institute with some XSLT knowledge (I write my own stylesheets). I still haven't perfectly integrated XQuery, but I wouldn't say my approach to editorial research questions has changed much. If anything, I am a little too modest in my ambitions, because I dread having to figure out how to press it out of my XML files later, lol.

2. I am in the process of completing the encoding, validation, and publishing of the Beggar’s Opera text. Working through the digital edition in the Institute helped me to think more strategically about the tagging of my TEI/XML encoded text.

3. Other users are now more present in all my considerations--as I research, I ask not just how I might make this information useful in my own classroom and research, but how I might make the original text itself something portable for other scholars' future projects. (This was not initially a consideration since I am digitizing a very small, relatively unimportant text for hyperlocal use at my university.)

4. I need to get competent at XQuery before I can even consider using it this way.

5. While I don’t take advantage of programmatic access nearly often enough, I think it’s fair to say that I have thought of my XML-encoded texts from a programmatic angle since I began creating them in 2020. Where the Institute helped me more was both
reminding me of skills and methods I was rusty with and teaching me new means of access (i.e., not GitHub Desktop, but more adeptness with the command line).

6. There is a difference between knowing that one can query XML and knowing how to query XML. Thinking about query at the design and implementation stages has helped me to make better encoding decisions.

**Question 4**

How has the Institute affected your approach to user experience (UX) in your own editions?

**Responses to question 4**

1. The wireframing exercise enabled me to rethink the layout of the webpage for my proposed project.

2. Not too much, although I appreciated the presentation on UX. It gave me a lot of language and examples for ideas that weren't yet fully formed for me.

3. I have little experience with UX and, quite honestly, I'm not sure how to answer this. I am still so absorbed in the back end technical details that much of UX flies right over me. Sorry I can't be more explicit.

4. I've been encouraged to simplify my project so that users (primarily undergraduate students and literature instructors who may or may not have a background in Medieval Studies) can focus on the materiality of a medieval manuscript instead of on the manuscript’s content (which has traditionally been my own research focus).

5. I'm not that far along yet.

6. The "3-click" rule has come up in my conversations with my technical consultant and interns multiple times as we redesign our menu/browsing options.

7. I'm thinking more about specific users and what they will need. The "general user" I was imagining before was really just me who, of course, already knows the data and where everything is.

**Question 5**

Which guest lecture had the most impact on your work, and why?

**Responses to question 5**

1. It's hard to pick one. Even the ones whose presentation style was a bit impenetrable for me at first, I eventually found my way back to some of what they covered. As an
example of what I keep coming back to (thanks, btw, for keeping everyone’s presentations on the NEH institute website): Leif-Jörn’s presentation on documenting and Chelsea’s on project planning.

2. A bit like asking me for my favorite movie...hard to say. Probably the first day’s "Transformation and model-view-controller", though it took me the rest of the Institute to figure out what the speaker had been talking about.

3. Patrick Juola’s lecture was thrilling, as I used some basic stylometry methods in some graduate school projects (unrelated to my current digitization project). His lecture inspired me to begin using stylometry as a mode of inquiry again.

4. Learning about collation and stylometry were the most relevant for what I'm doing.

5. Hard to pick! My FAVORITE lecture was the Stylometry one, even if I have yet to dream up a use for it for my own work; but there’s no question Shea Higgins’s "User-oriented design principles" was most impactful for my work because we are in the process of setting up most of our site’s features for the first time and redesigning what little we do have in the way of browse functions.

6. Network analysis. This was a skill I really didn’t have but needed. I’m still working to consolidate that knowledge.

Questions 6 to 13 (Likert scale)

How likely are you to use these technical tools (or their analogs) in your own research? For each of the listed tools below, please evaluate how likely you are to use them in your own work. An answer of 1 is “not likely,” 3 “likely,” and 5 “very likely.” An answer of 2 or 4 is something in-between.

Responses to question 6-13

A. **Technical tool**: Git and GitHub

   - **Responses**: 5 (“very likely,” 7 participants); 3 (“likely,” 1 participant).
   - **Mean response**: 4.8 (near “very likely”).

B. **Technical tool**: Command line utilities

   - **Responses**: 5 (“very likely,” 7 participants); 3 (“likely,” 1 participant).
   - **Mean response**: 4.8 (near “very likely”).

C. **Technical tool**: XML database (such as eXist-db)
Responses: 5 (“very likely,” 3 participants); 4 (near “very likely,” 1 participant); 3 (“likely,” 1 participant); 1 (“not likely,” 3 participants).

Mean response: 3.1 (“likely”).

D. **Technical tool:** XML programming languages (such as XQuery and XPath)

Responses: 5 (“very likely,” 6 participants); 4 (near “very likely,” 1 participant); 3 (“likely,” 1 participant).

Mean response: 4.6 (near “very likely”).

E. **Technical tool:** Web technologies (such as HTML and CSS)

Responses: 5 (“very likely,” 7 participants); 4 (near “very likely,” 1 participant).

Mean response: 4.9 (near “very likely”).

F. **Technical tool:** Programming editors (such as VSCode and eXide)

Responses: 5 (“very likely,” 4 participants); 4 (near “very likely,” 3 participants); 3 (“likely,” 1 participant).

Mean response: 4.4 (near “likely”).

G. **Technical tool:** Debugging tools (such as Monex, Developer tools in browsers)

Responses: 5 (“very likely,” 3 participants); 4 (near “very likely,” 1 participant); 2 (near “likely,” 2 participants); 1 (“not likely,” 2 participants).

Mean response: 3.1 (“likely”).

H. **Technical tool:** External APIs (such as Mapbox)

Responses: 5 (“very likely,” 2 participants); 4 (near “very likely,” 3 participants); 3 (“likely,” 1 participant); 2 (near “likely,” 1 participant); 1 (“not likely,” 1 participant).

Mean response: 3.5 (“likely”).