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Digital humanities is often presented as classroom savior, a narrative that competes against the idea that technology virtually guarantees student distraction. However, these arguments are often based on advocacy and anecdote, so we lack systematic research that explores the effect of digital-humanities tools and techniques such as text mining, Geographical Information Systems (GIS) and network analysis have on learning outcomes. This study applies activity theory in a case study of a history classroom in order to understand how introducing digital-history methodology using analog tools like posters and whiteboards can improve student appropriation of history-specific disciplinary skills. The end goal is to provide clear direction for humanities instructors with varied access to technology as they seek to understand how digital humanities tools might still fit within the larger pedagogical practices of higher education classrooms and within the push toward digital methodologies in traditional humanities classrooms.

INTRODUCTION

“Ban all technology in classrooms!”, one article reads (Rockmore, 2014). Another says, “Students are welcome to shop online during my lectures.” (von Schlichten, 2015) Yet another praises the active use of digital environments for supporting collaborative learning and promoting good citizenship (Marcinek, 2010). Digital humanities as a classroom savior that integrates big-data analysis techniques for text, mapping and social interaction competes against the idea that technology virtually guarantees student distraction on the other. That division results in discussions of digital-humanities pedagogy classroom praxis that are largely anecdotal or advocacy-oriented.

The focus on advocacy has considerable value. Anecdotal stories suggest that student engagement improves when students encounter humanities challenges mediated by digital methodologies like GIS or other big data techniques like text mining and network theory (Dougherty & Nawrotzki, 2013; Kelly, 2013). However, these anecdotal results are generally produced in classrooms run by instructors with advanced skills in the technology they are teaching and in classrooms well-equipped for technology-based inquiry. Such settings are rare and difficult to duplicate, and many instructional technologies go unadopted because instructors lack the resources or motivation to make major changes to their teaching practice (Blin & Munro, 2008). As a consequence, it’s difficult to imagine, much less study and produce quantitatively significant learning outcomes for, a digital-humanities-based activity that can be widely distributed to campuses with varying institutional support for classroom technology.

Activity Theory

One approach to bridge the gap between systematic activity design and systematic learning-outcome study for the digital humanities is activity theory. Activity theory situates learning in a sociocultural environment, and particularly in the shared collective exercises that are at the core of digital-humanities pedagogy (Engeström, 1987; Greeno, 2006; Vygotsky, 1978). The fluidity of group organization, technology interface, and classroom resources makes it difficult to assess the role technology, or indeed any one variable, has in any learning outcome (Danish, 2013). Activity theory helps untangle individual components (the learning objective itself, classroom norms, lesson-plan rules, the division of labor, the participants), situate these components in their socially constructed context, and make it easier to individually examine the role of any tools that mediate participants’ engagement with the other classroom variables.

This study applies activity theory to the design of a series of activities in a history classroom in order to explore how introducing digital-history methodology, which generally narrow the use of GIS, big-data text-mining techniques and social-network analysis to research on historical perspective and context (Seefeldt, D., and Thomas, 2009), might change student learning outcomes. In the examples that follow, activity theory is used to systematically trace the effects of decisions about the length, scope, and structure of a digital-humanities activity on students in a 25-person undergraduate introductory history course. The 200-level course contained a writing intensive component and drew from the student body of a large Midwestern university. Students were age 18-25, representing 14 different majors (including undeclared students) from all undergraduate levels. The current study also acts as a roadmap for a larger quantitative study that will examine some of the changes that new mediating artifacts and rules might have on the community and division of labor in a larger lecture classroom.

Applying activity theory to an undergraduate humanities classroom makes several contributions to both educational research and humanities pedagogical practices. Although some work has been done on the value of using activity theory to structure writing and composition courses and on the overlap between composition and entry-level survey history courses (Adler-Kassner, Majewski, & Koshnick, 2012; Russell, 1997, 2013), activity theory is rarely applied to humanities pedagogy broadly or history pedagogy on a narrower basis. A demonstration of its value in humanities classroom-activity planning broadens the reach of this valuable theoretical approach to SoTL audiences in humanities at large. More importantly, activity theory provides a systematic approach to evaluating the learning outcomes that are supported by modern data analytics techniques, a perspective that expands the use of technology in history learning beyond simulations and games (Morgan, 2013; Robison, 2013) and counters media narratives that mitigate the wide media swing between technology as a classroom...
Activity theory helps us isolate the physical, psychological and cultural artifacts that mediate one’s actions. In this case, the mediating artifacts for students are classroom tools (textbook, lecture), while the mediating artifacts for historians comprise of disciplinary knowledge that has been appropriated as a psychological tool (contextualizing historical data). The elements of this tacit disciplinary knowledge—the practice of taking more visible in service of making good pedagogical choices. To that end, I will first use activity theory to break a generic historical-thinking activity into the individual features that combine to shape the activity: classroom environment, the activity’s content, and the available tools. I will then apply that general process more specifically to three single-session activities using three different digital-history methodologies in service of a discussion of the value of single-value methodologies and analog tools in general. By examining three different methodologies together, we can see how the rules, object, and division of labor vary or overlap for a specific instructional goal. The three activities together also demonstrate the broader value digital methodology offers as instructors bridge the gap between their expertise as historians and the barriers students often face as they tackle the practice of historical thinking.

The simplest version of an activity triangle represents the subjects in the classroom—students, along with the objectives of activity, which helps clarify the changes we might make elsewhere.

Figure 1

Students’ Mediating Artifacts

<table>
<thead>
<tr>
<th>STUDENTS’ OBJECT</th>
<th>Students read historical fiction (e.g., a novel, short stories, biogra- phies) and discuss the implications of what they read. Students may be divided into groups of 4-6 people in a 20-25 person classroom.</th>
</tr>
</thead>
</table>

HISTORIAN’S MEDITATING ARTIFACTS: Controlled historical data

<table>
<thead>
<tr>
<th>STUDENTS’ MEDITATING ARTIFACTS</th>
<th>Uncontrolled historical data drawn from the primary source</th>
</tr>
</thead>
</table>

SUBJECTS: Students

OBJECT: Uncontrolled historical data in argument

RULES: With or without instructor, students identify and include certain local data.

COMMUNITY: Students, textbook, instructor, the public.

DIVISION OF LABOR: Students, textbook, instructor.

Time limits? Yes, student discussion timeline.


Figure 2

For instance, if not all students have laptops, at least one of the mediating artifacts must replace the computer and its allowance for writing, reading and drawing. Similarly, if a class has been divided into permanent groups, those groups dictate the division of labor during the lesson. Activity theory helps students shift their perspective, they begin to reflect on the purpose of taking historical perspective as it supports a historical argument. The appropriation not just of the digital tool but also of the instructor’s objective for their own research needs to be their own understanding of their approach to the practice of history. While this appropriation may not always lead to a metacognitive awareness of what it means to practice history, it may begin to develop that metacognitive awareness in novice historians (Wilson & Bii, 2010; Flawel, 1979). The three digital methodologies I explore below—spatial history, text analysis and network analysis—accomplish this restructuring of knowledge differently. The mapping exercises embedded in GIS and spatial history activities embed the bits and pieces of an unfamiliar geography of a far-off past in the larger context of a tool students regularly use to get driving or walking directions. Thus, the digital tool helps students shift their perspective, they begin to reflect on the purpose of taking historical perspective as it supports a historical argument. The appropriation not just of the digital tool but also of the instructor’s objective for their own research needs to be their own understanding of their approach to the practice of history. While this appropriation may not always lead to a metacognitive awareness of what it means to practice history, it may begin to develop that metacognitive awareness in novice historians (Wilson & Bii, 2010; Flawel, 1979).

Figure 3

Analog Tools in Digital History Classrooms

Theoretical Motivation

The more practical details of the lesson plan are shaped by the larger limiting factors that help toward laptop access and learning—smaller, more approachable mediating artifacts that give students autonomy without leaving them adrift and confused (Yorke, 2003). This same balance between student autonomy and structure means formative assessments using these tools are likely to make student learning outcomes more visible for instructors (Sadler, 1998). By using digital tools to explicitly redirect students’ object of activity, activity theory helps students develop the psychological tools that underpin the disciplinary practices common to a professional historian (e.g. understanding historical context). As the psychological tool helps students shift their perspective, they begin to reflect on the purpose of taking historical perspective as it supports a historical argument. The appropriation not just of the digital tool but also of the instructor’s objective for their own research needs to be their own understanding of their approach to the practice of history. While this appropriation may not always lead to a metacognitive awareness of what it means to practice history, it may begin to develop that metacognitive awareness in novice historians (Wilson & Bii, 2010; Flawel, 1979).
assumption that their learning objective is to memorize names, dates and places, but the goal for each map shifted memorization to the tool category in order to serve my learning objective: an argumentation exercise that communicated geographic significance based on the focus of their cartogram. Additionally, the integration of the three representations into a single classroom activity addresses the digital-literacy issue of maps as malleable objects that can be altered to make arguments, rather than maps as static representations of “true space.” Finally, the lesson allowed students to make use of digital tools like Google Maps, Stanford’s ORBS (which provides travel-time calculations using ancient travel methods), and Wikipedia on their smartphones, while asking for an explicitly analog output: a poster-paper sized hand-drawn map.

Lesson Plan

Introducing students to cartograms as a branch of GIS and map-making required particular attention to the idea of maps as malleable argumentative representations. That meant a short introduction using 2012 Presidential Election electoral maps to demonstrate a spectrum of cartogram alternatives to GIS maps (Gastner, Shalizi, & Newman, 2005; Newman, 2012). Students were first shown a geographic accurately map of the US and its electoral outcome, with states sending electoral votes to the Republican candidate in red and states sending electoral votes to the Democrat candidate in blue [Figure 4, where red is light gray and blue is dark gray]. They were then shown an electoral cartogram in which the representation of geographic size was mitigated by population density [Figure 5]. The final cartogram used the same population-density allocation of geographic space, but instead of red/blue, only the map represented a spectrum of percentage Democrat/Republican split, represented by shades ranging from red to purple to blue [Figure 6 and here the subtle gray shades demonstrate how well distributed the popular vote was geographically between the two candidates].

Outcome

As we moved through each map, students were asked to describe that map’s argument about the political distance between Republican and Democrat and the percentage of the country that subscribed to Republican or Democrat value systems. We used their responses—which moved from Republican-dominated and widely politically divided to mixed and more politically centrist as they viewed each successive map—to frame the idea of maps as visual arguments.

Figure 5

A Travel Map

- How does landscape alter people’s experiences?
- How long did it take to get from place to place?
- Which routes did people take from place to place?

A Frequency Map

- Where are Saladin's positive experiences?
- Where did Saladin spend most of his time?
- How is the frequency landscape different from the population landscape?

Figure 6

Student groups were then asked to use the basic visual principles in the cartograms—color as a representation of difference, size as a representation of importance, and distance as a representative of both geographic distance and conceptual distance—to create an argumentative map of their own. The instructor prompt focused on a particular kind of historical perspective-taking for each type of mapping exercises, providing extra questions to guide the students as they thought about what their argument would be [Figure 7].

Text Mining

As with the mapping exercise, this text mining exercise focused on aligning student objectives about memorization with instructor objectives more focused on argumentation. In this case, however, the goal was to shift student understanding of authorial purpose. Synthesizing documents with competing or confounding narratives, for corroborative purposes or to understand ongoing thematic focus, is a significant historical-thinking skill set, particularly in a very large text like the Iliad, the subject of this example. Breaking large confusing narratives into very small, familiar, easy-to-digest pieces and then reassembling them can help students find thematic and corroborative structure in ways that instructors struggle to do with more open-ended discussion. So the lesson exercise focused on chapters 6, 7, and 8 of the Iliad, in which (respectively) Homer explores Hector’s familial connections, the role of honor and the gods in war, and the role of fate. As an instructor, my goal was to help students understand Homer’s literary purpose in connecting the audience to Hector's story.

Figure 7

3 Maps (1 Map and 2 Cartograms)

A Travel Map

- How does landscape alter people’s experiences?
- How long did it take to get from place to place?
- Which routes did people take from place to place?

A Frequency Map

- Where are Saladin's positive experiences?
- Where did Saladin spend most of his time?
- How is the frequency landscape different from the population landscape?

Figure 8

As they were reading the text, the students said, they began to review their assumptions and give Jerusalem slightly less weight, but it still held a place of honor. Given media emphasis on Jerusalem in coverage of the Israeli/Palestinian conflict, this is hardly surprising, since students tend to import familiar knowledge into their historical understanding of events taking place in geographies with which they have little personal experience.

After the mapping exercise, however, both students described their surprise that Jerusalem was far less dominant than Acre, a tiny fortress with geographic space that was instead of red/blue, only the map represented a spectrum of percentage Democrat/Republican split, represented by shades ranging from red to purple to blue [Figure 6 and here the subtle gray shades demonstrate how well distributed the popular vote was geographically between the two candidates].

Additionaly, the individual discussion and initial shifts in response to the actual information in the primary source—as compared to student assumptions about what would be in the primary source based on their knowledge of the modern Middle East—were fostered by each individual mapping exercise but only firmly cemented by whole-class discussion of all of the maps together. The initial division of tasks suggested by an activity theoretical breakdown of the classroom emphasized the value of a wrap-up comparison, and the affordances of the analog tools that also came out of an activity theory analysis made that comparative discussion more productive. One of the major advantages of digital methodology performed with analog tools is its escape of the limitation of a single classroom screen display. This exercise allowed students to simultaneously see all of the map-making products, and it supported two groups’ choice to distort the geography of the Middle East in order to make an argumentative point.

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emotionally so they had a stake in his battle with Achilles and then his death, but also to understand the historical artifact of the text's emphasis on honor and familial connection even in the face of certain death.

I introduced the activity by suggesting that an author has very specific goals for communicating to an audience when they structure a narrative. With authorial purpose as our object on the right side of the activity theory triangle (Figure 11), and a rule that requires the instructor to break the text into smaller pieces, the remainder of the activity triangle focuses on how to organize students to see authorial purpose as it changes across different chunks of the text. Word clouds provide a simple, but effective, approach to the kind of analytical partitioning that text mining encourages. Activity theory analysis coupled with previous experience with the mapping exercise again suggested that the most learning gains would come from combined whole-class discussion after diverse small-group tasks. It can be difficult to produce even a simple text-mining artifact like a word cloud with limited experience, so students in three smaller groups were given specific instructions about how to identify characters and themes of interest in their section of the reading—one chapter of the Iliad—and then track those themes. As with the mapping exercise, not all students had laptops, so artifacts needed to be analog (in this case white boards instead of poster paper, although poster paper works equally well if the classroom is equipped with only a chalkboard).

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Students were then asked to produce a word cloud on the white board arguing for their ranking of thematic and character importance, using Wordle and their understanding of the simple argumentative strategies introduced at the beginning of class to guide their color, size and placement choice. As with the spatial-history exercise, the whiteboard acted as a mediating tool and was divided into three sections, so that the end result was a simultaneous display of all three word clouds for chapters 6, 7, and 8 of the Iliad, in that order.

Outcome

The first shift in perspective was visible when students began to negotiate thematic frequency. In the process of a seemingly quantitative discussion about thematic frequency, students began to make qualitative judgements about the generic themes they had tracked on an individual basis ("family", "battle","war"). These themes narrowed very quickly as a consequence of discussion, replaced by themes rooted in authorial language like "guest-friendship" or "ties of battle" begin to emerge. This process indicated an advantage to small-group work, which promoted a more complex understanding of and deeper engagement with the author's purpose. Students then tracked the frequency of these more complex themes, which also required each student to re-engage with and partially re-read the text, which is practical matter is a victory of its own.

The students working through book 6 highlighted the very mundane day-to-day interplay between warrior culture and family culture, and the role the gods had in encouraging or discouraging the balance between those two poles (Figure 12). The students working on book 7 focused their verbal description on the very mundane day-to-day interplay between warrior culture and family culture, and the role the gods had in encouraging or discouraging the balance between those two poles (Figure 12). The students working on book 7 focused their verbal description on the very mundane day-to-day interplay between warrior culture and family culture, and the role the gods had in encouraging or discouraging the balance between those two poles (Figure 12).
of information and then comparing and discussing their conclusions in the context of the other groups’ artifacts. In this case, students focused on the shift from human agency in chapter 6 to divine agency in chapter 7 and finally to the overwhelming sense of fate that reduced both sets of agents to pawns in chapter 8. Their conclusion was that Greek audiences idealized close family relationships as much for their emotional attachment as for their indication that familial lineage is important for inheritance and social stability, but that the emotional connections created by familial relationships aren’t subject to destruction by fate in the same way as social stability. This shift toward integrating an ‘humanized’ social and familial norms about class and familial organization, audience reception of the Iliad and Homer’s authorial purpose is very much in line with a professional historian’s analysis of audience makeup as part of understanding authorial purpose. It is also very hard to accomplish in a single class session, and the adoption of text mining to break authorial structures into smaller pieces and then display those pieces visually contributed to students’ ability to engage with this particular historical task.

To demonstrate both the value of, and the pitfalls of, this approach to text mining, we wrapped up class with an example of what each book would look like if it had been modeled by a computer rather than by a group of humans. Book 6 is shown below (Figure 15) as an example (using text from http://classics.mit.edu/Homer/iliad.6.vi.html).

In this discussion, students immediately highlighted the more granular nature of the computer generated word cloud. For instance, “son” and “wife” are separate rather than combined into “family”. Students also pointed out the value of an algorithmic presentation, though with some concern about “dynamism” and “localness”, the underlying concepts that tie family values to guest-friendship in the student-generated word-cloud for book 6. More far visible in the computer generated word cloud than in the human-generated word cloud.

From a digital-literacy perspective, seeing their own topic word cloud juxtaposed with the computer-generated version helped students see both where their own thinking was more sophisticated and where it had gaps. This opened the door for a conversation on the ways in which natural-language processing and customization act as a filter for good or bad, when we use Google repeatedly to search for information about the world around us.

Network Analysis
Understanding context—social norms, cultural values, historical events—provides students in history courses with the information they need to craft an argument. In this case, our goal was to help students see the fictional description of a set of social ties as containing an imbalanced interplay of social-network features: interaction, social etiquette and familial devotion. This interactional focus also provides a digital-literacy lesson in social networks and their role in shaping contemporary relationships.

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to demonstrate that Hector, Priam, Achilles and Agamemnon held the mortal world together, with Zeus acting as an intermediary between the mortal world and the gods.

Each of the networks is in its own way, and the students in each group were thoughtful in visual expression of their argument. The real value, however, was that the students were able to tie these networks to the destruction of Greek society that is the hallmark of the Iliad, despite the fact that they had only read 3 of the work’s 21 total books. The discussion of Greek destruction drawn from these networks also led some students to make unsolicited comparisons to the lack of cooperation and disintegration of the Greek world in Herodotus’ histories, which we read earlier in the semester. One student noted that without the idea of a “real” social network, it would have felt awkward to make a conceptual tie between a work of fiction and a work ostensibly of history.

The broader examination of activity that began this study addresses students’ relationships to digital technology. Designing for technology tools is a way to scaffold students from memorization of facts to use of evidence, context, and critical thinking. By using primary sources as mediating artifacts that can be used. The appropri-ation of this new perspective is evidence of a larger pattern of student engagement with disciplinary norms made possible by incorporating digital methodology with historical thinking. The broader examination of activity that began this study addresses students’ relationships to digital technology. Designing for technology tools is a way to scaffold students from memorization of facts to use of evidence, context, and critical thinking. By using primary sources as mediating artifacts that can be used. The appropriation of this new perspective is evidence of a larger pattern of student engagement with disciplinary norms made possible by incorporating digital methodology with historical thinking.

activity theory suggests some overarching guiding principles that make determining the activity’s rules, explicit community, and division of labor a more manageable task.

The activity triangle is a theoretical framework for describing the components of an activity. It consists of three elements: goal, means, and object. The goal is the end state that the activity aims to achieve. The means are the actions and processes used to achieve the goal. The object is the object of activity, which is the target of the means.

activity theory provides a way to analyze the relationship between a student’s object of activity and the digital tools and methods used to achieve it. It is a way to understand the way digital tools and methods are used to achieve the goal of a digital activity.

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