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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

evil and technology as an unlimited catalyst for positive change (Cuban, 1986; Nardi & O'Day, 1999).

The most common way activity theorists make classroom variable interaction visible is by breaking down the collective activity in a classroom using an *activity triangle* (Roth, 2004). It does so by making the environmental features that affect a history student's experience 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-session activities 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 objective of students' activity and the tools they use to mediate the lesson they are learning [Figure 1]. Figure 1 also includes the object and mediating artifacts a professional historian might have for a historical-inquiry activity, which helps clarify the changes we might make elsewhere.

Figure 1
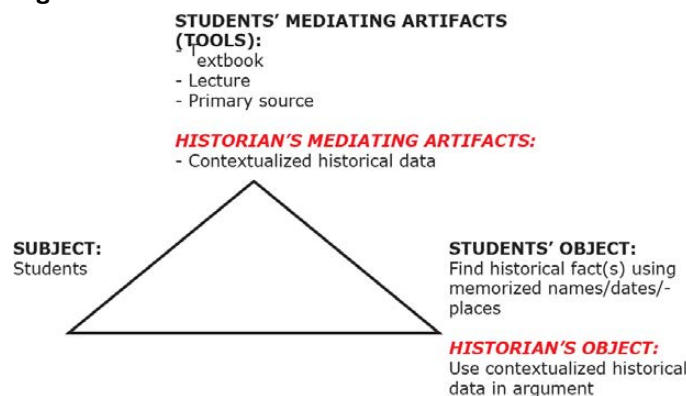
Adapted from Engeström, 1987; Danish, 2011

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 professional historians are comprised 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 perspective, for instance—have previously been placed into "decoding the disciplines" frameworks to identify the bottlenecks that prevent students from practicing history the same way a professional historian might (Middendorf, Díaz, Pace, & Shopkow, 2007; Wineburg, 2001).

Activity theory then highlights the kinds of decoding practices and perspectives identified by the "decoding the disciplines" framework, showing us where and how we might systematically

transform a physical mediating artifact present in the classroom—a primary source as a collection of pages to read—into an appropriated conceptual tool—a primary source as something to make sense of and use in an argument (Engeström, 1991). Arranging the classroom infrastructure more systematically helps us see how the appropriation of and use of these more conceptual tools by students can help them engage more meaningfully with historical tasks in which we want them to engage.

Specifically, novice historians often focus on the memorization of facts as their learning objective, while professional historians view the creation of a historical argument as their primary objective (Grim, Pace, & Shopkow, 2004). In more specific terms, historians often struggle helping students come to terms with the mix of familiar and unfamiliar in historical primary sources (Wineburg, 2001). The acknowledgement of this disconnect makes it more apparent that students see their goal as drawing facts from the texts they have been assigned, while historians see individual pieces of evidence from the texts as the mediating tool that helps construct an argument.

I used an extended activity-theory triangle to add several additional elements that interact with the object of the lesson and the mediating tools in use [Figure 2]. These elements make it easier to isolate each of the classroom features in order to better see how they interact.

Figure 2

Adapted from Engestrom, 1987; Danish, 2011
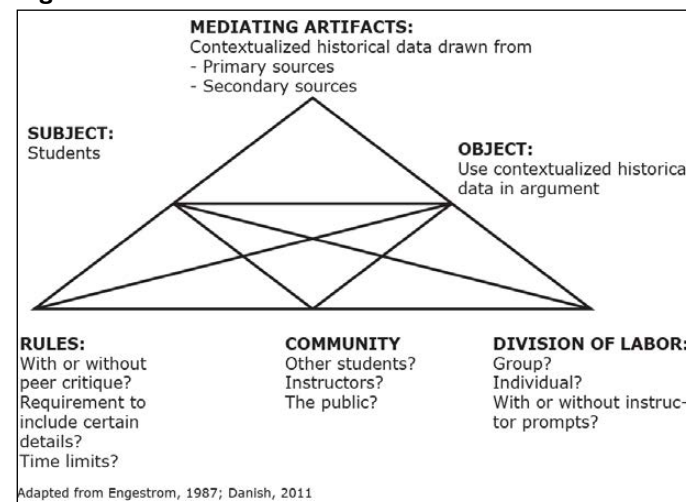
For instance, if not all students have laptops, at least one of the mediating artifacts must replace the computer and its allowance for writing, drawing and displaying. Similarly, if a class has been divided into permanent groups, those groups dictate the division of labor and will change the efficacy of the mediating artifacts depending on how rules of the activity are organized.

Existing work on historical thinking skills suggests three ways to overcome this obstacle: embedding unfamiliar information in familiar environments, breaking a familiar environment into smaller, less familiar pieces, and breaking an unfamiliar environment into smaller, more approachable pieces (Wineburg, 2001). A traditional history classroom might set out specific rules about how a student encounters a primary source: close reading outside of class coupled with the Socratic method during a lecture (Pace, 2004). Collaborative learning environments in history classrooms change the rules, community and division of labor in a history classroom in

order to better affect and track individual learning outcomes (Pace, 2004), but the underlying mediating artifact is still a combination of close-reading and Socratic questioning methods. Additionally, it's difficult to assess individual student learning outcomes when student appropriation of these disciplinary skills are tested via summative assessments in the form of broadly writ essay exams and long research papers that require many steps and many skills (Shopkow, Díaz, Middendorf, & Pace, 2012).

Adding digital-history methodology as a mediating-artifact layer on top of a primary-source mediating-artifact layer changes the classroom in one very important way: digital methodology often requires smaller, predictable chunks of primary source. These smaller pieces then require rules that change how students approach the primary source in equally predictable ways. Students who are mining a text for word-cloud purposes have more directed rules for reading than students who are reading a text with the broader, more general purpose of reading "for context." Instructors who give out those new, more direct rules, can guide students toward the specific things that make up context—themes, places, events, people, frequency of occurrence—and in doing so, shift the object of students' engagement to more closely parallel the instructor's object. In otherwords, these smaller predictable chunks provide 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, the instructor can then begin to help students develop the psychological tools that underpin the disciplinary practices common to a professional historian (e.g. understanding historical context). As the physical 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 restructures the students' 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 & Bai, 2010; Flavell, 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 embedding 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. Text mining breaks students of their surface-level familiarity with a text by breaking a text into smaller, less familiar pieces. Finally, networks take hard-to-analyze, difficult-to-remember seemingly-haphazard collections of people and clusters them into smaller, more approachable sets of relationships.

Mapping

While students generally know where Europe is—and they associate the medieval period with European centers like London or Paris —they are often unfamiliar with the basic geography of the medieval Mediterranean as a whole. That lack of familiarity limits students' understanding of geography's role as a historical actor,

as it shapes how people interacted with and moved through their environment. It also gives us a starting point for how to design this sample lesson in the activity triangle.

The instructor's primary goal was one of historical perspective taking: students should be able to understand how the agency of historical actors is affected by geographic context. Specifically, the case study uses Ibn Shaddad's *Rare and Excellent History* (Ibn-Shaddad, 2002), a Third-Crusade biography of Saladin, to demonstrate how desert geography and slower travel times limit historical events in unfamiliar ways. We also want to highlight the emotions people assign to geographic space as they write history. The object of perspective-taking on the right side of the activity theory triangle in Figure 3 is the foundational element in this activity triangle and directly affects the types of mediating artifacts or tools and the rules of the activity. Expressing multiple perspectives requires the creation of multiple maps. In other words, the lesson could not simply be about travel times. That requirement in turn affects the division of labor, requiring students to work in smaller groups to create individual maps. The other constraining element for this exercise was in the nature of the community: not all students had laptops. That further emphasized the small-group division of labor, but it also constrained output tools for each of those small groups to non-computerized display (or poster paper and markers). These in-class limitations also shaped the advance-reading directive. The activity requires multiple maps, which in turn requires different information about the geospatial environment Ibn Shaddad describes. Student groups were therefore asked to identify basic themes, historical figures and emotional highlights of the biography in addition to place names and movement in order to tie geospatial information to other content in the text.

Figure 3
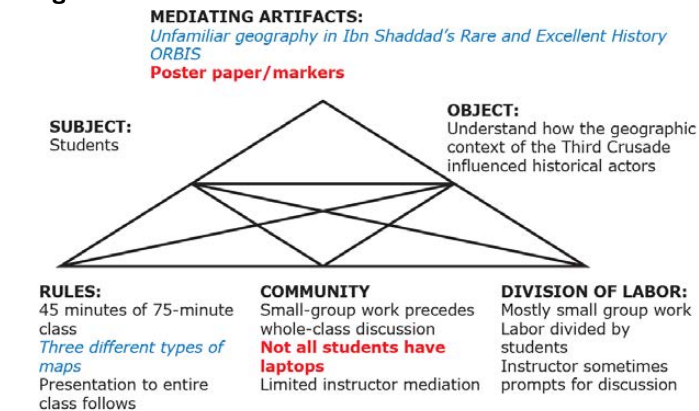
Adapted from Engestrom, 1987; Danish, 2011

Theoretical Motivation

The more practical details of the lesson plan are shaped by the larger limiting factors that hew toward laptop access and learning-objective shifts from facts to interpretation. I asked small student groups—4 groups of 4-6 people in a 20-25 person classroom—to create one of three maps. We then discussed their map in context of the other student-group creations. One GIS map focused on travel times using medieval travel methods would be accompanied by two cartograms, in which visualizations of geographic space would be altered by, in order, emotional experience and frequency of mention. The three maps made heavy use of the students'

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 ORBIS (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 geographically accurate 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 alteration 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].

Figure 4
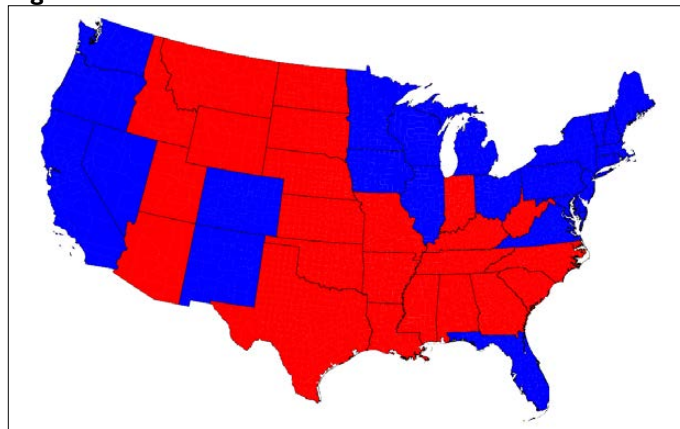
As we moved through each map, students were asked to describe that map's argument about the political distance between Republican and Democrat and the percentage of the country that subscribed to Republican or Democrat value systems. We used their responses—which moved from Republican-dominated and widely politically divided to mixed and more politically centrist as they viewed each successive map—to frame the idea of maps as
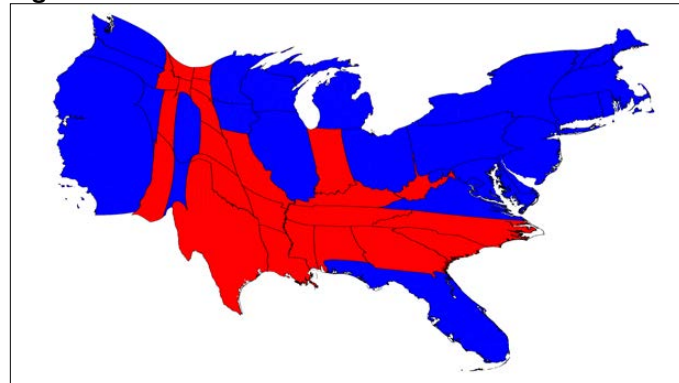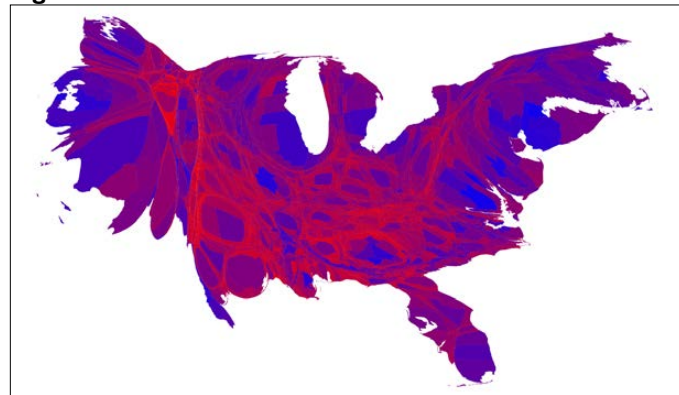
visual arguments.

Figure 5

Figure 6

Figures 4-6 © 2012 M. E. J. Newman

Student groups were then asked to use the basic visual principles in the electoral 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].

Outcome

The primary shift each student group made in both small-group map construction and in whole-class discussion was to reduce their perception of Jerusalem's importance in Ibn Shaddad's narrative. That small shift in geographic emphasis is a major shift in perspective, in line with the goals of the activity as I laid it out in my activity triangle during the lesson design. In his narrative, Ibn Shaddad focuses on Acre, but students often ignore his focus even in close reading or Socratic-method discussion. Their very modern perspective of the Middle East centers on conflict over holy sites in Jerusalem. By giving students the tools to explicitly rebuild Ibn Shaddad's narrative, their perspective shifts to a twelfth-century view of the Middle East, a perspective they can then use to understand Ibn Shaddad's very different geo-political context.

In whole-class discussion, two students, one from the frequency cartogram group [Figure 9] and one from the experience cartogram group [Figure 10], described a shift in their reaction

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? • What routes did people take from place to place?	**A Frequency Map** • Which locations are more important from Ibn Shaddad's point of view? • Where did Saladin spend most of his time? • How is the frequency landscape different from the population landscape?
An Experience Map • Where are Saladin and Ibn Shaddad's positive experiences? Negative? • How did Ibn Shaddad feel about the different places he'd been? • How did he portray Saladin's experiences?	

to the geography in *Rare and Excellent History*. Prior to reading the text, they assumed that Jerusalem would figure heavily in the Third Crusade. As they were reading the text, the students said, they began to revise their assumption 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.
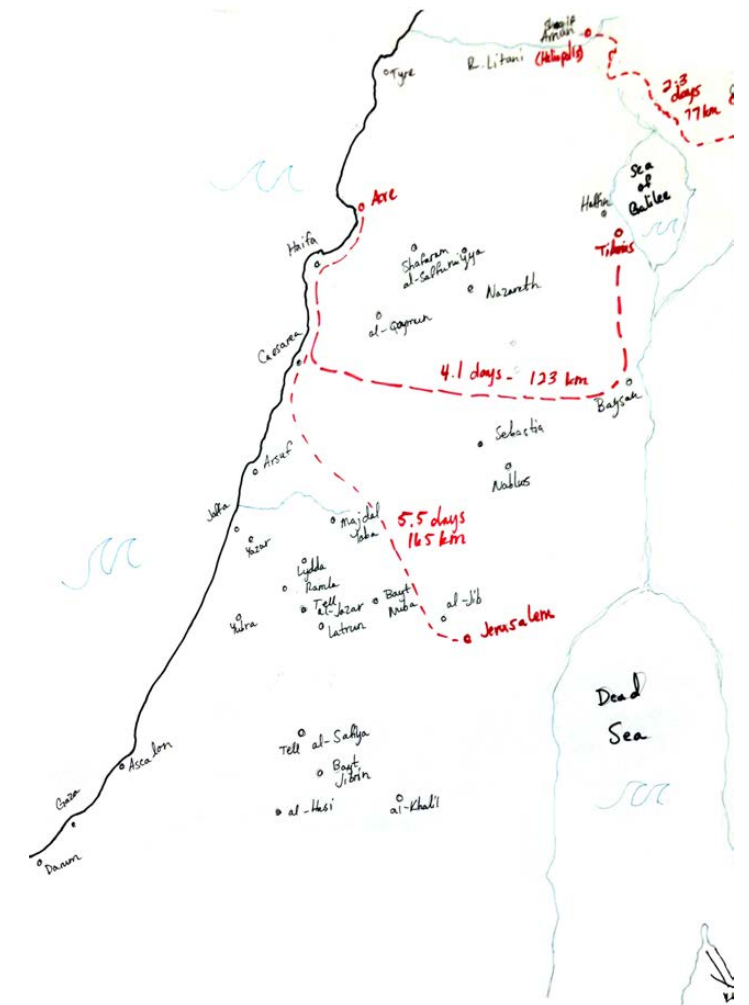
After the mapping exercise, however, both students described their surprise that Jerusalem was far less dominant than Acre, a tiny fortress on the Mediterranean coast, which figured far more heavily in Ibn Shaddad's narrative than their unstructured reading and notes suggested. At this point, a student from the GIS/travel map [Figure 8] added support for this shift away from Jerusalem by pointing out that Acre was the only city connected to two separate travel routes that figured highly in Ibn Shaddad's narrative.

From a digital-literacy perspective, seeing the distorted, but still recognizable, geographic space of the Middle East helped students to understand the tension between a static "truthful" set of driving directions and the constantly shifting geographic space that is the historical past. Mapping distortion is possible with GIS technology, but displaying distorted mapping layers with geographically accurate mapping layers on a single screen would be nearly impossible in a standard classroom with one screen at the front of a classroom. Using poster paper actually extended the GIS technology on which students were basing their maps in productive ways. The distortion coupled with simultaneous display fostered very fruitful discussion that brought student understanding of the Middle East into far better alignment with Ibn Shaddad's experience in the Middle East.

Additionally, 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.

Figure 8

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 confusing 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 unfamiliar 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 open-ended discussion alone. The 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

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.
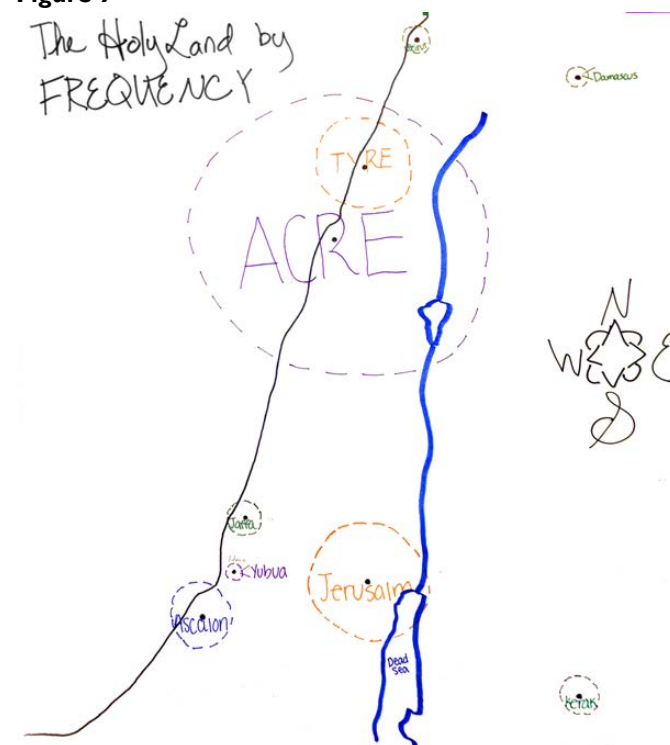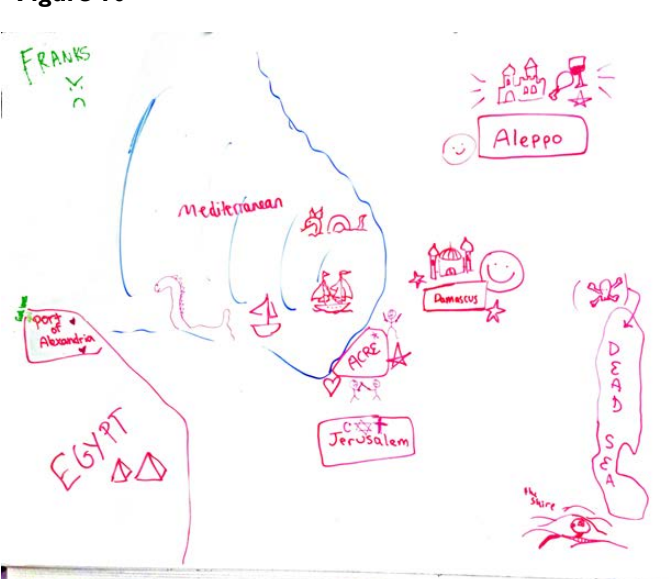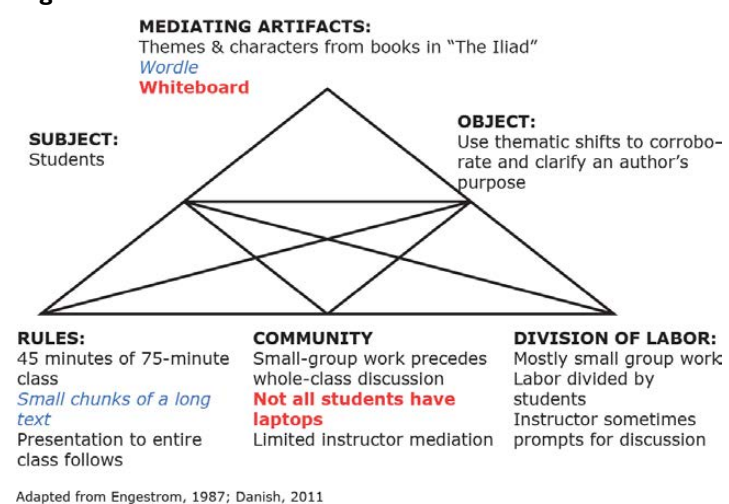
Figure 9

Figure 10

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).

Figure 11

MEDIATING ARTIFACTS:
Themes & characters from books in "The Iliad"
Wordle
Whiteboard

SUBJECT:
Students

OBJECT:
Use thematic shifts to corroborate and clarify an author's purpose

RULES:
45 minutes of 75-minute class
Small chunks of a long text
Presentation to entire class follows

COMMUNITY
Small-group work precedes whole-class discussion
Not all students have laptops
Limited instructor mediation

DIVISION OF LABOR:
Mostly small group work
Labor divided by students
Instructor sometimes prompts for discussion

Adapted from Engestrom, 1987; Danish, 2011

Lesson Plan

Students were introduced to Wordle (a web-based word-cloud generator) with the text of the first chapter of the Iliad so they had an example of what their text-mining word cloud should look like. We also used that Wordle cloud to discuss the importance of size, color and distance as elements of argumentation. Each of these elements emphasize values differently in visual argumentation, so this discussion was designed to bring an element of data-visualization digital literacy to bear in the production section of the exercise. Unlike the mapping exercise, the background on word clouds was otherwise minimal, since each student group had a laptop and the groups could experiment with their thematic and character weighting easily to best fit their argument about what was important in their chapter.

In the exercise itself, students in each group negotiated the themes and characters they had tracked individually, manually assigned frequency values to each of the characters and themes the group deemed important and then used one computer to enter those values and themes into Wordle, assigning manual weights using Wordle's advanced settings (http://www.wordle.net/advanced).

Students were then ask 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 "tides 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 as a practical matter is a victory of its own.

When the groups finished their word clouds, each group then presented a short 2 sentence overview of their word cloud to their peers in other groups. The students presenting book 6 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].

Figure 12

The students focused on book 7 highlighted a similarly human struggle: the tension between life and death [Figure 13]. They noted that in comparison with chapter 6, that focus was less on day-to-day life and more on the value of the physical realm vs the importance of the metaphysical afterlife. As with the struggle between warrior culture and familial loyalty, however, the gods played a role in balancing (or unbalancing) that tension.

Finally, the students working through book 8 highlighted the very high-level conceptual struggle that exists when we see hierarchies of power clashing [Figure 14]. Fate and its inscrutable invisible hand overwhelmed even the gods in book 8.
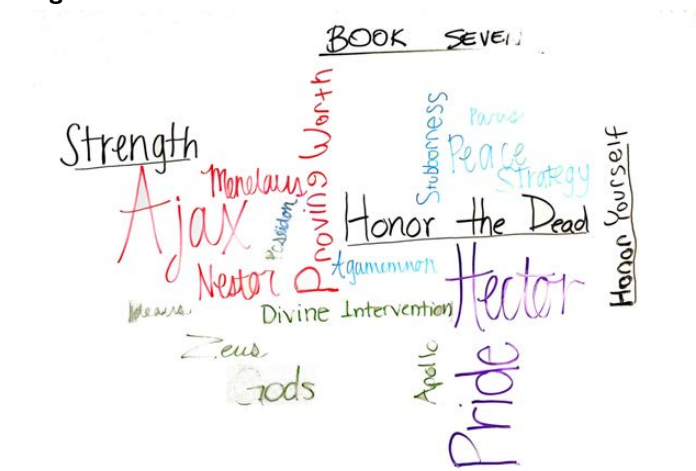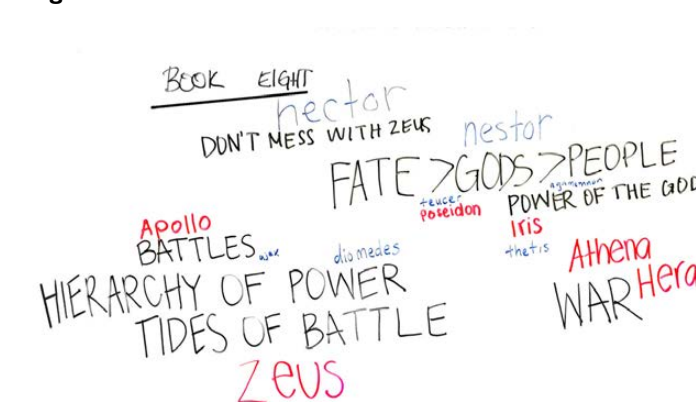
Figure 13

Figure 14

In the whole-class discussion that followed, students working on book 6 noted an initial reaction of surprise as the themes emerged for books 7 and 8. They were dismayed that the close-knit family Homer presents in visions of Hector playing with his young son is destroyed in book 7 and devalued in book 8. Students working on book 7 picked up on the implicit emotional attachment book 6 develops between the reader and Hector, and suggested that the destruction we see in books 7 and 8 would seem unimportant and distant without the connection to the worldly values of war and family in book 6. Finally, the students in group 8 noted that even the gods are subject to fate's will in book 8, with Zeus unable to save his own son Sarpedon, and that perhaps this structure was Homer's way of creating a parallel between the human nature of the gods and the short-lived relationships that humans create. One student in group 6 then argued that the tie between Homer and his son and Zeus and his son is as much about a noble lineage ending as it is about emotional attachment, despite the fact that Zeus displays far less personal affinity for Sarpedon.

This student's tie between social status and family ties marked a shift in the discussion from narrative to historical evidence. As with the mapping exercise, students made the biggest conceptual leap after engaging first in a very deep encounter with a smaller subset

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 audiences' social and cultural 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. "Noble" and "lineage," the underlying concepts that tie family values to guest-friendship in the student-generated word-cloud for book 6, are far more visible in the computer generated word cloud than in the human-generated word cloud.

Figure 15

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 their analysis 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.
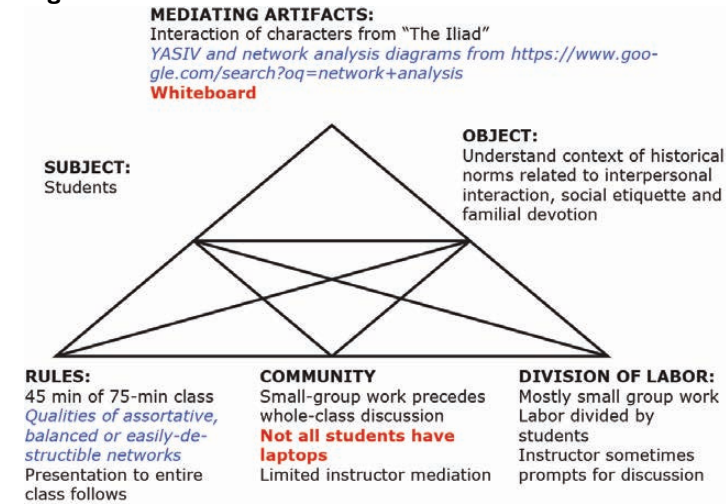
Network Analysis

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 important set of historical norms related to interpersonal 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.

The background of this lesson comes from an existing scholarly exploration of social networks in epic poetry. Pádraig Mac Carron & Ralph Kenna examined the networks in *The Iliad, Beowulf* and the *Táin Bó Cuailnge* and compared them to the structure of modern social networks as a way of determining whether these epic poems were based on familial and social networks that actually existed (Mac Carron & Kenna, 2012). The authors in this network theory piece described three kinds of behavior that create the features of a real social network: assortative behavior, or the tendency of people ("nodes" or circles in Figure 17) to have close ties ("edges" or lines between nodes) to other people with similar backgrounds, likes and dislikes (a pattern visible in the highly clustered nature of Figure 17); balanced behavior, or the tendency to engage not in exclusive two-way dyadic interactions but in three-way triadic or multi-way interactions (visible in Figure 18 by noting that few nodes have only a single edge or relationship); and easily destructible, in which connections between large clusters of dissimilar people are easily disrupted by the removal of one or two nodes (illustrated in Figure 19 by the fact that well-connected nodes at the center of a cluster connect to other well-connected nodes at the center of other clusters and removing these few well connected nodes would dramatically reshape the network).

Activity theory analysis coupled with previous experience with both mapping and text mining again suggested that the most learning gains would result when students pursued a local object of activity at the group level and were then able to explore and contrast that local object in the context of a larger whole-class framework. While it was valuable for students to see patterns within their group, the whole class discussion helped them to see how persistent and robust their own patterns were. With the context provided by historical social norms as our object on the right side of the activity theory triangle [Figure 16], and the three types of interactions laid out by Mac Carron and Kenna providing an easy way to divide small-group focus, the remainder of the activity triangle focuses on how to help students reflect their understanding of each network feature as a way of reconstructing their historical understand of the text. Students used their experience of character frequency in the text-mining exercise, which preceded this class session, as a foundation for creating the relationship patterns that grounded their network. They were instructed to think about whether their network did or did not meet the specific requirements of their assigned network feature, and told they needed to represent their yes/maybe/no answer using space, distance and color as with the text mining exercise. To give them a better sense of how different social-network features can be visualized, they searched for "network analysis" at Google Images (https://www.google.com/search?oq=network+analysis) on the central classroom computer and visualized their own Facebook network using YASIV (http://www.yasiv.com/facebook, now defunct). These minimal computer interactions, which generally impose some color on the visual organization of a network diagram, also mean some requirements for the mediating artifacts: white boards work, but chalkboards do not, because of the color requirement, so in rooms equipped only with chalkboards, poster paper works best.

Figure 16

MEDIATING ARTIFACTS:
Interaction of characters from "The Iliad"
YASIV and network analysis diagrams from https://www.google.com/search?oq=network+analysis
Whiteboard

SUBJECT:
Students

OBJECT:
Understand context of historical norms related to interpersonal interaction, social etiquette and familial devotion

RULES:
45 min of 75-min class
Qualities of assortative, balanced or easily-destructible networks
Presentation to entire class follows

COMMUNITY
Small-group work precedes whole-class discussion
Not all students have laptops
Limited instructor mediation

DIVISION OF LABOR:
Mostly small group work
Labor divided by students
Instructor sometimes prompts for discussion

Adapted from Engestrom, 1987; Danish, 2011

Lesson Plan

Each group was instructed to examine one aspect of a social network. Student assigned to study the assortative nature of the network focused on the appearance of tightly clustered sub-networks; students who were looking at balanced networks focused on the appearance of multiple edges for each node; and students looking at the destructibility of a network focused on the appearance of highly-connected nodes in an individual subnetwork acting as edges to highly-connected nodes in other sub-networks. Rather than simply representing the Iliad's network using their assigned feature, however, students were asked first to discuss whether they thought the Iliad's network met the qualifications of their assigned feature.

Their goal was to represent the results of their discussion as an argument in visual form. To support that, we again discussed basic principles of good data visualization: spacing to represent conceptual distance, color to represent categorical grouping, and size to represent frequency or some other consistent measure of importance. Students were given several examples of networks that were good representations of their assigned feature, and as discussion continued and individual groups began to ask questions about how they might make their argument clear, I provided specific examples.

For instance, the balanced-network group asked, after looking at the relationships they documented in the Iliad, how they might present a dyadic, or unbalanced, rather than triadic, or balanced relationship. I suggested putting nodes with many connections in a small cluster at the center of the diagram, leaving space to distribute the nodes that only had one connection around the outside. In that way, the nodes with only dyadic connections would actually take up the most physical space in the diagram and their single edge would be visually very clear, rather than crossing over lots of other connections.

Outcome

From an instructor perspective, one of the best things about this particular exercise was its iterative nature. All three student groups began with the assumption that the Iliad network was not real and therefore would not meet the qualifications of their assigned network feature. As they built draft versions of their network out from a starting node—usually Achilles, Hector or Zeus—on paper, their assumptions about how the Iliad network functioned began to change. I hoped

the process of discussion and network creation would emphasize revision as part of the historical argumentation process, rather than supporting the idea that history arguments are created perfect from thin air the first time. This exceeded my expectations.

Students working in the assortative group [Figure 17] used a combination of dialogue and the familial and adversarial relationships that are documented in the books of the Iliad they read. This set of information was fairly easy to collect and document, and as such, they came to a fairly quick conclusion: the Iliad has clear clusters of similar people who are highly connected to each other. While the group decided fairly quickly on an argument, they took some time to discuss representational strategies as a consequence of their strong conviction that clusters were an important part of the Iliad's social network. Ultimately, they used a combination of color, space and size to create categorized hub-and-spoke shapes designed to emphasize the clusters they saw in the Iliad.

Figure 17
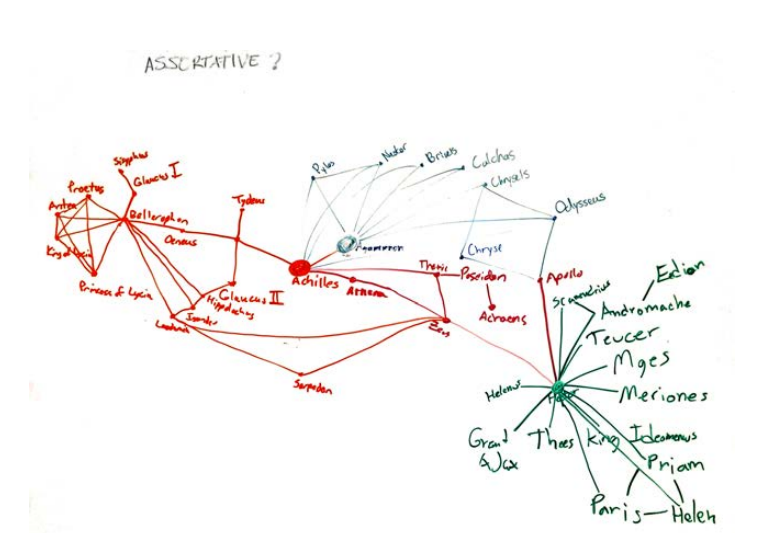
Students working on the balanced network [Figure 18] had the most difficulty formulating an argument, in part because they chose rightly to base their network shape not on co-occurrence—are two characters related or friendly generally—but on whether two characters have a dialogue, and if so, how often. This particular approach generated a series of questions about what constituted a conversation, a discussion that the easily-destructible group overheard and subsequently used in their argument formulation. The balanced group decided that descriptions of conversations, and not just quoted dialogue, counted, and that there were enough of those conversations to constitute a balanced network. They represented this balance by creating a highly clustered visual diagram, color-coded by relationship group, and divided into two to demonstrate where the triadic relationships were most prevalent.

Like the students in the assortative group, students in the easily-destructible group [Figure 17] settled on an argument, and an argumentation strategy, fairly quickly. They decided the Iliad was mostly easily destructible, but they took a very different visual argumentative strategy. They emphasized edge weight, or frequency of connection between two nodes, by drawing thinner or thicker lines

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 impressive 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 works' 21 total books. The discussion of Greek destruction drawn from these networks also led several 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.
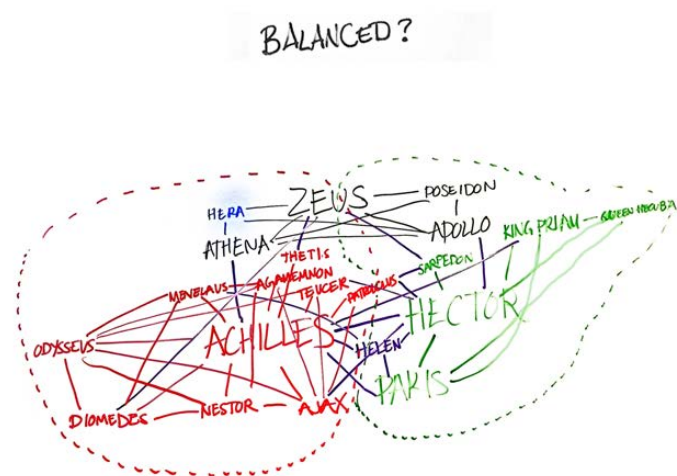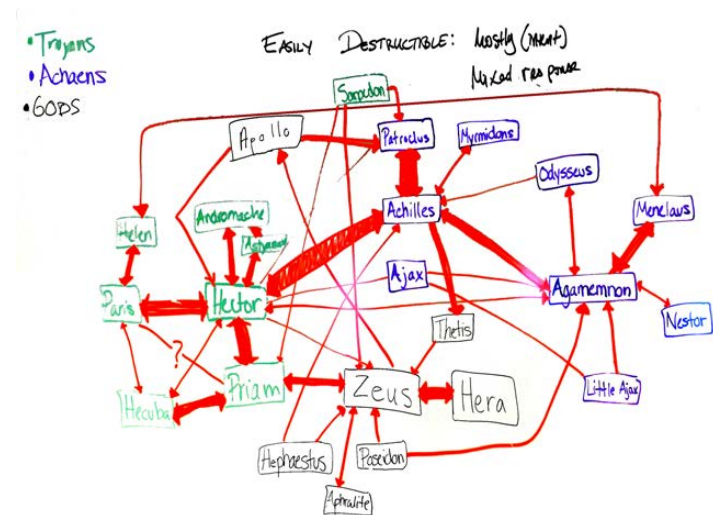
Figure 18

Figure 19

CONCLUSION

The broader examination of activity that began this study addresses some of the general concerns historians have as they seek to move students from memorization of facts to use of evidence, context, perspective, and corroboration in a historical argument. Each of the three digital-methodology activities begins with a focus on the object of activity and then uses that object to support the careful selection of digital tools as mediating artifacts. These artifacts can shift students' perspective from primary sources as things that need to be read to 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.

At the same time, these three sessions point to the importance of incorporating digital methodology in incremental terms. A single-session activity is less likely to have any long-term negative effects, but instructors will still be able to capitalize on the positive effects of an activity change, making a single session very low-risk instructionally. In-class variety keeps students active and emphasizes the different effects of each methodology's mediation. Using multiple methodologies in a single semester allows instructors to scaffold the students' experience with digital methodology by moving students from the familiar methodology of mapping to the less familiar network analysis, which can help students' acceptance of the tools. Finally, if a single session is successful, it is easy to expand the next time an instructor uses the methodology; by comparison, a longer multiple-session plan is harder to condense down into a single session.

Finally, activity theory provides clear solutions to the structural limitations of institutional and personal technology access. Several studies suggest that technology integration into classroom instruction has been slow for a variety of reasons (Li, Worch, Zhou, & Aguiton, 2015), the most notable of which is a lack of institutional technology support. If the mediating artifacts cannot be technology because it is simply not present, but technology as a mediating artifact presents the best tool for a particular learning outcome, then adapting the methodology behind the technology to analog tools like blackboards can help bridge that gap.

Activity theory analysis also points to several advantages in using analog technology to teach digital methodology: first, because there is less to learn from a software perspective (fewer mediating artifacts), the object is easier to achieve. It also has the added benefit of stripping away the speed of a computer and emphasizing the mediation angle of a digital tool: because these activities push students to take—and therefore explicitly grapple with—a new perspective, students can more easily understand how the results of something like text mining or network analysis might proceed through several from data input to product (rather than simply using a technology and not taking a critical stance toward the product and perspective it provides).

There are, of course, disadvantages. Computer-mediated activities are faster, provided the learning curve of the software is low). Additionally, computer mediation can strip out human confirmation bias, insofar as that is possible. If too much time passes between a student's initial contact with the theory alone and their re-use of the theory combined with a fully digital toolkit, they may need to be reacquainted with both. This limitation weakens some of the advantages of using analog technology in service of learning digital methodology. Still, an activity theory analysis of digital methodology in support of humanities context-making and perspective-taking suggests that, provided a

digital methodology explicitly supports a history learning outcome, the advantages far outweigh the disadvantages.

While each of the three cases here have some differences, activity theory suggests some overarching guiding principles that make determining the activity's rules, explicit community, and division of labor a more manageable task.

First, one of the tricks of systematically using the activity triangle is to prioritize one element in an activity. In these examples, I prioritized bridging the gap between a student's object of activity and a professional historian's object in a historical inquiry. This focus offered a more straightforward view of how the digital tools and conceptual tools in the activity might interact to more readily align student learning objectives with instructor learning objectives, or a barrier to understanding or a tool (or lack thereof) that supports a learning objective, prioritizing a single element in the activity triangle allows the instructor

To that end, instructors should explicitly discuss the digital tools as practical elements of a connected world. This can help align student learning objectives with instructor learning objectives. There are two ways to accomplish this: the object of the lesson should have a component that makes use of digital tools students are likely to encounter outside of the classroom. Similarly, the activity can and should take advantage of the individual technology students bring into the classroom—smartphones for simple tasks, for instance. Both of these goals bridge the gap between the role of digital technology in the students' everyday life, the importance of using those tools critically, and the ways digital tools align and combine with analog tools and human cognition. These explicitly position the historical learning objective in service of real-world tasks the student may repeat multiple times outside the walls of the classroom and make it more likely that students will appropriate the critical processes being taught.

Finally, instructors should include advance reading assignments, along with parameters and instructions for the preparatory reading, as part of the activity triangle. Students who are directed to simply read will take different elements away from a source than students who are directed to read and take notes about recurring themes, places, names, or other elements. Reading prompts for the sources assigned in advance of these classroom activities should therefore take advantage of the students' existing close-reading skills but should also direct their preparatory reading in a way that supports the affordances of the digital methodology being used for that classroom activity.

While the study here is presented in mostly anecdotal terms, with student artifacts providing some context, these initial ideas are quite promising. The lesson plans here allow students to engage in a growing field of research without worries about the digital divide, without significant time investment on the part of instructors whose lives don't revolve around technology the way a digital historian's does, and by using a systematic approach to activity planning that helps instructors craft thoughtful, flexible activities that are likely to succeed the first time.

REFERENCES

Adler-Kassner, L., Majewski, J., & Koshnick, D. (2012). The value of troublesome knowledge: Transfer and threshold concepts in writing and history. *Composition Forum, 26*(Fall 2012).

Blin, F., & Munro, M. (2008). Why hasn't technology disrupted academics' teaching practices? Understanding resistance to change through the lens of activity theory. *Computers & Education, 50*(2), 475-490.

doi:http://dx.doi.org/10.1016/j.compedu.2007.09.017

Cuban, Larry. (1986). *Teachers and machines.* Teachers College Press.

Danish, J. A. (2013). Designing for technology enhanced activity to support learning. *The Journal of Emerging Learning Design*(1).

Dougherty, J., & Nawrotzki, K. (Eds.). (2013). *Writing history in the digital age*: Trinity College (CT) web-book edition, Spring 2012, http://WritingHistory.trincoll.edu; University of Michigan Press.

Engeström, Y. (1987). *Learning by expanding: an activity-theoretical approach to developmental research.* Helsinki: Orienta-Konsultit Oy.

Engeström, Y. (1991). Non scolae sed vitae discimus: Toward overcoming the encapsulation of school learning. *Learning and Interaction, 1*, 243-259.

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive–developmental inquiry. *American psychologist, 34*(10), 906.

Gastner, M. T., Shalizi, C. R., & Newman, M. E. J. (2005). Maps and cartograms of the 2004 US Presidential Election results. *Advances in Complex Systems, 08*(01), 117-123. doi:10.1142/S0219525905000397

Greeno, J. G. (2006). Learning in Activity. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (pp. 79-96). New York: Cambridge Univ Press.

Grim, V., Pace, D., & Shopkow, L. (2004). Learning to use evidence in the study of history. *New Directions for Teaching and Learning, 2004*(98), 57-65. doi:10.1002/tl.147

Ibn-Shaddad, B. a.-D. (2002). *The Rare and Excellent History of Saladin or al-Nawadir al-Sultaniyya wa'l-Mahasin al-Yusufiyya* (D. S. Richards, Trans. D. S. Richards Ed.): Routledge.

Kelly, T. M. (2013). *Teaching history in the digital age*: University of Michigan Press.

Li, L., Worch, E., Zhou, Y., & Aguiton, R. (2015). How and why digital generation teachers use technology in the classroom: An explanatory sequential mixed methods study. *International Journal for the Scholarship of Teaching and Learning, 9*(2).

Marcinek, A. (2010). A Web 2.0 Class: Students Learn 21st Century Skills, Collaboration, and Digital Citizenship. *Edutopia*. Retrieved from http://www.edutopia.org/blog/web-20-21st-century-skills-collaboration-digital-citizenship

Middendorf, J., Díaz, A., Pace, D., & Shopkow, L. (2007). *Making thinking explicit: A history department decodes its discipline.* Paper presented at the National Teaching and Learning Forum.

Morgan, E. J. (2013). Virtual worlds: Integrating "Second Life" into the history classroom. *The History Teacher, 46*(4), 547-559.

Nardi, B. A., & O'Day, V. L. (1999). *Information ecologies: Using technology with heart.* Cambridge, MA: MIT Press.

Newman, M. (2012). Maps of the 2012 US Presidential Election Results. Retrieved from http://www-personal.umich.edu/~mejn/election/2012/

Pace, D. (2004). The amateur in the operating room: History and the scholarship of teaching and learning. *The American Historical Review, 109*(4), 1171-1192. doi:10.1086/530753

Mac Carron, P., & Kenna, R. (2012). Universal properties of mythological networks. *EPL (Europhysics Letters), 99*(2), 28002.

Robison, W. B. (2013). Stimulation, not simulation: An alternate approach to history teaching games. *The History Teacher, 46*(4), 577-588.

Rockmore, D. (2014, June 6, 2014). The Case for Banning Laptops in

the Classroom. *The New Yorker*.

Roth, W.-M. (2004). INTRODUCTION: "Activity Theory and Education: An Introduction". *Mind, Culture, and Activity, 11*(1), 1-8. doi:10.1207/s15327884mca1101_1

Russell, D. R. (1997). Writing and genre in higher education and workplaces: A review of studies that use cultural--historical activity theory. *Mind, Culture, and Activity, 4*(4), 224-237. doi:10.1207/s15327884mca0404_2

Russell, D. R. (2013). Activity theory and its implications for writing instruction. In J. Petraglia (Ed.), *Reconceiving Writing, Rethinking Writing Instruction* (pp. 51-78): Routledge.

Sadler, D. R. (1998). Formative Assessment: revisiting the territory. *Assessment in Education: Principles, Policy & Practice, 5*(1), 77-84. doi:10.1080/0969595980050104

Seefeldt, D., and Thomas, W.G. (2009) What Is Digital History? Perspectives 47 (5). Retrieved from https://www.historians.org/publications-and-directories/perspectives-on-history/may-2009/intersections-history-and-new-media/what-is-digital-history

Shopkow, L., Díaz, A., Middendorf, J., & Pace, D. (2012). The History Learning Project "decodes" a discipline: The union of teaching and epistemology. In K. McKinney & M. T. Huber (Eds.), *The Scholarship of Teaching and Learning In and Across the Disciplines* (pp. 93-113). Bloomington, IN: Indiana University Press.

von Schlichten, D. (January 21, 2015). Students Are Welcome to Shop Online During My Lectures. *The Chronicle of Higher Education*. Retrieved from http://www.chronicle.com/blogs/conversation/2015/01/21/students-are-welcome-to-shop-online-during-my-lectures/

Vygotsky, L. S. (1978). *Mind in society: the development of higher psychological processes*. Cambridge: Harvard University Press.

Wilson, N.S. & Bai, H. Metacognition Learning (2010) 5: 269. doi:10.1007/s11409-010-9062-4.

Wineburg, S. (2001). *Historical thinking and other unnatural acts: Charting the future of teaching the past*. Temple University Press.

Yorke, M. (2003). Formative assessment in higher education: Moves towards theory and the enhancement of pedagogic practice. *Higher Education, 45*(4), 477-501. doi:10.1023/A:1023967026413