January 2017

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Available at: https://doi.org/10.20429/ijsotl.2017.110107
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(Received 30 March 2016, Accepted 19 August 2016)

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 are the tools by students can help them engage more meaningfully with the historical tasks in which we want them to engage. Specifically, 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, & Shkoph, 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.

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 in the activity. 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 reasons through 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 & Bai, 2010; Florow, 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. Text mining breaks students into smaller, 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 a 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 other words, these smaller predictable chunks provide more approachable mediating artifacts that give students autonomy without leaving themadrift and confused (Torke, 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 analysis, we can help 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 reasons through 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 & Bai, 2010; Florow, 1979).

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Analog Tools in Digital History Classrooms

Theoretical Motivation

The more practical details of the lesson plan are shaped by the larger limiting factors that push toward laptop access and learning—obvious ones like geography, and less obvious ones like different student groups—4 groups of 4-6 people in a 20-25 person-classroom—to create one of the two lesson plans. We then described how to incorporate this material into a sample lesson in the activity triangle.

Some of the usual tools for personal 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’
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.

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 on Jerusalem. 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 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 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 added 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 helps students 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 understanding of the Middle East even farther beyond what students had experienced in the classroom.

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.

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 authoritative purpose. Synthesizing documents with competing or conflicting 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. An open-ended 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
I introduced the activity by suggesting that an author has very specific goals for communicating to an audience when they structure a narrative. With an authoritative 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 these 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). 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 Wordle 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 into 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 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 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 "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 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 were 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 8 then argued that the tie between Homer and his son and Zeus 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.

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 were 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 8 then argued that the tie between Homer and his son and Zeus 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 audience’s 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 “making mining” the underlying conceivings 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.

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 where their analysis had gaps. This opened the door for a conversation on the ways in which natural-language processing and 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 way of determining whether these epic poems were based on 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 piece described by B. 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 (I 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 social networking helped us make the argument that the 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.

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 contrast provided by historical social norms as our object on the right side of the consistent social 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 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 relative 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 represent 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 many 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 too many 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 drafts versions of their network out from a starting node—usually Achilles, Hector or Zeus—on paper, their arguments about how the Iliad network functioned began to change. I hoped

Students working on the balanced network (Figure 18) had the most difficulty formulating an argument, in part because they chose to base their network shape not on co-occurrence—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 ended up with descriptions of conversations, and just quoted dialogue, counted, and that there were enough of those conversations to constitute a balanced network. They represented this balance by creating a clearly 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 argument 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 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. Each of these digital methodologies 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 instructional- ly. In-class variety keeps students active and emphasizes the different effects of each methodology’s mediation. Using multiple methodologies in a single session seems 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.

Activity analysis points to several advantages in using analog technology to teach a single activity: 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 of a digital object. Because these activities push students to use digital objects and therefore explicitly grapple with—the historical learning objective in a straightforward way that supports the affordances of digital methodology being used for that classroom activity.

While the study here is presented in mostly anecdotal terms, with some students reporting some initial ideas and therefore explicitly grapple with—a new perspective, students held said they felt awkward to make a conceptual tie between a work of art and the lack of cooperation and disintegration of the Greek world 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 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.

CONCLUSION

The broader examination of activity that began this study addresses the lack of general history hands-on activity. Students from memorandum of facts to use of evidence, context, perspective, and corroboration in a historical argument. Each of these digital-methodology activities begins with a focus on the object of study 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 digital tools as things that need to 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. Next, these students find that linking 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. These are two ways to accomplish this: the object of the lesson should have a corresponding learning tool. Initially, instructors try to support activity for the Scholarship of Teaching and Learning, 109(1). Paper presented at the National Teaching and Learning Forum.

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digital methodology explicitly supports a history learning outcome, the advantages far outweigh the disadvantages. Some general history hands-on some differences, a concept theory suggests some overarching guiding principles that make determining the activity’s rules, explicit community, and division of labor a more manageable task. First, students’ ways 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 proliferation of sources as mediating activity in a historical inquiry. 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 (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. These are two ways to accomplish this: the object of the lesson should have a corresponding learning tool. Initially, instructors try to support activity for the Scholarship of Teaching and Learning, 109(1). Paper presented at the National Teaching and Learning Forum.

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