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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 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 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

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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 make up the activity classroom environment, the activity’s context, and the available tools. I will then apply that general process more specifically to three single-session activities using three different digital-history methodologies in service of a discussion of the value of single-value sessions 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 reasons we might make them else where.

Figure 1

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, maps, day-planner, whiteboard), while the mediating artifacts for a professional historian are comprised of disciplinary knowledge that has been appropriated as a psychological tool (contextualizing historical data). The rules, object, and division of labor a professional historian might (Middendorf, Díaz, Pace, & Shopkow, 2012). 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 make up the activity classroom environment, the activity’s context, and the available tools. I will then apply that general process more specifically to three single-session activities using three different digital-history methodologies in service of a discussion of the value of single-value sessions 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.

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Figure 2

For instance, if not all students have laptops, at least one of the mediating artifacts must replace the computer and its allowance for writing, drawing and displaying. Similarly, if a class has been divided into permanent groups, those groups dictate the division of labor in that class. Activity theory helps students develop the psychological tools that underpin the disciplinary practices common to a professional historian (e.g. understanding historical context). As the 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 reflection on the instructor’s 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. As the mapping exercises present students with a more familiar level of detail, familiar artifacts, these smaller predictable chunks provide more approachable mediating artifacts that give students autonomy without leaving them adrift 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 activity, activity theory helps instructors develop and maintain 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 reflection on the instructor’s 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).

Mapping

While geographers 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 very specific part of the activity triangle.

The instructor’s primary goal was one of historical perspective taking on the right side of the activity theory triangle in Figure 3 is the foundational element in this activity triangle and defines the tasks of mediating 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 maps and their tools for non-computerized display (or 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 the specific spatial context in order to give geospatial information to other content in the text.

Figure 3

Theoretical Motivation

The more practical details of the lesson plan are shaped by the larger limiting factors that hew toward laptop availability and learning-oriented student grouping. While the activity triangle shows that groups of 4-6 people are a 20-25 person-classroom—to create one of these maps. We then mapped their context in the first phase of the activity and used 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, 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 to 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).

Outcome

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

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 authoritative perspective. 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 structures 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 and how his actions were driven by the geography of the Middle East in order to make an argumentative point.
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 judgments 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

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.

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 6 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 aesthetics 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 for destruction by fate in the same way as social stability. This shift toward inverting an ‘audiences’ social and familial norms about class and familial organization, audience reception of the Iliad and Homer’s authorial purpose is very much in line with a professional historian’s analysis of audience makeup as part of understanding authorial purpose. It is also very hard to accomplish in a single class session, and the adoption of text mining to break authorial structures into smaller pieces and then display those pieces visually contributed to students’ ability to engage with this particular historical task.

To demonstrate both the value of, and the pitfalls of, this approach to text mining, we wrapped up class with an example of what each book would look like, but not from one student’s book, as the book would be more similar to another book or a set of books than by group of humans. Book 6 is shown below (Figure 15) as an example (using text from http://classics.mit.edu/Homer/iliad.6.iv.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 “not mining against the screen” (a visualizing), the underlying conceits 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 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 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 interpretations, an interaction, social etiquette and familial devotion. This interactive 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. Pedrag Mac Carron and Ralph Kenna examined the networks in The Iliad, Beowulf and the Táin Bó Cúailnge. Students were instructed to think about whether their network did or did not meet the specific requirements of their assigned networkCloud. They were 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 edge weight, they were asked to use their visualization to give them an idea of what 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 network. This argument was visually represented in 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, whether their network would actually take up more 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 and read the most relevant Google search results on the central classroom computer and visualized their own Facebook network using YASIV (http://www.yasiv.com/facebook). Now defunct).

These tools of computer interpretation gave them some color on the visual organization of a network diagram, also mean some requirements for the mediating artifacts: whiteboard and chalkboards, but not blackboards, because the color requirement, so in rooms equipped only with chalkboards, poster paper works best.

**Figure 16**

**MEDIATING ARTIFACTS:** Interaction of characters from “The Iliad”

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

**B I L E S:**

- 40 minute 75 – 85 minute class
- Number of assignments, homework and quizzes
- Article write up and presentation to write up

**C O M M U N I T Y:**

- Small group work precedes whole-class discussion

**DIVISION OF LABOR:**

- Whole small group works
- Percentage of work divided by students

**PRESENTATION TO PREPARE:**

- Limited instructor mediation

**LESSON PLAN**

Each group was instructed to examine one aspect of a social network. Students were given several examples of networks that were good representations of their assigned feature, and as discussion importance. Students were given several examples of networks that were good representations of their assigned feature, and as discussion size to represent frequency or some other consistent measure of conceptually distance, color to represent categorical grouping, and size to represent frequency or some other consistent measure of import. For instance, and individual groups began to ask questions about how the 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 edge weight, they were asked to use their visualization to give them an idea of what 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 network. This argument was visually represented in 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, whether their network would actually take up more 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 and read the most relevant Google search results on the central classroom computer and visualized their own Facebook network using YASIV (http://www.yasiv.com/facebook). Now defunct).

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**Lessons Learned**

Students working on the networked (Figure 18) had the most difficulty formulating an argument, in part because they chose rightly to base their network shape not on co-occurrence—arise 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-network group, on the other hand, did not meet the specific requirements of their assigned network feature, however, this set of questions allowed students to better understand the constructs of conversations and how ubiquitous was the concept of interactions. Two characters who were related or friendly generally—but on whether they might make their argument clear, I provided specific examples.

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**Outcome**

From an instructor perspective, one of the best things about this conversation 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 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 hold 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 some students to make unsolicited comparisons to the lack of cooperation and disintegration of the Greek world in Herodotus’ histories, which we read earlier in the semester. One student noted that without the idea of a “real” social network, it would have felt awkward to make a conceptual tie between a work of fiction and a work ostensibly of history.

CONCLUSION

The broader examination of activity that began this study addresses some general characteristics of activity. Designing for technology tools helps 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 a student’s research, or the object at the heart of each activity. These artifacts can shift students’ perspective from primary sources as things that need to be read to primary sources as questions that need to be asked. 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.

In each of the cases, students are encouraged to think about a task or a tool (or 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 single methodological focus, or there should be a single mediating artifact. This focus allows the digital tools to correspond with 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 the digital project and thus give students the opportunity to find additional evidence on their own, or the digital tools to help them understand the problem at hand. In these examples, I prioritize one element in an activity. In these examples, this focus offers 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 the student as a teaching assistant that supports the alignment of the learning objective, prioritizing a single element in the activity triangle allows the instructor to:

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Figure 18


REFERENCES


the Classroom. The New Yorker.


