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Abstract We summarize a recent multi-institutional collaboration in digital field scholarship involving four liberal arts colleges: Davidson College, Lewis & Clark College, Muhlenberg College, and Reed College. Digital field scholarship (DFS) can be defined as scholarship in the arts and sciences for which field-based research and concepts are significant, and digital tools support data collection, analysis, and communication; DFS thus gathers together and extends a wide range of existing scholarship, offering new possibilities for appreciating the connections that define liberal education. Our collaboration occurred as a sandbox, a collective online experiment using a modified WordPress platform (including mapping and other advanced capabilities) built and supported by Lewis & Clark College, with sponsorship provided by the National Institute for Technology in Liberal Education. Institutions selected course-based DFS projects for fall 2012 and/or spring 2013. Projects ranged from documentary photojournalism to home energy efficiency assessment. One key feature was the use of readily available mobile devices and apps for field-based reconnaissance and data collection; another was our public digital scholarship approach, in which student participants shared the process and products of their work via public posts on the DFS website. Descriptive and factor analysis results from anonymous assessment data suggest strong participant response and likely future potential of digital field scholarship across class level and gender. When set into the context of the four institutions that supported the 2012–2013 sandbox, we see further opportunities for digital field scholarship on our and other campuses, provided that an optimal balance is struck between challenges and rewards along technical, pedagogical, and practical axes. Ultimately, digital field scholarship will be judged for its scholarship and for extending the experimental, open-ended inquiry that characterizes liberal education.

Keywords Digital · Field · Scholarship · Liberal arts · Mapping · Mobile device

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1 Introduction: digital field scholarship

Digital field scholarship (DFS) is a term we propose to organize and extend an exciting array of scholarly work.[1] DFS is perhaps best described in reverse: it is first and foremost *scholarship* in the arts and sciences for which the *field*—including field-based research and associated concepts such as place and space—plays a significant role and *digital* tools provide support. Yet, it could equally be imagined in the context of how mobile devices, user-friendly mapping platforms, and readily available spatial data have transformed a wide range of scholarly pursuits—not only those in the natural and social sciences (e.g., ecology and geography) for which spatial analysis and the field are often significant, but others in the humanities (e.g., English and history) that demonstrate an increasing interest in GIS and digital mapping tools such as Neatline.[2] The domain of DFS thus reaches across the disciplinary span of the contemporary liberal arts, from the earth sciences to the digital humanities.[3]

The DFS approach could be purely multidisciplinary, welcoming but not necessarily blending plural academic pursuits; or it could verge on the transdisciplinary, building on the disruptive vision of scholars such as Taylor [9] who see connections across previously unrelated areas, and using the field as an opportunity for relatively sequestered sectors of the academy to discover new similarities and differences. Indeed, DFS recognizes field-based analysis as a crosscutting, experiential scholarly realm, one that may offer new opportunities for discovery and communication of the connections that define liberal education [3]. There is a variety of ways to theoretically ground this realm: one is known in an array of disciplines as the spatial turn, a term dating back to theorists such as Jameson [7] which itself "reflects much broader transformations in the economy, politics, and culture of the contemporary world" [10]. The spatial turn suggests how concepts such as space and place are now invoked across a wide swath of the arts and sciences. In addition to new concepts, DFS embraces new technologies for knowledge production based on the work of scholars such as Davidson, who rhetorically asks "What is the purpose of a Model T in an Internet age?" [4].[4] Davidson and others are unapologetic in calling for new pedagogies given the new digital modalities available in higher education. The positions taken by contemporary scholars such as Taylor and Davidson are provocative and debatable; we hope that digital field scholarship provides a way to test this new terrain and see what it can offer the liberal arts.

[1] For background, see blogs.nitle.org/2012/08/17/what-is-digital-field-scholarship.

[2] See neatline.org.

[3] For one of many recent DFS examples, see [6].

[4] See also [5].

2 The 2012–13 DFS sandbox

In this paper, we present the results of a sandbox (or collective online experiment) in digital field scholarship pursued during the 2012–2013 academic year by four liberal arts colleges: Davidson College (Davidson, NC, USA), Lewis & Clark College (Portland, OR, USA), Muhlenberg College (Allentown, PA, USA), and Reed College (Portland, OR, USA). The sandbox was sponsored by NITLE, the National Institute for Technology in Higher Education,[5] with Lewis & Clark College providing training and technical oversight alongside technical staff from the other colleges. Participating institutions submitted successful proposals to NITLE and Lewis & Clark College in fall 2012, and pursued DFS projects in targeted courses during fall and/or spring semesters 2012–2013.

Institutions utilized a common website built on a responsive (mobile device friendly) WordPress platform [www.sge.lclark.edu/dfs], customized by means of a suite of plugins (e.g., the MapPress Pro plugin to enable spatial data display)[6] and custom post types (to enable structured form entry/display).[7] We selected the WordPress medium given its ubiquity, ease of setup, and customizability,[8] thus potential transferability to other liberal arts institutions. Given the WordPress medium, the most common form of student participation involved structured posts with associated resources (e.g., still or motion images, field data) and metadata (e.g., geotags, project categories). These posts, often initiated in the field via mobile devices, were gathered together on a project page (or associated subpages) for public display. Following our DFS approach prioritizing public digital scholarship, student posts documented the entire process as well as products of their project-based research. In addition to displaying these posts in a variety of formats, the website included background on digital field scholarship and online help supporting field device use, computer use, and institutional administration.

Institutions pursued a variety of DFS projects ranging from documentary photojournalism to home energy efficiency assessment. Most were completed in the vicinity of the participating institution, though some were international. Summary pages for each are available online [www.sge.lclark.edu/dfs/dfs-sandbox-projects]. In the following sections, we will detail the specific projects pursued by each institution.

[5] See www.nitle.org. For the August 2012 NITLE webinar broadcasting the DFS sandbox, see www.nitle.org/live/events/141-digital-field-scholarship.

[6] See wphostreviews.com/product/mappress.

[7] For more information, see www.sge.lclark.edu/dfs/this-dfs-site.

[8] See wordpress.org for details on installation and customization.

2.1 Davidson College

"Why study math?" can be a common question in a mathematical classroom. While a variety of answers are possible, helping students see how math relates to the world around them can be inspiring, motivating, and eye opening. Further, such applications can help students see math as more than numbers and formulas. One example is the Found Math Galleries on the Mathematical Association of America website.[9] The content in these galleries is crowdsourced from MAA members and includes images of everyday objects that also contain mathematical properties. It serves as a reminder that math is everywhere.

For their DFS project, Finite Math students at Davidson College partnered with local K-12 teachers and used the DFS platform to develop a series of K-12 math map exercises, which they presented to teachers and students in local K-12 schools in class or via a walking tour. Each math map consisted of six to eight geotagged sites with activities designed for a hands-on math experience. All activities adhered to the Common Core standards for each grade level served, and were designed for access by K-12 students via computer as homework, or via mobile devices (with built-in map navigation using the math map placemark) on an outdoor field trip. The activities offered a variety of exercises, such as telling time at a giant outdoor analog clock, identifying three-dimensional shapes in a sculpture garden, calculating purchases at a town business, and measuring yard lines on the campus football field.

Davidson students worked in groups of two or three to create these math maps, using their smartphones or loaned tablets.[10] While in the field, students opened the WordPress app and geotagged their location for the math activity within a post. They also photographed location-related math objects using the device and inserted images into the post. Because device screens are small, most students edited the post-based instructions for the activity on a computer once they were back on campus.

Math map projects for fall 2012 and spring 2013, with well over 100 map placemarks total, are summarized on their respective project pages [www.sge.lclark.edu/dfs/project/geotagged-math-maps] [www.sge.lclark.edu/dfs/project/geotagged-math-maps-spring-2013]. In addition, a variety of K-12 class specific portals were created. As one example, 4th graders at a local charter school would navigate to their portal [www.sge.lclark.edu/dfs/davidson1/community-school-4th-grade], then click on mashup map placemarks to view abstracts of activities. When they click on the activity titled Recess Time Splits [www.sge.lclark.edu/dfs/recess-time-splits], they are taken to a post that contains images of the objects at the site. The exercise instructions follow these images: "If you have 20 minutes to play on the playground but want to have time on all four structures (the slide, the swings, the monkey bars, and the tire swing), how can you divide your time evenly? What if you want to spend extra time on one structure, like the swing, more than the other three structures? How can you divide your time then?" At the bottom is the activity's geotagged marker on the map, by which students may navigate to the point in the field via mobile devices. The Recess Time Splits post, then, offers these fourth graders in one page all the information and functionality they would need to complete this activity. This post is typical of a wide range of others, all created in the field by Davidson students for use by K-12 students in the community.

2.2 Lewis & Clark College

Lewis & Clark College pursued two DFS projects, both during spring semester 2013. One focused project was a part of an overseas program to Australia involving a dozen students; this project involved the development of a set of neighborhood tours in Sydney and Brisbane [www.sge.lclark.edu/dfs/project/australia-neighborhood-tours]. Each tour was conceived by a small team of students who created geolocated posts on our DFS site with tour point photos and descriptions, and then linked these posts together into a tour narrative. The completed tour is available on the DFS site and can be accessed via mobile devices, with navigation available to each of the tour points. The project was a simple one, intended to blend site photoreconnaissance and narrative with public digital scholarship.

A more involved DFS initiative at Lewis & Clark from spring 2013 was an upper-division seminar in digital field scholarship, with a variety of course and small-team projects [www.sge.lclark.edu/dfs/project/digital-field-scholarship-seminar]. Seminar participants included 12 sophomores, juniors, and seniors, all of who had some previous experience with GIS or digital mapping. The objective was to test the integration of relatively simple DFS skills (e.g., the use of geolocated mobile device apps) with more advanced spatial skills. The seminar was organized into three broad phases of digital field scholarship: spatial data collection, analysis, and communication of results. Five online laboratories conveyed skills in these phases, with a special emphasis on spatial data collection via laboratories on mobile device geolocation errors, field vegetation change reconnaissance, georeferencing, and spatial interpolation. Students reinforced existing GIS skills as a part of their selected course projects and learned about spatial data communication by

[9] See www.maa.org/community/columns/maa-found-math.

[10] At Davidson, the percentage of first year students coming to campus without a smartphone has declined from 38 % in 2010 to 11 % in 2013, so they are nearly ubiquitous among students. iPad tablets were loaned to one student team who did not have smartphones for the exercise.

building interactive maps primarily by means of the GeoCommons platform.[11]

As a major element of the DFS seminar, students worked individually or in small teams to pursue seven semester projects [www.sge.lclark.edu/dfs/envs490], including:

- The gentrification of food in northeast Portland
- Lewis & Clark campus tour
- Peri-urban development in the Ezulwini Valley, Swaziland
- Spatial history of land use in Sullivan's Gulch, Portland
- Spatializing Portland's local business network
- Sustainability and spatial analysis
- Urban soundscapes in Portland

Each student defined a research focus question to guide their projects. For spatial data, students utilized field-based social surveys, georeferenced Sanborn fire insurance maps, audio sound clips, historical air photos, website location references, and other primary and secondary sources. Results of GIS-based analyses of these data were primarily communicated using GeoCommons maps, with an emphasis on developing interactive layers, filters, timelines, and other opportunities for viewers to navigate the data. One project team utilized the Neatline platform to communicate their results, with considerable success following equivalent time investment.

At the conclusion of the semester, students joined other participating DFS sandbox institutions in presenting the results of their efforts to a national web audience as a part of a NITLE-sponsored webinar.[12] Given time limitations, students carefully rehearsed their 2-min mini-presentations and the overall flow of the Lewis & Clark segment; the positive reviews they received offered additional reinforcement of the excitement and significance of public scholarship.

2.3 Muhlenberg College

In text and image, the field figures prominently in documentary studies. Documentary is itself a way of seeing and making meaning of a particular field of social and cultural life. Muhlenberg College's DFS project integrated documentary theory and practice within the DFS platform to engage students in the collaborative construction of a narrative map that shares student-produced documentaries about places in Allentown, the community where Muhlenberg is located. Participants completed two DFS projects in fall 2012 and spring 2013, combining digital storytelling and mobile media as a set of tools and practices to construct their identities as agentive learners in connection (and sometimes tension) with the community beyond the campus.

In its first DFS implementation [www.sge.lclark.edu/dfs/project/documentary-research-storymapping], the locus of Muhlenberg's activity was documentary research, a required course for media and communication majors. In this course, students are introduced to documentary methods and field work and grapple with the ethics of representing the lives of others in image, sound, and word. Since 2010, course objectives have been organized around a story mapping project that integrates digital storytelling with digital mobile mapping technologies. An interactive GoogleMap[13] has served as the narrative gateway to more than 100 short 2–3 min stories produced by Documentary Research students. The DFS-based project addressed limits in the existing storymap model, which was functional as an archive of student work (with videos uploaded after the end of each semester), but of limited use as a resource and tool during the research and production process.

Doing documentary work is much more than recording facts. Through hands-on and field-based activities, students experience doing documentary work as a reflexive process in which they confront what Robert Coles calls the "moral underpinnings of social inquiry" [2]. The course provides an overview of documentary methods, traditions, and landmark projects within an American context, and emphasizes the ethical dimensions of telling true stories about others. How do we know what we know? How can we really know about and understand the lives of others different from ourselves? And how can we best represent what we have learned so that others may also broaden their understanding? These are the questions students grapple with as they research, document, and produce their own short digital documentaries.

These questions emerge in the course of students' documentary practices as they travel off campus and into Allentown to conduct documentary fieldwork, interviewing, photographing, and recording. The DFS platform created space and opportunities for students to make their responses to these questions constitutive of their documentary fieldwork, rather than post-documentary reflections. With mobile devices (their own and others borrowed from the Media and Communication Department), they shot photos, recorded interviews, and uploaded geotagged posts to the DFS project site from the field in Allentown.

In the following post, a student reflects on experiences during a documentary walking tour of the corner of 12th and Turner Streets in Allentown's center city, including a Dominican restaurant whose owner has welcomed the entire class into his storefront and offers us plates of food to sample:

> The reason I chose this picture to represent our experience at Las Palmas is because I felt that I had over-

[11] See geocommons.com.

[12] See www.nitle.org/live/events/172-digital-field-scholarship-outcomes.

[13] See www.muhlenberg.edu/main/academics/mediacom/map/map.html.

> come a cultural barrier that I sometimes feel in some situations in Allentown. However, there was no cultural "barrier" at Las Palmas—only the presence of a culture in which I had not previously immersed myself. I like that this picture captures the food, the culture of the restaurant, the owner's kindness, and our Professor's appreciation. In a way, this picture captures a moment on our trip which was filled with life and culture. [www.sge.lclark.edu/dfs/reaching-across-the-barrier]

The DFS platform also provided a more dynamic and effective space for making student work public, not only for their professors and peers, but also for the community. Students' documentary writings take that wider public into account, and some developed a more critical awareness of the role of documentary work in informing and shaping public dialogue. In the following post, a student in Documentary Photography champions the subjects of her project, in a voice that intentionally invokes her awareness of the camera as a tool to promote community change visually:

> Let these images of Alex and Richie be a reminder that youth, and urban youth in particular, are not the problems in their community. Rather, they are inspirational leaders. Their voices matter. [www.sge.lclark.edu/dfs/beyond-the-camera-lens-richie-and-alex-as-young-igniting-change]

2.4 Reed College

During spring 2013, students in the capstone course for Reed College's nascent environmental studies program used smart device geolocation and collaboration to place issues of carbon sources and sinks in a spatial context [www.sge.lclark.edu/dfs/project/carbon-field-studies]. Information gathering and collaboration took two forms, including a locally focused project on energy use and policy, and a regional-scale project on carbon sources and sinks.

Students and faculty learned about regional carbon sources and sinks by visiting sites relevant to climate change throughout northern Oregon, such as Portland General Electric's Boardman coal-fired power plant and a wind farm in the Columbia River Gorge. Students gathered information about the sites both in groups and individually, and each student posted an entry to the DFS site from the field or after returning. Content included images, carbon-related statistics, site status and other information, individual reflections on the sites, and notes on relevant policy. The DFS platform encouraged students to reflect on their field experience after the fact, which sparked some interesting discussions both online and in person. The spatial component of the site allowed students to connect their on-the-ground experiences with a sense of place on a regional scale.

At the local scale, the Portland Climate Action Plan has defined goals for carbon reduction: by 2030, the city aims to achieve a 40 % reduction in carbon emissions relative to 1990 levels. In Multnomah County, where Portland is located, 20 % of the average person's carbon impact is from home climate regulation. Based on the significance of household energy use, students conducted fieldwork to gather information that might inform policy recommendations related to weatherization and home energy efficiency. Participants designed a sampling strategy to identify patterns of energy inefficiency across single family homes using the following tools: (1) background information on building codes in Oregon as related to energy efficiency; (2) energy use data by census block; (3) detailed data on houses by tax lot, including value of home, size, and year built; and (4) field measurements from infrared cameras, used to measure thermal emission from homes. Based on this information, students hypothesized that the year of construction, size of home, and value of home may play a role in household energy efficiency, and set out to design a sampling strategy accordingly.

Using ArcGIS Desktop to synthesize and visualize data, student groups chose sample locations based on values for the variables mentioned above. Groups further refined site selection based on energy use at the census block level. Each group chose to focus on a different neighborhood near the Reed College campus to ensure no overlap in sampling. To maintain consistency in thermal emission readings, all sampled houses faced the same direction, ensuring that walls would have had a similar amount of recent heat (sun) exposure. For each site, temperature difference was directly proportional to the heat transfer from the exterior of a house. The representative heat loss metric used was determined by subtracting the reference temperature from the maximum wall temperature for each house.

Once sites were selected, students headed to the field with infrared cameras to record thermal emission from homes. One student in each group used the DFS site as a mobile laboratory notebook (via a personally owned smartphone), recording data at each site. This information included specific characteristics of the property, detailed sampling notes, and site address. To protect homeowner privacy, these initial posts were kept private. Before publishing the field data, support staff slightly adjusted locations for the public-facing posts while preserving a private copy of the initial field data collection. Creating a second dataset required a small amount of time investment, but was necessary to protect homeowner privacy and present the project work to the wider world while also allowing the initial field observations to remain intact.

Similar to Lewis & Clark's DFS seminar, Reed's carbon field studies project thus blended relatively straightforward mobile device-based field reconnaissance with advanced spatial data collection and analysis. Viewed as a whole, projects

Table 1 Selected descriptive results ($n = 45$)

Item	Mean value[a]
Proficiency with "using mobile devices to capture images or video"	4.1
Proficiency with "using mobile apps to find out your location"	3.7
"It was fun using mobile devices as part of this DFS activity"	4.0
"It seems educationally valuable to use mobile devices as a part of DFS activities"	4.0
"It was easy entering or editing DFS posts on a computer"	4.3
"It seems worthwhile for our DFS posts to be displayed and accessible via a map"	4.3
"My technological skills have improved as a result of this activity"	4.1
"I see the value of publicly sharing our work as we did on the DFS site"	4.4
"I'm proud of the quality of my work as part of this DFS activity"	4.4
"I'd recommend this experience to other students"	4.3

[a] 1 = strongly disagree; 5 = strongly agree

pursued by these four institutions as part of the 2012–2013 DFS sandbox demonstrate a diverse set of disciplinary interests—from math to journalism to environmental studies—and areas of scholarly intensity, though all engaged centrally in the field as an experiential site for undergraduate learning and all utilized common, readily available technologies to achieve their diverse ends.

3 Assessment and reflections

What benefits did our DFS sandbox pilot convey to participating students? Results from an anonymous online assessment form broadly support digital field scholarship among undergraduates in the liberal arts. The form included basic demographics (class year and gender), five items related to proficiency with computer and mobile device technology, nine items related to mobile device use and other technical dimensions of the DFS pilot, and seven overall assessment items.[14]

Selected descriptive statistics ($n = 45$, approximately 80 percent of all participants) are presented in Table 1, using a response scale from 1 (strongly disagree) to 5 (strongly agree). Participating students generally entered the DFS activities with some existing proficiency in computers and mobile devices; supported the use of mobile devices and the DFS website; and appreciated their DFS activities overall. In particular, their endorsement of the more innovative elements of our DFS pilot, including field use of mobile devices and public online display of their work, suggests a broad resonance with our DFS pedagogy and approach. In brief, for all its cutting-edge differences with more standard approaches in the liberal arts, digital field scholarship appears to work well with the majority of our students.

As additional steps in the analysis, we first ran zero-order correlations between all responses and respondents' gender (62 % female overall) and class level (42 % sophomore, 29 % junior, 29 % senior). Interestingly, no responses were significantly correlated ($p < 0.05$) to these demographics, suggesting that responses to items such as the above were broadly shared among males and females, and lower- and upper-division students, alike. Response items, however, were significantly intercorrelated, so our next step involved factor analysis of the 21 items: using principal component analysis and varimax rotation with Kaiser normalization, four identifiable factors emerged, as summarized in Table 2.

Table 2 Factor analysis results

Factor	Variance explained (%)	Items	Cronbach's alpha
Mobile device support	17.5	5	0.82
Mobile technology abilities	15.6	4	0.84
DFS process support	15.0	5	0.82
Positive DFS outcomes	11.9	3	0.80

* Factors obtained via principal component analysis utilizing varimax rotation with Kaiser normalization

Table 2 presents a summary phrase derived from factor items, the amount of variance in response data this factor explained, the number of response items included in the factor, and Cronbach's alpha (internal consistency) for these response items. Using these four multi-item factors, we can now consider the extent to which mobile device support, mobile technology abilities, DFS process support, and a positive report of DFS outcomes relate to participant responses.[15]

Two factors in particular yielded statistically significant demographic and attitudinal associations. The first factor,

[14] Full assessment instrument and redacted data available upon request.

[15] Note that, given the orthogonal rotation procedure typical of factor analysis, these four factors are assumed to be independent of each other, so we cannot ask to what extent they are interdependent; yet, inspection of contributing items to each factor suggests a number of possible connections.

mobile device support, represents five response items generally involving a positive assessment of mobile devices: e.g., the two items most strongly weighted in this factor include "It was easy installing and using the WordPress app on my mobile device for a DFS post" and "It was fun using mobile devices as a part of this DFS activity'.' This factor was strongly associated ($r = 0.44$; $p < 0.01$) with students' self-rated overall educational experience ("I learned a lot as part of this DFS activity"). It is possible, then, that our DFS activities worked better in general for those who were more inclined toward the use of mobile devices. Though this result may seem to mitigate against students who were not so inclined, the observed ubiquity of mobile devices among liberal arts undergraduates on many campuses suggests that digital field scholarship is building on an increasingly shared set of technologies and practices.

The second factor involved mobile technology abilities, with the two highest-weighted items including "Proficiency with…using mobile apps to find out your location (e.g., for directions)" and "Proficiency with…using mobile apps to post online (e.g., a Facebook status update)". This factor correlated significantly with gender ($r = 0.41$; $p < 0.05$). Among our participants at least, women seemed to find themselves more proficient in the use of mobile devices than men. Given the generally acknowledged preponderance of women on liberal arts campuses, this result combined with the above seem to bode well for expanded use of DFS-based activities on these campuses. Interestingly, no factors were associated with class-level demographics, so the broad characteristics implied in these factors do not seem to differentiate among lower- versus upper-division students.

Results from the online assessment form are even more useful when set into their institutional contexts. At Davidson College, for instance, participants were required to reflect on the project [www.sge.lclark.edu/dfs/category/institutional-categories/davidson/reflections]. A handful of students expressed frustration with occasional technical glitches. Some students lacked experience working with devices and websites in this way, but easily overcame them with minimal guidance. Students more often commented on the difficulty in writing good, clear educational math exercises for a very specific skill-level audience.

At Lewis & Clark, students participating in the DFS seminar extended their spatial analysis and communication skills tremendously. Yet in many cases, these skills were applied directly to projects representing their undergraduate majors or concentrations, and thus were an important means to larger substantive ends. Seminar students experienced similar technical challenges and breakthroughs as other participants in the DFS sandbox, but given the explicit DFS focus of the course participants had sufficient time to get comfortable with technical requirements of DFS, from spatial data collection to analysis to communication. This allowed them to apply these skills toward their own areas of interest, and to conceive, implement, complete, and communicate an entire research project—a highly important scholarly skill in its own right.

At Muhlenberg, the DFS sandbox was effective as a shared space for examining key questions, and for public reflection and analysis. Relative to the initial storymapping platform, the DFS site enabled a more textured and nuanced record of students' learning and research, thus providing a representation of documentary research as a *mediated process*, not just a record of students' *media products*. While the original storymap recorded the products of students' documentary research—short 2–3 min documentary videos rendered in QuickTime and visible through waypoints marked on a Google map of Allentown—the process of participants' research, their reflection, and their reorientation to the field of their studies remains masked or invisible. In the DFS environment, the documentary journey itself was unmasked and rendered visible for student researchers, their peers, and the community members whose stories were being told.

At Reed, faculty found value in adding a spatial component to both the local and regional components of their carbon field studies project. By placing the Portland-area project in spatial context, students were faced with questions of how one may need to sample across geographies to gain a sufficient amount of information to make an informed policy recommendation. Being able to spatially situate observations allowed students to make compelling maps, which were invaluable when the results of this project were presented to planners at the City of Portland. In addition to the value in spatial thinking, the SGE site served as an excellent communication tool, both across participants in the course and as a method of connection with the community.

Given the successful pilot test of digital field scholarship summarized above, what next steps are possible? Some institutions are building directly on the positive attention their sandbox work received. For instance, Davidson's math map project was mentioned at a 2013 section meeting of the Mathematical Association of America, and the idea has since gained momentum, on campus[16] and elsewhere. As of 2014, Davidson is in the first year of a Mellon-funded program in Digital Studies that is being led by a prominent digital humanist, Mark Sample, and includes faculty development opportunities and the new Davidson Domains initiative, where every student and faculty member will have access to their own domain, along with the suite of tools that come with a hosted environment. The Davidson Domains initiative is inspired by A Domain of One's Own [umw.domains] at University of Mary Washington. Faculty and students will begin exploring the possibilities for digital tools, data, and what it means to have your own domain. All of the DFS toolsets can be recre-

[16] See sites.davidson.edu/insects.

ated at the individual, course, and program level through this initiative.

The DFS initiative at Muhlenberg has been presented to faculty in multiple venues. The model is poised for integration beyond this initial pilot to support elements of Muhlenberg's new general education curriculum. In particular, Muhlenberg is exploring the possibilities of developing this model in the context of new general education curricular initiatives. With increasing numbers of students participating in short-term study abroad opportunities, the Muhlenberg Integrated Learning Program (MILA), the DFS model offers a promising set of practices and technologies for students to map and reflect on their global learning experiences and for the campus to render the connections and intersections between these geographically dispersed, but networked experiences. A Muhlenberg adaptation of the DFS model is expected in spring 2015.

Lewis & Clark College, which has pursued a variety of DFS-related projects in recent years [www.college.lclark.edu/programs/digital_field], developed in 2014 a multisite-based digital scholarship platform [ds.lclark.edu], and is launching a series of DFS initiatives to be shared among liberal arts institutions (including Reed College) participating in the Northwest Five Consortium, or NW5C.[17] One current initiative, Imagining the Global [ds.lclark.edu/ig], is designed to promote innovative collaboration on key global themes weaving together a wide range of field-based scholarly experiences. Imagining the Global offers NW5C students and faculty digital tools and resources for use in courses, scholarly projects, and field-based programs, ultimately to help students develop more sophisticated global understandings and identities, and to view their common Pacific Northwest setting in a broader context.

As part of a the first capstone course taught in Reed's nascent Environmental Studies program, the DFS project set a precedent that spatial work is a central aspect of interdisciplinary environmental studies. In 2014, the capstone project was fundamentally spatial: students used a network analysis to evaluate the feasibility of converting the Boardman Coal Power Plant in Oregon to a plant powered by biomass. Instructional technology staff and Environmental Studies faculty are currently building a short course on GIS to integrate into the capstone, using data from the 2013 DFS project and the 2014 class project. This increase in spatial work is part of an ongoing focus as Reed faculty and instructional technology staff work to integrate a spatial context into more courses and student projects across the curriculum.

Our four institutions participating in the DFS sandbox are by no means the only liberal arts colleges doing serious field-based work or spatial analysis and mapping; the DFS movement has thankfully taken off on many institutions and among a wide range of academic programs. Yet, institutions interested in developing their own digital field scholarship initiatives may benefit from consulting with the four that participated in this sandbox.[18] Questions concerning student and faculty training, pedagogical options to ensure field-based learning value, trade-offs between site customizability vs. commonality at the user, project, and institutional scales, hardware and platform options, and others have not been entirely resolved via our DFS sandbox, but we now have the experience to venture some advice. What seems key is to achieve an optimal balance between challenges and rewards along technical, pedagogical, and practical axes, realizing that these axes are highly interrelated. For instance, some technical challenges inherent in DFS can be addressed via good planning and adequate training, but a more expansive technical vision will necessarily entail higher risk, as well as greater pedagogical possibilities and potential practical benefits. Low-risk, small-steps approaches to DFS may ironically not benefit most liberal arts institutions unless the pedagogical and practical payoffs maintain the interest of participating students and faculty in taking additional steps.

Ultimately, digital field scholarship is *scholarship*, and liberal arts institutions interested in pursuing DFS ventures may wish to consider how it enhances their ongoing scholarly efforts, rather than imagine (or promote) it as something entirely new. As Edward L. Ayers, President of Richmond College, has said, "To be recognized and rewarded as scholarship in the traditional sense, digital scholarship must do the work we have long expected scholarship to do: contribute, in a meaningful and enduring way, to an identifiable collective and cumulative enterprise" [1]. This has not yet happened: for instance, Ayers mentions an informal survey of higher education faculty in which fully two-thirds felt that "new digital methods are 'not valuable or important' for their research".

The liberal arts of today advance a progressive, pragmatic tradition of deep significance in American higher education and culture. Michael S. Roth, President of Wesleyan University, has recently endorsed the "experimentation and open-ended inquiry" of liberal education, a tradition that to Roth stretches from Thomas Jefferson to his own MOOC [8]. By sharing and extending these important attributes, digital field scholarship will find its rightful place in the contemporary liberal arts.

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[17] See www.nw5c.org.

[18] Contact information available upon request.

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