# Wayfinding in Global Contexts – Mapping Localized Research Practices with Mobile Devices

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### Abstract

Through the use of GPS-enabled mobile devices, writers are increasingly able to incorporate location into their writing and research and to do so from different points around the globe. This article articulates the importance of integrating location into writing research through wayfinding. The objective is to determine how writers locally situate their work in an increasingly globalized world. In so doing, the essay describes mobile tools, such as the Strava application and GPS-mapping, to demonstrate their usability and ubiquity. Further, findings include maps from the study which integrate student research into the global locations where that writing work happens. This form of visualizing research practice clarifies and reinforces student movement as an integral aspect of conducting research in global contexts.
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## 1. Introduction

Increasingly, writers compose with mobile devices at different points around the globe. As mobile devices such as smartphones and tablets become commonplace, the need to integrate these tools into daily writing and research practices increases as well. Moreover, existing mobile networks and interconnected mobile devices are now in the hands of users. Therefore the questions are not a matter of *if* or *when* but *how*: How can composing and research processes in global contexts be represented and made visible? Such questions are central ones to address, for mobility creates new challenges and opportunities for research and teaching about composing practices.

This article presents the results of a six-week long place-based research study conducted on a technical writing study abroad program in Dundee, Scotland. It traces student use of mobile devices to map the physical locations where they worked and researched in Scotland, and maps and the mobile traces generated during student travel and composing are the focus of this study. The work reveals how mobile technology use by students *and* the need for location-based research become important loci of literacy practice as writers enter into the unfamiliar territory of increasingly global, intercultural writing situations.

Although the case examined here follows a group of students in the unique context of a study abroad course, the act of integrating into a local community and understanding its culture is a key aspect of the work all writers do. Further, the need to disseminate research findings to others necessitates a way to walk readers through the research process via

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the use of wayfinding as a framework for discussing these issues. By examining these topics through this particular case, this study articulates many issues of location that will affect online writing work in global contexts now and in the future.

## 2. The mobile context of composition

Mobiles, a term including both cell phones and smartphones, are increasingly becoming the tool of choice for getting online around the world (Rainie & Poushter, 2014), and we need a similarly mobile-first concept to better understand the importance of location and context in writing. Mobile writing technologies change the nature of connections as well as inflect how we interact. Madanmohan Rao, for example, refers to mobile users as "untethered knowledge workers" (Rao, 2013, p. 1). This sense of writers and researchers moving where their work takes them without sacrificing productivity appeals to businesses and educators alike. From an educational perspective, the use of mobiles as composing devices/technologies takes students beyond simply writing for a global audience. Rather, these technologies provide students with not just a mobile device for composing, but also a similarly mobile, untethered audience reading and writing online in many locations. Within all of these contexts, mobile communication and the composition practices they support include not just voice communication, but a mixture of various composing modes including voice, text, sound, and image. Central to understanding this concept of mobile is the interlinked concept of networks. And such networks, in turn, can be effectively examined via wayfinding.

### 2.1. Wayfinding and ideas of location and mobility

Following recent discussions of mobile research methods such as Jason Swarts (2007), Olin Bjork and John Pedro Schwartz (2009), Amy C. Kimme Hea (2009), and Yi-Fan Chen (2013) this essay presents wayfinding as a research methodology for studying the impact of location on digital composing practices. Adapted from urban planning and design, wayfinding focuses on the movement of users in physical spaces and their goals in understanding and using those spaces. Focus on movement, action, and understanding provides a useful framework for discussing similar needs of writers as they are tasked with collecting data and researching in non-classroom settings. Just as writers need to find their way through research, successful global communication requires orienting their readers to the unique environment in which that writing took place. With location tracking for digital tools such as Twitter, Facebook, and other social media sites, it is now increasingly easy to include geographic location as one data point among others when composing via mobile technologies. As teachers of rhetoric and writing begin recognizing the rhetorical nature of place and how it impacts online interaction, in particular, such concepts become pedagogically important. Within this context, wayfinding includes orientation in physical spaces using visual signage or spatial markers.

Urban planner Kevin Lynch coined the term, "way-finding," in *The Image of the City* (1960) as describing ways people are supported by maps, signs, and other users in making their way about a location. The term has since been adopted by architects, designers, and visual communicators. In rhetoric and writing, wayfinding research contextualizes the writer in diverse workspaces, adding literal place as a part of contextual awareness. As an active participant in these spaces, the writer is tasked with finding his/her way through the space, and here, always in pursuit of a research agenda. As writing research moves out of the classroom and into diverse, global environments, making sense of unfamiliar places becomes an increasingly important part of research practice. As such, the researcher is situated not only among members of a new culture, but in an entirely different environment and way of doing things: of traversing those spaces. By combining wayfinding with GPS-enabled mapping tools, researchers have new means for incorporating the place where research work happens as an integral aspect of that work.

Like similar work on technology impacting boundaries (e.g., Schmidt, 2011; Geisler et al., 2001; Prior & Shipka, 2003; de Souza e Silva & Frith, 2014), examination of technologies of place reveal impactful integrations and applications of these technologies, especially ways those technologies can focus research. Mapping reveals links to global contexts by positioning mobile and live-mapping technology as a way for researchers to collect notes, artifacts, and other materials as they move between work sites, enabling the researcher to effectively respond to different cultural contexts. With all the movement associated with these research practices, the mobile technology itself helps provide a stable point for the user to focus on while writing in these different contexts.

Wayfinding literature, in turn, has concentrated on mental maps and sense of space that people create as they move through places. Our mobile technologies literalize these emplacements, thereby enabling students to see relationships

they have developed. While these traces are developed through mapping their own work, the use of GPS-enabled mobile devices allows for a more distinct sharing of space and location with other users. Accordingly, mapping, sharing maps, and telling stories of movement externalize stories we have shared but also allows students heuristic memory and access to visual representations of their movements to which we simply have not had access.

## 2.2. *Wayfinding and mobile writing practices*

How can mapping mobility inform our writing practices? As Peter Morville (2005) explains, access to information is no longer tied to a building, a workplace, or a classroom. As students prepare to write in global contexts, we need to include study of these non-traditional environments because of the complexities embedded in the richness and diversity of location. Accordingly, as wayfinding involves the study of movement around these work environments, there is similarly a need to disseminate the information gathered in such spaces, and to do so with accuracy and speed. In tying work to specific local spaces, we must avoid the problem of seeing these locations as fixed sites that the writer enters into, conducts work in, and leaves without any sort of lasting connection to the location itself. Through GPS and mobile devices the technology is available to visualize this aspect of our work, positioning the writer and researcher as a local entity in any generated map. Further, this perspective helps dispel the notion of a totalizing view of the local space and instead focuses on the individual's experiences and interactions with others, physical space, and movement in that location. These ideas are of specific interest to global studies in integrating a greater sense of what *local* entails when working in international contexts.

In relation to these ideas, mapping serves as both an output for wayfinding and a method for conducting research in disparate contexts. The use of maps as research method is examined in Patricia Sullivan and James E. Porter's (1997) *Opening Spaces*. Sullivan and Porter re-orient research methodologies for work within digital spaces by focusing on the rhetorical nature of situated practices. They write: "The study of electronic writing as a situated practice requires a particular and pragmatic sensitivity to the particulars of the writing context—for example, to the particular *kairos* of the writing situation, including the types of writers and audiences involved, the forms of technology being used, and the type of heuristic methods being applied to the study" (p. 9). Again, this perspective avoids a singular approach to conducting local research and instead tasks the writer with adapting to the contexts presented by that location. As with the work of both Rice (2012) and Appadurai (2001), Sullivan and Porter position the individual writer as well as the individual character and aspect of the local research context at the center of any research project.

Sullivan and Porter define this combination as *praxis* or "practical rhetoric," connecting localized practices with theoretical backing (p. 26). Contextualizing research practices as *praxis* in this way avoids the view of data gathering and research as split between types of sources, abstract, or divorced from the researcher. Instead, the writer is always situated as a researcher mediating a complex, localized research site composed of a network of technology, information, and other users visualized through these maps. These factors can have important implications for teaching students how to use online media to write in global contexts. Such implications include the importance of the writer in the research process and how that aspect of the work is heightened by global communication. Understanding localized practices in this way raises the overarching question of how such mobile devices help us trace, contextualize, and visualize research in writing studies. The following section addresses this question by presenting a case study of a summer study abroad program.

## 3. Writing work, location, and the study abroad context

One way to address the previously stated question is to examine how students use mobile technologies to compose when moving through and interacting in different contexts. Case studies can, in turn, serve as effective contexts for initially investigating such practices. To this end, I used the case of a summer study abroad program to explore how aspects of location and place affected and were affected by composing using mobile technologies.

The case in question involved a Purdue University writing course conducted in Dundee, Scotland in the fall of 2014. To undertake this research, I first asked Professor Michael Salvo, the Purdue faculty member who led a study abroad course, for permission to conduct a study of his Professional Writing students and their use of mobile devices when engaging in composing activities for the class. Since participating Purdue students were scheduled to do field research as part of the course, my goal was to integrate mapping applications into their pre-existing work habits. The student participants had familiarity with smartphones as part of their preparation for the course, and traveled with a variety of

their own mobile devices. To combat possible wireless connectivity limitations, which would limit data use and reflection over such data creation, I used real-time data synching and location surveys to collect student responses. The research was conducted with IRB approval (Purdue IRB Protocol #1405014840) and students were recruited using a simple invitation described in the IRB application asking students to volunteer their maps for study and respond to surveys.

Interestingly, examinations of such study abroad experiences can provide valuable insights on mobile composing practices in a range of modern educational and employment contexts. To begin, study abroad courses have been gaining support in recent years; Purdue University, for instance, has the goal of 33% of students taking part in a study abroad program that would triple current participation rates (Neubert, 2013). The emphasis on writing for global audiences also holds true for professional/technical writers in industry, especially as demands of international communication and globalization require writers to not only be aware of different cultural dimensions for their work, but also to write with a global audience in mind. And many feel this degree of understanding is best gained through contact involving the "cultural dislocation" (Andrews & Henze, 2011, p. 114) that occurs through adapting to a new culture.

These factors mean the importance of locating one's work can combat this dislocation felt from global writing contexts. Both Michel de Certeau (1984) in *The Practice of Everyday Life* and Erik Jonsson (2002) in *Inner Navigation* discuss how the layout of cities and physical spaces drive one's movement and interaction within that space. The experience of getting lost, finding familiar paths, and building a mental map of the city are traits of locals that the study abroad students adopt quickly in order to simply live in the host city. Weekly excursions to new cities (and sometimes new countries) continued that feeling of unfamiliarity and dislocation. At the same time, students spent enough time in their host city to become regulars at the local café, navigate the city streets during rush hour, and find the shortest way home from the pub.

As daily practices change to account for the city, so too can research and writing account for the new spaces of writing. As students become comfortable with working in their new environment, the mobile tools and mapping applications provide an augmented way of viewing their work as intimately connected to local paths, infrastructure, and spaces. Unlike a provided map or outline, the self-generated traces position the act of mapping itself as an approach to researching the city by connecting together disparate locations or bits of collected data that may not be readily apparent. For example, one graduate student interested in archival research built off the class trip to the Scotland national archives with travel to smaller research sites including libraries and colleges around the country. Another student found a flyer for a knitting club in Dundee that led to talking with local women from both Scotland and England about the approaching Scottish Independence referendum vote. (Personally, I encountered a connecting thread in my travel around Scotland as I visited a number of small towns as the Queen's baton moved around the country for the commonwealth games in a style similar to the Olympic torch relay. Like the students, I uncovered this possible research thread by talking to locals and going "off path" for work.)

In each of these cases, the discovery of research opportunities was tied to exploring the cities and speaking to locals. The unique, individualized maps generated by students then become a way to walk through this process of discovering research opportunities through exploring local spaces. In essence, students must learn the contextual nature of their new home and these maps serve as a way to show their research as a form of contextual knowledge-making. Providing this context acts as the wayfinding for readers to follow in the students' literal footsteps for seeing how that research was generated and then to interpret that work in their own perspective. Beyond a stationary, assumed location or shared perspective the maps physically position that research as connected to a unique context that can be further connected to local, social, historical, or global concerns. These contexts and experiences, thus, became the focus of my own research on how mobile technologies could be examined—and better understood—in terms of ideas of location, space, and place when individuals use mobile technologies to compose in the modern global context.

## 4. Methods and methodology

To examine how ideas of location and mobility affect composing practices in global contexts, this study sought to answer two overarching and interconnected research questions:

- How can mobile devices be used as a way to trace, contextualize, and visualize research practices associated with writing in global contexts?
- How does this act of mapping inform the research – and related writing – practices themselves?

Considering such questions provides opportunities to reflect on ways we teach research by focusing on the iterative, interactive nature of that work. To study such contexts and better understand such practices, I used the Strava running and cycling app as my primary tool for collecting data and mapping student research practices. Although the case examined here follows a group of students in the unique context of a study abroad course, the act of integrating into a local community and understanding its culture – which all students did when composing via mobiles– is a key aspect of the work all writers do. Further, the need to disseminate research findings to others so they might make us of and build on such work necessitates a way to walk readers through the research process.

### 4.1. Participants

In total, 10 Purdue students – six men and four women – participated in this project. Of these 10 participants, six were Professional Writing majors, one was in the School of Science studying Geology, and three were in the college of Engineering studying civil engineering and aeronautical engineering. Two of the students were non-native English speakers from East Asia, and for most of the participants, this trip to Scotland represented their first trip outside their home country.

In recruiting subjects for this project, I used an initial email to approach the students enrolled in the study abroad program and asked them to consider participating in this study. The initial email provided students/prospective subjects with a short overview of how the application chosen to collect mapping data for the study (Strava) worked. This overview also included instructions on how to download the application, and an indication of my intention to use of the research resulting from this study to create visual representations of their movements and a final article manuscript on such practices. (As the maps created for this project were housed in a shared online account for the class, each of the participants could access the maps he or she was generating via their own mobile-based research.) This initial invitation was sent to all 10 students enrolled in the program, and all agreed to participate. Each participant then received a link to access the joint Strava account as well as access to the survey materials. The extent to which each student participated is unknown; six distinct participants supplied data regularly.

For their research projects, students found a topic, developed research questions, and then conducted their research in order to produce a final report for the course. As the class contained a diverse group of students, their projects emerged from a variety of interests for technical writers. Projects included studies of sustainability and green energy, local discussions of the referendum vote, infrastructure development, the history of technical writing in Scotland, and mass media. Public posts are available: http://pwscotland2014/blogspot.com.

### 4.2. Data collection methods

To examine my initial research questions on mobile research and composing processes in global contexts, I used two different methods to collect data. The first mechanism I used for data collection was a survey I requested all participants to complete, and this survey asked students to anonymously input the location where they conducted their research on a given day of the study abroad trip. While the survey approach did not work in real-time, it could be used by students in more remote areas where wireless signals were difficult to access.

The second approach for collecting data involved using the mobile application Strava (2015) and its API developer tools to collect information on where students were located when using mobile technologies to research and compose. Strava and its API could run in the background of the devices students used when conducting their own research, and as such, these technologies allowed me to collect location data in real-time and mapped student movements around a given research site.

Through these two mechanisms, I was able to collect data on how students physically moved around the city of Dundee while working on their class projects. During these data collection processes, students were in control of when they wanted to use the Strava application to collect information on their location, and the background nature of the tool meant students often turned the tracer on and then forget about it while they performed their research. This "oversight" led to an element of daily discovery for students as they uploaded their maps at the end of the work day and saw the messy, wandering paths they had taken as they worked on their own research projects. The data collected through these two mechanisms also provided me with a method both to visualize student research practices directly as they moved

about the city and to place that research contextually in a global environment as outsiders to Scotland. As a result, I could gain a more complete picture of how students were moving as they were researching and composing using mobile technologies.

### 4.3. Tools and technologies used

All ten participants carried a smartphone they used as a primary method of communication with family/friends back home and with other members of the course. The majority bought cheap smartphones from shops in the United Kingdom, and these devices ran on familiar technology, with most individuals using Android user interfaces. The availability of online access did affect the data collection process throughout this project. Connections to Mobile networks and GPS are still not ubiquitous in Scotland and other parts of the UK, even in the midst of densely-populated, bustling, tourist-filled city centers like Edinburgh and Glasgow. Public transportation was one reliable source of Wi-Fi, as was the free public Wi-Fi in areas such as downtown Dundee or museums, so many students were able to connect to the application successfully. This real-time data provided an interesting log of both placement and research as students worked.

As students used their devices for recording notes, conducting interviews, and taking pictures, the GPS tool needed to reliably connect and record when students wanted to supply location data according to their preferences. Strava, the tool selected for collecting such location data on participants, is a running and cycling application that uses GPS to record the path the user takes as he or she goes for a morning walk or afternoon jog. Although designed for exercise, Strava offers developer tools and an API that can be modified for research purposes. As the maps output by Strava were through Google Maps, the data could also easily be used by students alongside the survey-generated maps.

### 4.4. Data collection context

The host city Dundee is a hub of Scottish culture, and students were encouraged to record their movement around the city as an opportunity to examine different research ideas before settling on a topic for their final class projects. Due to the exploratory nature of study abroad and the free reign students had in determining what they wanted to study, the instructor encouraged students to explore a variety of research sites. When engaging in such activities, students collected data such as images, typed notes, and recordings of ambient sound and voice; at the same time, they were connected through wireless networks to applications that traced their paths during their research activities. I checked the shared student Strava account on a weekly basis in order to see how many students were participating and was on-hand during a few class periods to answer questions or address any problems. The application collected location data only and most was submitted by students while in the process of researching their projects, although some also used the Strava app to trace things like travel time or wandering about the city.

### 4.5. Data mapping

The student-submitted survey data allowed me to pinpoint the general area where students worked on any particular day. The map in Figure 1, for example, shows a broad look at the work these students did on the study abroad trip, and the survey results reported in this map represent a broad view of where students worked. Each red indicator on the map displays a location that a user accessed mapping tools at least once. Although lacking detail, this pulled-back view reveals different locations students traveled to and where they performed different activities during the summer study abroad program. As such, the points presented on this map highlight the range of locations students visited when using mobile technologies to engage in research and composing activities. The points on this map thus reveal the ease at which student research activities took them across a wide expanse of territories and brought them to a variety of new cultural spaces while researching and composing.

The data collection process was not automated and not as precise as other methods (i.e., it could not show street-level work by the students across all of the United Kingdom and into Europe), but when mapped, it did provide a sense of scope of their mobile work during the course. Clusters of markers on the map in Figure 1 indicate a group of students at a certain location, such as class trips to Pitlochry and Falkirk. Conversely the spread of individual points at different locations on the map highlights the range of sites students visited when engaging in research and composing activities for the course. As students were free to select their own research projects – and thus the related locations in which they
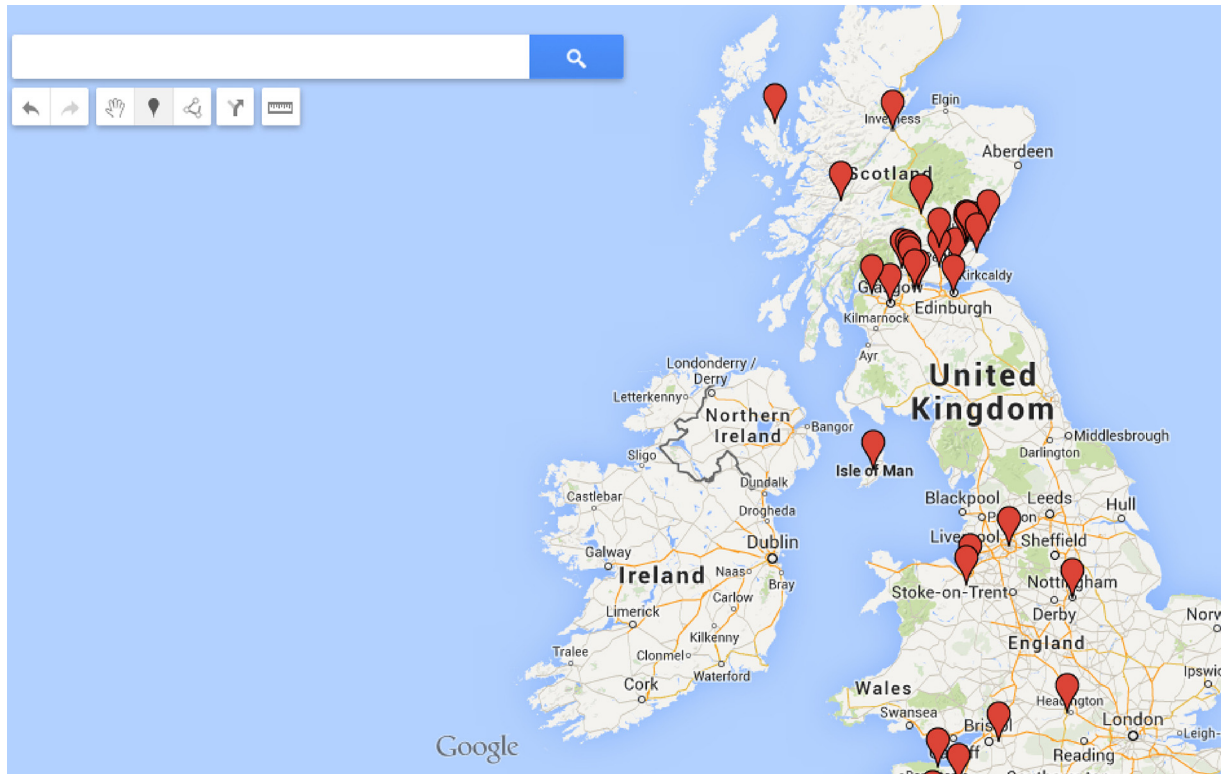
Figure 1. Google Map showcasing survey results from student research trips.

conducted research, the majority of these movements represented by individual points on the map indicate individual student choice. The formality of the official research trips led to increased data submission from students, but the maps chosen as representation of this project show a range of student submissions across the study's duration. The initial map presented in Figure 1 thus serves as a general foundation for examining student movement during the course of conducting their own research for their individual class projects.

## 5. Findings

The maps shown in this section represent various kinds of data collected from the class Strava account during the course of this project. To provide context for understanding the different kinds of data collected, this entry includes a number of maps that show a range of student uses of the application. (These include a quick orienting map generated by students in the first week of class, a map of local research in Dundee, and a map generated by a student using the app to track their journey north on a research activity.) Each of these maps highlights a different approach to using the Strava application and points toward the usefulness of maps in responding to my earlier research questions that focused on investigating locative research and composing practices associated with uses of mobile technologies.

### 5.1. Student-directed mapping

As Reynolds (2007) reminds us, "there is a danger of investing in technologically sophisticated maps as the new source of truth without also acknowledging the shifting, fragmentary nature of all forms of knowledge and information" (p. 82). GPS-enabled maps are precise, and accurate, but they must work in conjunction with the writer's sense of place and location. Reynolds highlights the habitual nature of pathways and the need for experience to be the driving factor in our work (p. 81). Maps can be formal, outlined paths or simply everyday meanderings committed to memory. This idea can be seen in certain maps produced from the data I collected on student movement during their mobile-oriented research activities.
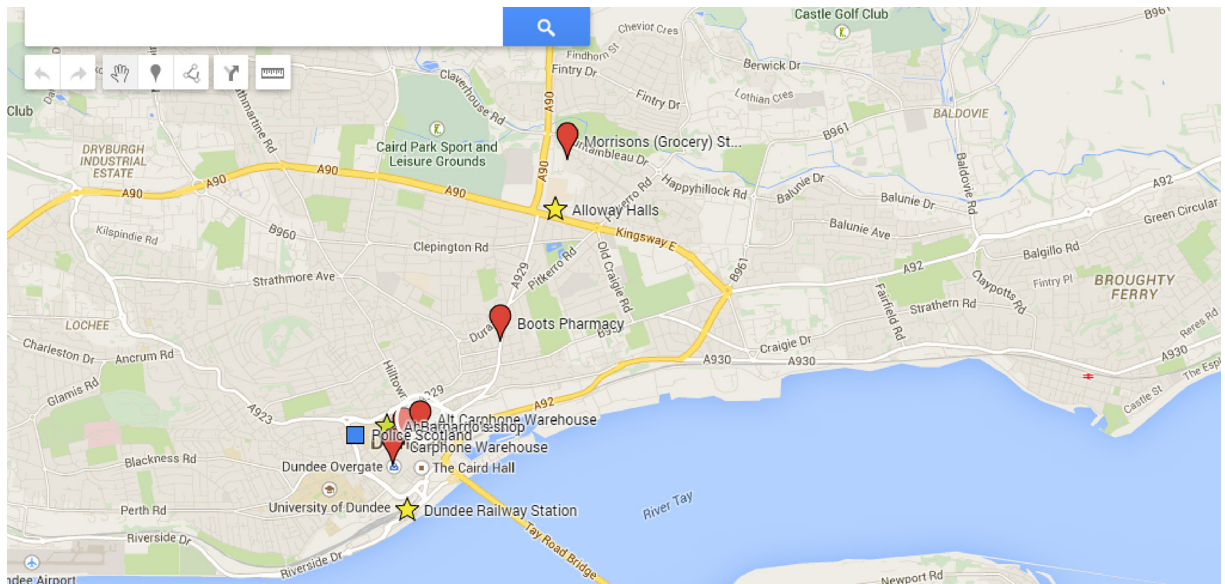
Figure 2.  Google Map created by students showcasing regularly-used spots around town.

The professional writing students in the study abroad trip were strangers to Dundee, at least at first. Thus, their first use of maps were as tourists trying to find locations, getting to meeting spots, and looking for places to shop or eat (see Figure 2).

Figure 2, for example, was generated by the students before starting on their research projects in the class. As such, it reveals a tendency for individuals who are new to an area to simply mark important locations on the map, such as the classroom, grocery store, pharmacy, and transportation hubs. Although referenced often at first in their mapping activities, as students became more familiar with the area, this knowledge allowed them to engage in and chart more adventurous movements down to the Contemporary Arts Center, across the Tay Bridge for a bike ride, or around an unfamiliar city for a day. The map in Figure 2 highlights the early use of the mapping tools by students and provided opportunities for students to narrate strategies they developed to orient themselves as they engaged in composing practices in new locations. In this context, the maps, themselves, act as heuristic devices. Through them, students told stories of their days exploring, writing, and researching prompted by as can be seen in the turns and twists represented on these maps.

As writers learning to navigate new environments, the students started by tracing daily habits in order to share information with each other. This type of situating work is important for writers working online and in global contexts as they need to have a firm grasp of both the situation they are writing from as well as the possible contexts their work is entering into. This sort of cultural fact-finding can be one way to build understanding of the people and places where their work will be read. Additionally, once aware of these practices, writing instructors can encourage students to engage in more thoughtful adaptation of tools to meet student needs based upon such understanding of use. By drawing attention to such factors, writing instructors can encourage students to employ more thoughtful and meaningful use of those tools as they fit into the work practices students develop – skills that can greatly benefit these students when they use mobiles to interact effectively within the context of today's global society.

### 5.2.  Maps for exploratory research

Figure 3 represents a week's-worth of student movements around the host city of Dundee with these movements layered into one map using the Strava Multiple Ride Mapper by Jonathan O'Keeffe (2013). Although the lines get jumbled at certain points, distinct areas of focused interest can be seen. For example, Abertay University (seen in the middle of the map) was the location of the classroom used throughout the program. Thus, lines naturally intersect there regularly. But other distinct movements, such as to the southwest of the map toward the Dundee Contemporary Arts Center, as well as to the northeast along popular biking trails around town, indicate numerous hubs of student attention.
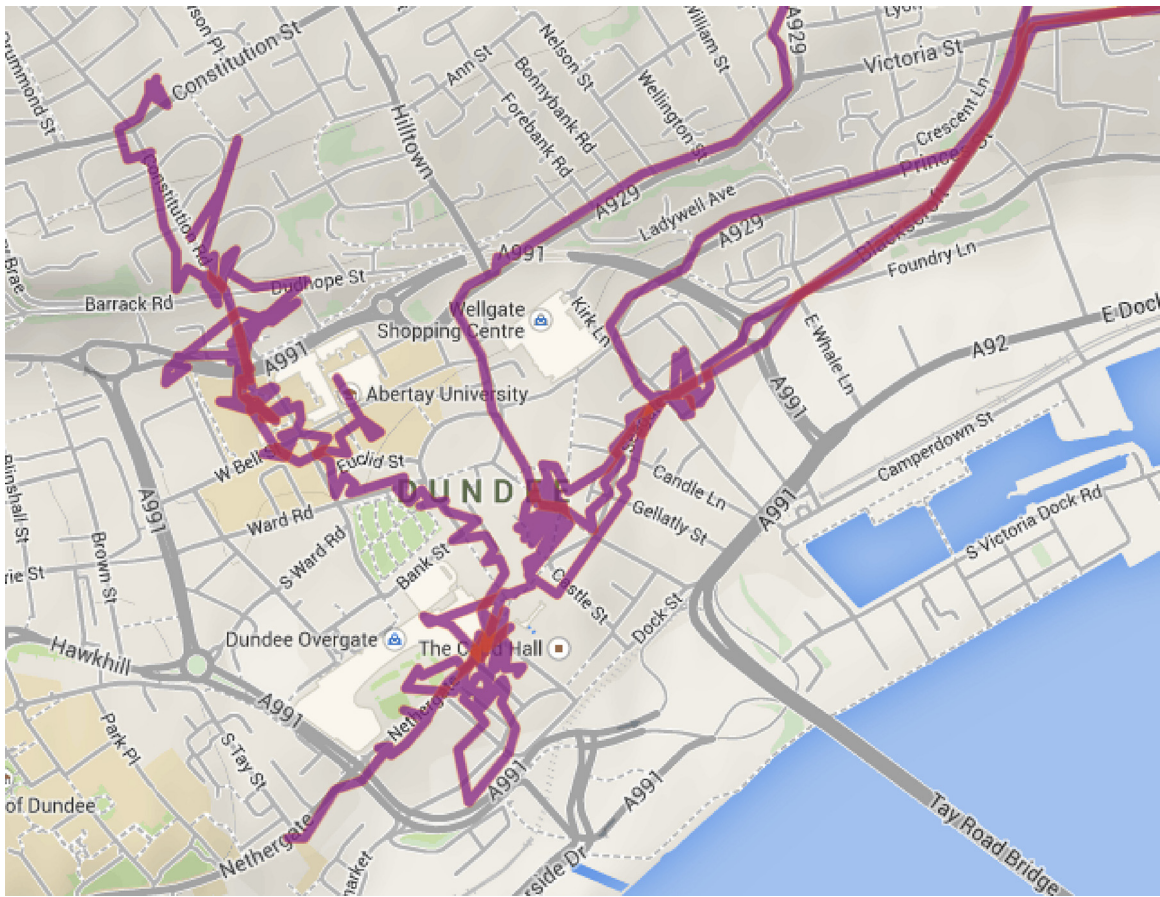
Figure 3. Strava-generated map of student paths taken during a week in Dundee, Scotland.

Caird Hall, in the south-middle of Dundee, represents a cluster of restaurants and cafes where students often gathered to spend afternoons working, while the hill up toward Constitution Street to the North offered students a number of twisting streets they could take to return to their dorm. The map in Figure 3 thus shows that students are using the mapping application as a form of exploratory research by turning on the tracker while moving about the host city. In this, way students had access to a view of their movements around the city. They could then use this knowledge to when composing their weekly progress reports and memos, a perspective they could not access other ways. Through such activities, students begin to learn how to more closely connect aspects of place to ideas when composing, and through such connections, they can draw from a wider range of spatial information when composing for readers in both their same and in other locations.

Figure 3 also highlights the spatial nature of writing as an activity that occurs in a multitude of distinct spaces where the user has access to the technology. As Bjork and Schwartz (2009) describe, "students equipped with mobile devices are always prepared to research, write, and even publish on location" (p. 230) provided the framework is able to keep up with their use. And these movements can become an aspect of that research. As de Souza e Silva and Frith (2014) note, "Either through a user's location history or through a pattern of similar information embedded in different locations, users create connections among previously disconnected locations in the city; they suggest patterns of mobility through urban spaces" (p. 42).

As Figure 3 reveals, localized research can occur in disparate locations. These messy lines do not highlight distinct research sites so much as they show a process of moving and working throughout the city as a contextual development of student work. Their research activity is physically "placed" around Dundee, with the city, Scotland, and its people. Such factors prove the backdrop needed to view the data in a more complete context that can facilitate understanding of where and when individuals compose in different contexts. In moving this work to more global communication, any
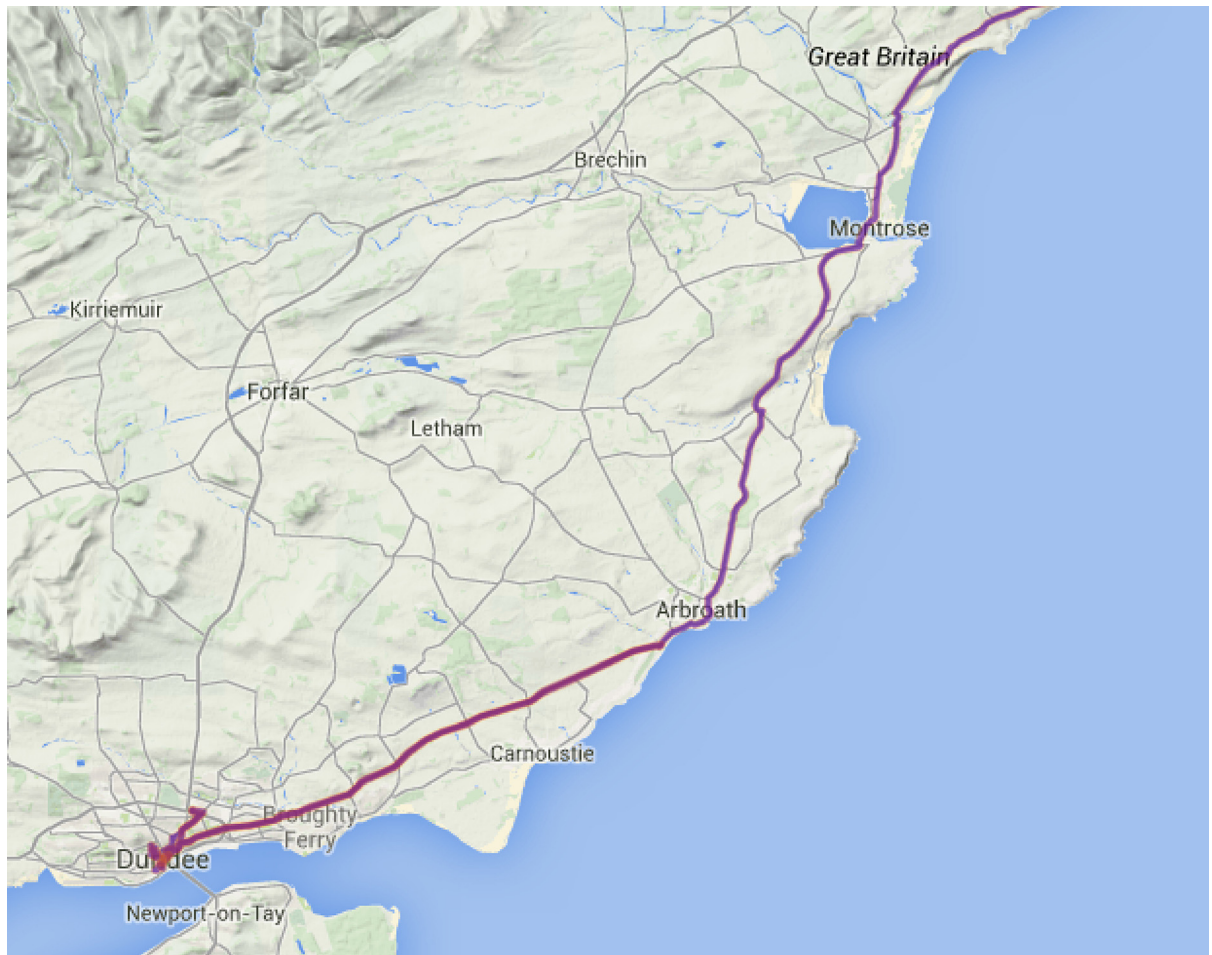
Figure 4. Strava-generated map of student taking train north along the coast.

reference to the students' work is built through the city as a lens for understanding that work. When communication happens between disparate places, each location on that spectrum offers context to the interaction as a whole.

Although it only traces the everyday sorts of paths students took, the map in Figure 3 affected student work as another way of "seeing" the city of Dundee in their work. Research was done in the same spaces they used for exploration, activity, or fun, and the maps made no distinction among the types of work being done. Such a recording the path taken and the movement itself relates back to work on Auge's "non-places" as explored in both Hea (2009) and Swarts (2007). Our assumptions of the significance of a singular place (Hea, p. 206) becomes at odds with the ability to do work in those places thanks to mobile technologies. In such situations, students are literally working between locations. Their movements, however, also represent movement between cultures in an effort to better understand their new context. As Swarts says, "Mobile technologies accelerate the production of non-place" (p. 282). For the students reported on in this study, in Dundee, their maps provide them access—an opportunity to see themselves moving through a city, to understand it and themselves in relation, and as places of transition that factor into work. Just as these students shift perspective and focus as they moved through the city, work that crosses borders or cultural boundaries incorporate the in-between as necessary context for bridging meaningful communication across cultures.

### 5.3. Maps for research in non-places

The next map (Figure 4) highlights the use of Strava for research purposes. It represents an instance of when a student ran the application while riding on a train north to the furthest reaches of the British Isles. Although not

intended for use in vehicles, Strava was able to keep up with the train and recorded a fairly accurate path of the student's journey.

Such situations can help writing students gain a better understanding of how the work they do via mobiles can move beyond the designated boundaries of a research "site." In this way, students can see how their work is in line with the *kairotic* aspect of digital work and the ability to scale from more localized maps to transitions as wide-ranging as half the country is useful for demonstrating the scalability of these tools. While Sullivan and Porter (1997) describe the *kairotic* aspect of digital work, "just-in-time" takes on entirely new significance with mobile technologies.

The relative inexpensiveness of train travel in Scotland allowed for students to take these impromptu research trips and the maps likewise recorded the non-places, the spaces between as a part of the research itself. As the trains were equipped with Wi-Fi, not only could they function as places to work, they factored into the overall planning time. In a more general way, this trip/journey aspect of the research site (i.e., composing via mobile devices) becomes an important aspect of the work itself. As with Figure 3, Figure 4 shows passive context. It begs the question: "What happens when there is no segmentation of tasks as described by Geisler et al. (2001, p. 296) or split from place to non-place?" The constant connection of the writer and his or her mobile device to the map complicates our already messy notion of the location of work, offering a complex look at future workplaces. In global context, travel across countries and continents, planning of research and method, become explicit aspects of work and available through these maps. In global online context, asynchronous time in-between likewise becomes evidence of important work accomplished in these non-places, accomplished during once-wasted time in transit and waiting. In effect, it adds non-time to non-places. Such factors are key ones to be aware of should students wish to use mobile technologies in an informed way that can help them better address ideas of place and location when communicating with global audiences.

Figure 4 also highlights wayfinding and the ways students already write using mobile devices—with images, audio, video, location data—and that all these modes of recording are folded into research. There is no special tool to learn. Rather, there is simply another program that students run on their phone while using that same device to collect other research data. These visual signs create a contextual, localized view of research that resembles what Gordon and de Souza e Silva (2013) describe as "net locality" wherein both physical and digital objects become an integral part of a location: "The idea that both remote and co-present interactions are now interfaced via mobile technologies fundamentally redefines how we understand public spaces and the character of locations" (p. 74).

In these processes, the "character" of a location changes the researcher's perception, which in turn colors choices the researcher makes. As changing technology allows for GPS tracking and always-on network connections even as writers take a train to the far reaches of Scotland, data can be recorded in real time and used to navigate hybrid digital/physical realms. Further, there is opportunity for more non-linear, exploratory invention away from the seek-and-find method of research. Such factors echo what Schmidt (2011) details as an organizational shift from narrative to database for storing and sending information (p. 312). Exploratory student research involving such situations can thus be seen and valued through the affordances provided by mobiles in data collection when composing. Just as students rely on smartphones as a multi-tool in study abroad, academic use of mobiles at home connects students through global smartphone adoption.

## 6. Conclusion

The maps are visualizations of both place and time of research activity. They represent a group of physically and culturally dislocated students, recording their processes of coming to understand a new host city, Dundee, Scotland. These visualizations are created by mobile technologies in communication with powerful network analysis, GPS data, and complicated mobile devices running advanced operating systems. Moreover, these maps represent movements of a group of students, created as they write and research—work—in an international context. In so doing, they demonstrate the use of wayfinding, mobile mapping, and digital tools in locating technical communication research as it happens in global contexts.

For the study reported on here, students used the mapping software in both expected and unexpected ways—ways that have important implications for writing practices in global contexts. Although a logical use of Google Maps, using the tools for both class projects and mundane activities highlights blurring of boundaries (on and off the clock,

classroom and home) that happens on study abroad trips and typically "messy" research and experiential learning, as well as in the workplace. These maps show

- The need for cultural fact-finding as students enter into new global contexts for their work,
- The ability of GPS-traced maps to connect disparate locations of work together,
- The impact of including such non-places in the methods of empirical research, and
- The *kairotic* aspect of these digital tools to enable students to take these methods with them wherever they have a networked connection.

In the research examined here, wayfinding becomes a viable method for approaching research in global contexts through the use of local knowledges and mobile technology. Students are already composing with mobile tools, and mapping their work is a way to begin connecting daily practices s to empirical research. Further, as mapping scales to a range of size of location (nation, region, city, neighborhood), this study's methods can be transitioned to new contexts. Such scaling offers promise for studying local research in global contexts.

Building off existing theories of mobility and mapping in global contexts, the results of this study offer a case study of incorporating location into research practices through wayfinding methodology and the use of GPS-enabled mobile devices. Writers need to better understand the contexts of their work in an increasingly globally-aware society. They also need to navigate these increasingly complex networks of technologies and people. Wayfinding and the re-focusing of location in writing is a useful means to approach these issues.

When we add in the pervasiveness and multi-tool aspects of mobile devices, the writer as an always-on, always-connected mobile individual reinforces the way unique locations of writing impact the work produced. When writing can happen "anywhere" the specific integration of tools, geo-location, and the individual has a profound impact on the writing produced. Globalization, as viewed in terms of the study abroad course examined here, provides the unfamiliar territory that students need to navigate. As mobile device use continues to grow, and devices become more powerful, we will continue to need to ask these questions of our tools and practices as a way of framing writing and research in situated, localized spaces.

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