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Interactional Practices and Artifact Orientation in Mobile Augmented Reality Game Play

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Abstract

In an effort to better understand the ways that small groups use digital technology as they move through a physical environment, this paper describes the methods used by groups of three people to maintain a group participation structure as they accomplish a quest-type task during mobile augmented reality game play. The game was available on one mobile digital device (an Apple iPhone) that was shared by three players as they negotiated a set of point-to-point route finding tasks. Video-recordings of each group were made using three cameras (two head-mounted cameras and one hand-held camera). We focus on the different ways that the single device was oriented to by group members via talk-in-interaction as they accomplished the game activity. In particular, we outline the practices for talk-in-interaction (including gaze, postural alignment, and deictic expressions) used by the participants to maintain their constitution as a group, to accomplish a shared visual focus on the single device, and to explicitly transfer the device from one player to another.

1. Introduction

Advances in the development of mobile handset technologies have made access to information and communication increasingly available and inexpensive resulting in the ubiquitous use of mobile devices in many parts of the world. In fact, in early 2014, smart phone mobile app access to Internet resources eclipsed those made from personal computers (O'Toole, 2014). This said, the use of mobile technologies, even in their current user-friendly formats (lighter devices with larger screens), are managed by humans who are part of, and often also engaging with, the non-digital

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physical world. This is particularly the case when mobile devices are used to help find physical locations and to gather (and sometimes produce and make available for others) relevant information about locations or venues.

Since the advent of the iPhone in 2007, the coordination of digital devices with talk-in-interaction while moving through the environment has become a high frequency life activity, one that expands beyond engagement with the smartphone to include visual perception of the physical and built environment, including signage and other available cartographic resources, and communication with co-present parties. Hence, the coordination of talk with digital devices is a contemporarily important area for investigation that seeks to uncover participants' sense-making practices as they utilize tools and talk-in-interaction to coordinate movement through physical environments.

The human interface with technology is not a new area of study (e.g. Shneiderman, 1980; Suchman, 1987; Whiteside, Bennett, & Holtzblatt, 1988; Goodwin, 1996) and the rapid development of mobile digital devices has increased the richness and importance of this area of research. The use of mobile technologies has made relevant research on talk-in-interaction while moving (Haddington, Mondada, & Nevile, 2013; McIlvenny, Broth, & Haddington, 2014) and the use of mobile technologies in such interactions (Brown, McGregor, & Laurier, 2013; Luff & Heath, 1998). Our primary interest is to better understand how interactants in the physical world, whose interaction is mediated and directed by mobile digital technology, manage the interface of the virtual and the physical through talk-in-interaction. Especially interesting is how it is that we use mobile digital technology to co-construct place, to move through the world in coordination with technology and human co-participants to get from where we are to where we want to be, and the attendant processes of using multiple semiotic resources for negotiation and communication with others who are physically co-present.

This context provides the opportunity for new, empirical investigations of the mirco-interactional practices for maintaining a sense of group cohesion while using mobile technology to collaboratively navigate a physical environment. Focusing on the use of a mobile device during face-to-face interaction while playing a mobile augmented reality (AR) game, this research investigates the following foundational question: How do physically co-present participants engage vocally, aurally, visually, and haptically in a time-sensitive way to coordinate instructed action and spatial movement through use of mobile technology? First findings from our empirical investigations outline the micro-interactional and linguistic practices that groups use to

maintain their collective identity and to connect the semiotic realms of the mobile device and the physical world.

In the research reported here, we focus on the ways that small groups of English language learners orient to and use mobile digital technology (GPS-enabled commercially-available iPhones in this case) to accomplish a series of game-like quests or tasks. The student-players are given the role of agents who have traveled back in time from the year 2070. They have been instructed to seek out five locations in which green technology was used in the present day (2015) in order to help preserve the earth's environment for the people of the future. Participants are to file a video report for each example they find (Thorne, 2013). Although the broader research project extends beyond orientation to and use of the mobile device, our analysis has shown this to be a primary activity for our participants during the accomplishment of the task. This perspicuous setting allows us to analyze and uncover participants' sense-making practices as they realize, situate, and enact, through talk-in-interaction, the mobile device's miniaturized, detail-poor, two-dimensional map representation in the broader context of the three-dimensional, sensory-rich physical world.

2. Review of research

Researchers of social interaction have studied the situated relevancies for objects during interaction (Knorr Cetina, 1997; Goodwin, 1994; Hindmarsh & Heath, 2003; Nevile et al 2014) and have also studied co-participants' movement through space as a group (Ryave & Scheinken, 1974, Goffman, 1971; De Stefani & Mondada, 2014; Weilenmann, Normark, & Laurier, 2014). More recently, a smaller set of studies has focused on the organization of people's talk-in-interaction around mobile devices as they walk, a common practice for groups using smart phones (hereafter 'device' or 'mobile device') for information gathering and way finding. De Stefani and Mondada (2007) studied the ways that movement influences how people organize their talk while walking and shopping in a supermarket as well as while driving in a car. For example, physical movement (i.e., walking) is made relevant in the talk of co-shoppers in a supermarket when it is necessary for them to be in a close physical proximity to co-locate items or to orient themselves to where to find next items. Additionally, movement was seen as relevant in both walking and driving situations in that the immediate physical context for talk changes more or less quickly, but constantly nonetheless because of the co-participants' mobility, and talk being sequential, participants must

orient its sequentiality to changes in physical surroundings. In a recent edited volume (Haddington, Mondada, & Nevile, 2013), De Stefani also addressed moving while interacting in supermarkets and illustrated that co-participants often, among other things, come to a stop in order to introduce next actions. Other papers in Haddington et al (2013), such as Broth & Lindström, show how a small group maintains its status as a 'mobile with' (Jensen, 2010) while moving to and from various destinations, in this case walking along a dock. Their investigation highlights the importance of the immediate physical environment for the way a group interacts. The fact that the participants are moving shows the changing contextualization for talk: "places materialize as meaningful 'places in sequence' in and through the embodied mobile interaction of a group" (p. 91).

Research on interaction around the use of mobile phones includes a number of studies focused on the sequential structure of talk as well as on how the portability of these devices influences the interactions of those in the vicinity of the device (Arminen & Leinonen, 2006; Arminen & Weilenmann, 2009; Hutchby & Barnett, 2005; Licoppe, 2009). Of these studies, only Licoppe focused on the way participants connected cartographic location on the device to the physical location of the device holder and none of these studies investigated the influence of walking on participants' orientation to the device.

Most closely related to the focus of our current study is the research by Brown and colleagues (Brown & Chalmers, 2003; Brown & Laurier, 2005; Brown, McGregor, & Laurier, 2013), which comprise a series of empirical studies of meditational tools for way finding used by small groups. In Brown et al 2013, video recordings were made and screen captures were collected of participants visiting various places in a city (Stockholm) on a 'typical day'. The visits were mediated by an iPhone used for information gathering and to help locate specific sites. Their analysis, the first to use video recordings to observe mobile phone use while walking, showed, as might be expected, that participants used the devices frequently in order to be Informed about locations before visiting them. They also used the GPS and mapping capabilities for way finding. The research showed that the mobile device significantly shaped the interaction the user had with other people and that there were convergent and divergent interactions (Mondada, 2008) around the iPhone. That is, mobile phone users at times made the phone available to other co-participants (convergent) while at other times used their phones alone without showing the device to co-participants (divergent).

For the research reported here, rather than focusing on the mobility aspect of the interaction, or on the many semiotic affordances for exploring green technology and sustainability projects and finding their way around a university campus, we start with what we feel is a more basic descriptive investigation that focuses on how the device is oriented to, in what contexts and for which purposes, and how the mobile device facilitates the group's maintenance as a group and the accomplishment of their activity.

2.1 'Serious games' and mobile devices

The concept of ludic engagement as a form of developmentally productive activity has likely existed for as long as have formal approaches to teaching and learning. Developments in contemporary digital learning have recently come to include 'serious' games, which involve the use of computer and mobile device game-like activities with an explicit educational focus. A compelling illustration from the serious games movement is the work of Jane McGonigal (2011), who harnesses the motivational elements of game mechanics in order to create experiences intended to raise awareness of, and critical thinking about, humanitarian, ecological, and societal issues. In similar work, Ian Bogost (2007, 2011) has described the use of digital games for documenting historical and cultural events as spaces for artistic and political engagement.

Designing AR games to highlight and more fully understand and appreciate specific places is a growing phenomenon, with theoretical grounding in situated learning theory and critical pedagogy (Gruenewald, 2003; Holden, Dikkers, Martin, & Litts, 2015). Diverse projects types include scientific themes (e.g., metallurgy), urban studies, architecture, and history (for examples, see http://arisgames.org/). AR games are rapidly appearing in museums, community-based education projects, and more slowly, in formal educational settings. Existing AR games (e.g., Holden & Sykes, 2011; Squire, 2009; Thorne, 2013; Thorne, Hellermann, & Jones, in press) and accompanying mobile resources for learning share certain objectives, such as to increase engagement in the language learning process by moving students and language learning experiences out of the classroom and into the world and to provide *in situ* prompts for communication and language use in situations of contextual relevance to the topical activity at hand.

An AR game recently developed at Portland State University by an on-campus group (the 503 Design Collective, a team of undergraduate students and faculty), which takes the university's emphasis on green technology and sustainability as its core

focus, is called ChronoOps (or 'chronological operations', in reference to the theme of time travel). The conceit of the game, as mentioned earlier, is that students play the role of an agent from the future (the year 2070). The game narrative is that in the year 2070, the planet has suffered massive environmental degradation and the player-agent has been sent back in time to the year 2015 (as of this writing) in order to learn from the "simultaneous dawn and dusk of green technology" that is in evidence on and around the university campus located in Portland, Oregon, in the United States. It is relevant to note that this project's subtext is prosocial in the sense that in addition to putative language learning opportunities, the game's narrative encourages participants to think about the consequences of their daily choices regarding transportation and energy use as they relate to the larger issues of environmental stewardship and the health of the planet's ecosystem.

When players enter certain physical locations, they receive video, audio, or text information and/or directions in one of numerous languages (currently English (for ESL students), French, Japanese, Russian, or Spanish). Players are given tasks that result in visits to the electric avenue (a location where electric cars can be recharged), a large solar array producing electricity for a campus building, public transportation hubs, bicycle parking areas, and environmentally designed "green structures" on campus. See Figure 1, below, for an illustration.

Figure 1. Screen captures from the game showing instructions in various languages and map

En route, players are prompted, in their role as agents tasked with investigating sustainability projects that could yet save the future of the planet, to record verbal narratives of what they observe using the target language. At various points, they are also asked to make text notes, shoot video, and take photographs, all of which are later

used in language class assignments such as the production of written reports and oral presentations. Participants are asked to play in small teams of three and group interaction while playing the game involves various types of task- and way finding-related communication. Instructions for the five destinations appear on the phone and must be shared with the group. When the groups arrive at a destination, they are instructed to record a video report about the green technology they observe.

This research analyzes the interactions of small groups as they play the ChronoOps AR game. A distinctive feature of the context for our study is that only one participant in a group of three was carrying a mobile device, which created a dynamic in which the group, together, would orient toward the device. This contrasts with the aforementioned Brown et al 2013 study in which each person had a device, a situation that resulted in divergent, device-based interaction that we did not see in our data.

3. Data collection

Participants in this research project were intermediate-level students of English as a second language at the university where the research is taking place. Data collection is ongoing and at the start of each recorded activity, in the classroom, students download the app (arisgames.org) to access the game. The teachers inform the class that they have an undercover mission to carry out and that they need to work in groups of three (one phone to be used per group) to find examples of green technology in the area. At present, eight groups have been video recorded playing the game. Each game took a little more than an hour. We have over eight hours of video recording. Five groups' video recordings have been transcribed using principles and procedures from conversation analysis (Jefferson, 2004).

The video recording of each group included three video and audio channels. Two members of each group wore a Contour ROAM brand head-mounted camera that captured an approximately 150 degree visual field in the direction they faced (Figure 2).

Figure 2. Three views from a head-mounted camera

These cameras captured audio of the camera wearer and the group. A third member of the group wore a wireless microphone that fed audio to a third, hand-held camera operated by a member of the research team (Figure 3).

Figure 3. Hand-held camera view

Both the head-mounted and hand-held cameras had high quality stabilization features to enable clear video of the participants while in motion. Additionally, the students used their group's mobile device to record video reports from each of the green technology sites, which were uploaded and available to the teacher and students after the class.

4. Analysis methods

Data analysis procedures were influenced by ethnomethodological conversation analysis (CA) as well as micro-level linguistic anthropology (Goodwin, 1981, 1994, 1995; see Arminen, 2008 for a discussion of the value of a synthesis of CA, EM, and Ethnography). The authors were camera operators during the data collection and participant observers. The instructors of the classes in which the participants are enrolled are part of our research team and we are familiar with the curricula and other contexts of the courses in which the AR game was used.

Our analysis started with close transcriptions and sequential analyses of the talk-in-interaction using methods from CA (outlined in Liddicoat, 2011). The visual record of the interaction available via multiple camera views was imperative for understanding the role of the physical environment and augmentation of interaction via mobile digital devices. These analyses were initiated in group data sessions. The CA transcriptions used for team data analysis sessions, including those for this paper, have embedded images of the participants' gaze, gesture, direction of movement, interaction with objects, and the digital and physical environments to illustrate how these resources interact with the talk-in-interaction (Charles Goodwin's body of work is the model here, but see Mondada (2008, 2009) for a discussion of methods for

multimodal transcription). Although we conducted sequential analysis of the talk, the use of multiple video recordings and our research questions required multimodal analysis allowing us to foreground and describe sequences of actions as much as turns of talk (Ford et al 2013), where actions are designed as "complex multimodal gestalts" (Mondada, 2014, p. 139).

The mobile device was the chief source of instruction for the activity. The activity was set up so that one device was used by each group of three players and each small group needed to coordinate their interpretations of the instructions for the activity and their movement around the university campus as 'mobile withs' (Jensen, 2010). The *mobile with*, a further development of Goffman's participation structure he called a 'with' (1971, 1983), is a configuration of more than one person moving together, acting as, and being oriented to by others as belonging together. The instructions for the activity were available on the device and the device featured a GPS map giving the group the further characteristic of being a *networked with* (Jensen, 2010).

After repeated observations of the interactions, we asked how it was that groups achieved coordinated action and for this analysis, we focus specifically on the methods used by the groups to orient to the device (NB: how the group members access information from the device and interpolate cartographic information from the device with the environment are subjects of work-in-progress). In the analyses that follow, we illustrate three organizational patterns: 1) explicit orientation to and staying near the device holder, 2) group members physically orienting to the device screen, and 3) group members requesting physical control of the device. Interactional practices used to display this orientation included summonses and directives in the form of repeated sayings, reference to locations, and reading instructions for next actions from the device.

5. Explicit orientation to staying near the device-holder.

The first set of excerpts show the way that the device holder and co-participants orient to maintaining their group formation participation structure. The first excerpt (Excerpt A1) illustrates the device holder as the focal point for the group's orientation. We see directives given by the device holder who is, at the same time, looking at the device. In this interaction, the participants are from the group called 'the three Rs'. The

group members were assigned the pseudonyms 'Recycle', 'Reduce', and 'Reuse', which in the transcript we abbreviate to Rec, Red, and Reu, respectively. The following sequence in Excerpt A1 takes place during the middle of the game as the group is trying to find the location of the fourth destination. The group has just crossed the street and is moving in the same direction (east). Recycle is several paces behind and is actively attending to the mobile device (lines 1 and 2). Reduce and Reuse are not near enough to be able to attend directly to the instructions on the device.

Excerpt A1 (ESL131006SGT1G2RC1 24:54-25:57)
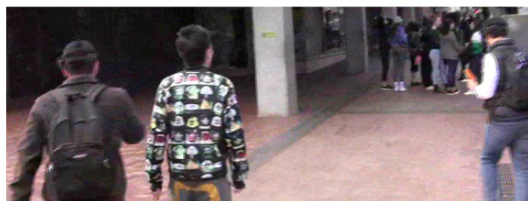
In line 1, while attending to the device, Recycle makes repeated directives to his co-participants about a shift in direction. It is likely that in his peripheral vision he can see the other two group members continuing in an easterly direction. Recycle's directive is not, however, transparent to others without visual access to him. The formulation of the directive 'this way' using the proximal deictic marker is interpretable,

though, as a directive to move toward Recycle. The screen captures show that Recycle is visually oriented to the device as he makes his first directives. Reduce and Reuse are oriented away from Recycle and the device during the first directive but shift their gaze direction after that and during the second directive are facing Recycle. They can subsequently see him looking at the device. Recycle shifts his gaze to his co-participants, points to them with his left hand as he reformulates the directive ("come", line 4), and then points to his right with his right hand, the hand holding the device ("this way", line 4). Reduce and Reuse orient to the directives and the pointing with the device, shift direction and walk in the direction Recycle has indicated.

In Excerpt A1, Recycles's embodied language use with his gaze to and manipulation of the device simultaneously redirects the walking direction of two members of the group while bringing those two members closer to him. He looks to the device as he makes a directive with underspecified direction ('this way'). His 'straying' co-participants see him oriented to the iPhone and after Recycle points with the device to his right (south) to complement the verbal directive ('come this way'), the co-participants change direction and begin walking south.

A similar sequence of actions oriented toward maintaining proximity to the device holder occurs with another group (Max, Prius, and Trek) in Excerpt A2. Here, the two participants not holding the device use deictic gestures that lead them away from the device holder. Their awareness of the device holder having stopped to look at the device makes their reconvening as a group relevant. Early on in their game activity, Max is holding the device as the three participants walk abreast northward along a wide sidewalk in a park toward the first destination. At the start of the excerpt, Max slowly comes to a stop (line 11). At the same time, Trek observes something to her right and points in that direction (line 12).

In line 13, Prius mimics Trek's gesture and utters a change of state token in overlap with a try marked proposal for a place or direction from Trek (line 14). Max looks down to his device just after Trek utters line 14. The gestures she and Prius use become indicative of a next place or direction and Trek and Prius take a few steps in that direction (east) until Prius turns his head (line 18) to see that Max, the holder of the phone, has stopped and shifted his gaze to the device. Prius shifts his direction to move back toward Max. Trek notices and follows. It is then that Max sees that the two had moved away from him and utters a reprimand in the form of a question (line 19).

Excerpt A2 (ESL131002AC1G2HC1.1 6:19-6:30 ESL123AC1G2RC1 w audio 1:23)

```
10 Max:    there are a lot ((gazes to device))
11         (1.3) |((Max comes to a stop and then looks up))
12 Trek:        |((points to her right))
```



```
13 [Oh!
14 [not here?
```
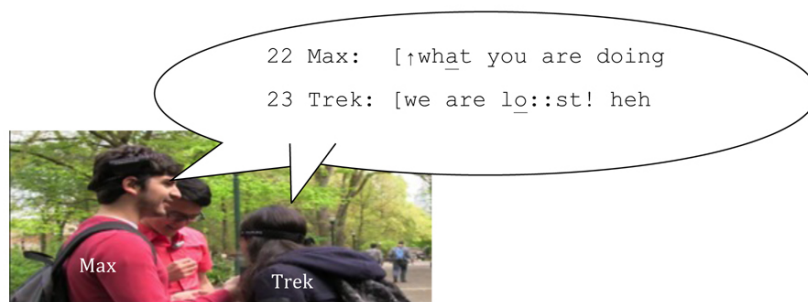
```
15        (2.0)      ((Max looks to device))
16 Prius: hey.
17        (2.0) ((Trek and Prius walk in direction of gesture))
18        (2.0)  ((Trek faces Max whose gaze is to the device))
```



```
((Prius follows Trek's gaze toward Max))
```



```
19 Max:    ↑what you are doing.
20 Trek: ha [↑heh heh heh
21 Prius:    [heh hah heh
```



```
22 Max:  [↑what you are doing
23 Trek: [we are lo::st! heh
```

As in Excerpt A1, when group members stray from one another, the group engages in interactional work to maintain physical proximity to the device holder. Here, it is one of the two 'strays' (Trek), not the phone holder, who first orients to their separation. Trek sees Max looking at the device and initiates movement back to the device holder. The phone holder orients to this separation after the two strays return

and makes a joking reprimand. Here, a provisional direction to the next destination had been selected (non verbally) by two members who moved in that direction. The device holder, however, was not walking at that point and the result was that Prius and Trek moved out of a three-person configuration. Max was then looking at his device as Prius and Trek noticed their separation from the group configuration and initiated their move back toward the device holder. Group cohesiveness and changes in direction are thus seen to be accountable and subject to verification by the device holder. Trek's assessment at line 23 also accounts for their move away from the device holder showing that they understand it to be infelicitous with respect to the instructed action presented by the game.
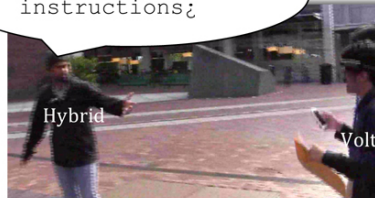
In Excerpt A3, it is the arrival at a destination and a history of straying of a group member that seems to warrant the work to re-convene the group as a 'with'. A multiple saying by the device holder (the spatial deictic *here*) as well as the repetition and reformulation of the action being accomplished – the reading of instructions – are the methods used by the device holder to reign in a stray. This excerpt features Volt, Hybrid, and Schwinn approaching the fifth destination of the game.

As the group moves toward destination five, Hybrid moves ahead of the device holder (Volt) and co-participant Schwinn two times, before line 80 and then between lines 81 and 84. In lines 80-81 Hybrid asks the device holder (for a second time) to read aloud the instructions for destination five. As Volt reads the instructions, Hybrid is within reach of the other two co-participants but immediately moves forward again as Volt nears the end of reading the instructions. It is then that Volt does the repeated saying (line 84) which results in Hybrid reversing course and returning to the group spatial orientation. As he returns, Volt repeats the instructions showing an explicit orientation to Hybrid's lack of previous co-presence. Volt's repetition of the instructions is done in overlap with Hybrid and after Schwinn's receipt token (line 86), Volt does a restart of the turn and reformulates the instructions.

Excerpt A3 (RC1.2 3:10)

```
79 Vol: °hehheh° "°what form of [transportation
80 Hyb:                         [complete the::
                                 instructions¿
81        complete¿ (.) complete¿
82 Vol:   okay. what form of uh: what form of uh: (.)
82        transportation do you use when you travel to school.
83        (2.0)
84 Vol:   just here.        >here here here here
85        (1.0)
86 Hyb:   [(here)
87        ["what for:m,"
88 Hyb: mmhm¿
89 Vol: what form of uh:: transportation,   >do you use
90        when you go to school.<
```

The excerpts in group A illustrate how group members straying from the phone holder is accountable behavior. In Excerpt A1, this is made accountable via a directive to the group by the device holder, Recycle, who, while gazing at the device, made a

verbal directive to co-participants. The directive and gaze direction are observed by the straying co-participants which makes relevant a change in the direction that the other two group members had been following. In Excerpt A2, it is the orientation of one of the strays to the device holder's lack of forward motion and his gaze at the device that redirects the two straying members back toward the device holder. The reprimand by the device holder and a negative assessment by one of the strays as to their chosen direction toward the destination show straying to be an accountable action. In Excerpt A3, the third excerpt, the device holder uses a repeated saying of a spatial deictic to indicate to a stray that he has overshot the destination. Once the stray returns to the *with,* the device holder restarts and reformulates the instructions the group needs to make their report at that destination.

6. Participants looking at, doing looking at, or directing others to look at the phone

In contrast to the ways that maintaining a group participation framework shows their orientation to the device holder, the next set of excerpts features more direct reference to the device itself. These excerpts show how all group members display their orientation to the device itself by standing in close proximity to the device and maintaining various levels of accountable attention to the device.

In the first excerpt (Excerpt B1), the group is searching for the first destination of the activity. They had just clarified that they need to be looking for examples of green technology and are walking in the direction (north) they believe the game has specified. As they walk, Max makes a hedged assertion (line 1) that bikes (of which they have seen many examples) are a green technology. As he formulates that assertion, the group is walking and the immediate physical surroundings (their 'mobile space', Haddington, 2013) are changing. Prius is looking at the phone while walking and holds it in an outstretched arm to index a relevant point of orientation for the group. With this gesture, he makes a summons and repeated saying to the group to stop (line 2). Trek agrees with Max's hedged assertion ('yes', line 3) and repeats Prius' directive to stop ('stop') as she stops walking.

Excerpt B1 (ESL131002AC1G2HC1.1 5:03-5:09)

```
01 Max:    I think bi:ke (.) alre[ady is a green,

02 Pri                        [hey stop. >stop stop
                            stop   stop<
```
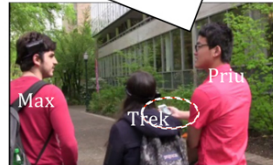


```
03 Tre:    ye:s. stop?=((Trek stops and directs gaze to phone))
04 Pri:    =a:re we::, [here,
05 Tre:                [ohh yeah it's a (turk?)=[↑what?
```


By holding out the device, Prius has made the directive to stop device-relevant and visible to the group. His repeated saying of the directive also suggests his own orientation as one in the position to direct others (De Stefani & Mondada, 2014). As a result, one participant, Trek, shifts her gaze to the device. Another, Max, shifts his position with respect to the group and device. Max moves to position himself between Trek and Prius (see last image in Excerpt B1) and closer to the device as the group configures themselves to form a space for shared focus on the device, what Kendon (1990) has called an *f formation*.

Similarly, in Excerpt B2, there is some difficulty with locating a destination in the game when a repeated saying is made to interrupt the forward motion of the group in order to get them to closely focus on the device. The group (Flora, Fauna, and Rain) has found the building associated with destination three in the game but is having difficulty locating the focal green technology (solar panels). They have just asked a security guard about the location of the panels and walk southward alongside the building. The group has already walked northward, the full length of the building, and is now backtracking. After Flora makes a proposal to follow what another group of students had done (lined 14: go inside the building), Fauna makes a directive to stop the progress of the group and asks to see, not just the device, but more specifically, the map that is located on the device (line 17).

Excerpt B2 (ESL131AC2G1HC1,1 21:58)


```
14 Flo  : alright. maybe we should get i:n just like the other
15         guys did.
16         (2.0)
17 Fau:    wait wait wait. can I see map?
18 Flo:    ↑sure you can see the map I jus[t
19 Fau:                                   [stop stop stop
20 Flo:    sto:p?
21 Fau:    yeah.
22         (1.0)
```



```
23 Flo: here is [the map.

24 Fau:         [yeah!
```



```
25 Flo:    uh, its near.
26 Rai:    (         )
27         (1.0
28 Fau:    (h)hah! ↑its where?
29 Rai:    maybe we should go inside¿
```

Flora agrees to show the device and map to Fauna and when the group does not stop, Fauna upgrades the directive from 'wait' to 'stop', also a repeated saying intended to halt the forward motion of the group (line 19). The group stops and together attends to the device in order to locate the focal technology.

Unlike the previous two excerpts, Excerpt B3 illustrates members of the collective *with* may not be visually attending to the degree that they can read from the

device, but *do attending* nevertheless as part of maintaining the public sense of a group. As the device holder, Rec, reads from the phone (line 1) and self-initiates repair (line 2), Red's gaze is toward the phone. However, given the difficulty of seeing even very sharp images on a mobile phone screen in daylight, it is unlikely that he can see the text on the screen well enough to read it. Upon hearing the information-seeking first pair part by Rec in line 2, Red initiates repair (asking for a repeat of what was said – line 3) and then repositions himself in order to be able to read the screen and, therefore, provide an informed response to Rec's information-seeking first pair part.

Excerpt B3 (ESL131006SGT1G2RC1 25:34-25:44)

```
01 Rec:  "rain water can be used."
02       what is
                >the rain< water?
```



```
03 Red:  I'm sorry?
```



```
                ((Red repositions to be able to read the screen))
04 Red:   "th:e toilets in the: °academic°-"
```

Excerpt B3 shows that before the device holder (Rec) indicates trouble in the interpretation of the instructions on the device, a co-participant, Red, displays a posture that indicates an alignment with the group and his availability for engagement with the device screen. After Rec's self-repair, Red shifts his upper body and leans in so that his gaze is on the device. In Excerpt B3, the repair initiation by the device holder and gaze shift to Red makes Red the relevant party to provide the repair. Red is a relevant next speaker, in part, because he has maintained a physical alignment with the group. Reading from the device and encountering trouble, Rec orients to Red as available after which Red shifts his posture to be able to read from the device and respond to Rec's information seeking repair initiation.

7. Explicit requests for the device

We have seen examples of how, throughout their joint activity, participants in each group regularly do work using talk-in-interaction to show physical orientations to maintaining the sense of the group (the A excerpts) and to the device itself (the B excerpts). The following excerpts (C1-C3) illustrate contexts and sequences of talk for explicitly requesting the transfer of the mobile device, further showing the centrality of the device for their activity.

Excerpt C1 shows how the cessation of forward movement and some expression of confusion over the group's current location warrant a request for the device. The group had been walking to their first destination when Prius (the device holder) directed the group to stop. While looking at the device he utters an information-seeking turn regarding the group's location (line 5). In overlap with Trek's response to Prius, Max makes an indirect request for the device as he reaches for and takes the device from Prius (line 7). The group then continues working on situating themselves in the environment with respect to the map available on the device.

Excerpt C1 (ESL131002AC1G2HC1.1, 5:10-5:26)

```
05 Pri:  =a:re we:, [here,
06 Tre:            [oh: yeah it's a (turk?)=[↑what?
07 Max:                                      [°let me see°
```



```
         ((Max takes the device from Prius))
08 Pri:  we are: [uh::]
09 Tre:          [eh::] ((looks away from device))
10       southwest Harrison ((looks to device))
```

In Excerpt C2, a different group is having trouble coordinating the map on the device with the immediately local buildings. It is this mismatch and a hedged assertion that makes relevant one participant taking possession of the device from another. During their search for the first destination presented by the game, as the group looks at the device together, Rec tentatively proposes two physical locations for the virtual indicators given on the map on their device and uses a pointing gesture to locate each (lines 2 and 3). Red begins reaching for the device (line 4) and takes it using the same polite request for the phone ("let me see") that Max used in Excerpt C1.

Excerpt C2 (ESL131006SGT1G2RC1 4:50)

```
01              (4.0) ((the group looks at the device))

02 Rec:   ( I think (.) )      this building
```
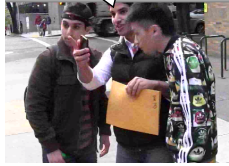


```
03        or this building ((points to right)) (.) maybe.
04 Red:   ( >let me see that< )        let me
```



```
05        see (    ) ((walks away from group))
06 Reu:   there is Smith
```

Excerpt C2 illustrates how a hedged assertion, the mentioning of a candidate location by the device holder, makes relevant the request for the device by another participant.

In Excerpt C3, it is moving into proximity of a building that is relevant to the game that warrants the change in device possession. The group (the same as in Excerpt C2) is walking to their fifth destination in the game (the student recreation center). They are walking single file with Red leading the way. As they near the doors of the recreation center, the location of the fourth destination and a building they had just exited, Red turns his head toward Rec and makes a summons followed by the start of a *wh-* question (line 10) requesting something. The request is packaged with a stretched vowel on the article that makes it, and the fact that a noun phrase is absent, salient to the other participants. Red is looking at the device holder Rec. Rec hears Red's turn as a request for the next destination and responds (line 11) with the deictic and number to indicate to Red that they are now at destination number five, information that is available on the device. Red's turn production stretches the vowel on the article and includes a gesture, his right hand reaching toward Rec which forms an embodied completion (Olsher, 2004) that together with the verbal first part of the grammatical question solicits the device.

Excerpt C3 (ESL131006SGT1G2HC2.1 33:36; 32:48 HC1.1)

```
10 Red:   Hey where's the:::
((gestures to the phone))
```



```
11 Rec:    ((hands him the phone)) Here. number five here.=
12 Red:    =No this just °video°
13         (3.5)
14 Red:  I'll shoot the video because eh (.) they want to know
15         the advantages o::f uh:
16 Rec:  uh huh
```

After receiving the device and hearing from Rec about their current location, Red indicates, however, that he wants the device not for locating the next destination but to take some video of the area to complete their multimedia report of the previous destination.

7. Discussion and conclusion

As a first step to understanding the rich interactional possibilities for place-based language pedagogy (using a mobile phone for a serial destination quest activity), this analysis has focused on the discursive practices used by small groups to maintain their *mobile with* and to show their orientation to the one mobile device used by the group for accomplishing an augmented reality activity. We proposed that they do so by coordinating talk and gaze orientation to maintain a spatially proximate group of three persons. Our analysis also showed that when a group member is not the device holder, there are different environmental and interactional contingencies that warrant achieving closer access to the device. For example, buildings and street signs become perceptually and interactionally relevant due to the group's mobility and periodic lack of clarity about where they are currently located. All group participants, even though there is only one device per group, look at, do looking at, or direct others to look at, the device.

It is not surprising that the participants oriented to the mobile device as an important focal point and mediating tool for the activity. However, we found the interaction around the mobile device to be quite complex due in part to the coordinated actions necessary to use one mobile device in a group of three persons. When participants who are not holding the device move away from the device holder, all

group members see this as accountable behavior and do work to maintain the *with* participation structure. Device holders may use direct or indirect summonses (*come this way* or the proximal deictic *here*) together with gestures for getting strays to move back to the device holder. Those without the device also note their own straying and move back to a device holder without being summoned back. These actions are summarized in table 1.

Table 1. Interactional practices for three persons with one mobile device.

Maintaining the *with*: (A) excerpts	
Device Holder	Direct and indirect summonses (*come this way; here*); gestures
Others	Observe distance and return; retrospective account for straying
Shared looking at device: (B) excerpts	
Device Holder	Directives
Others	Repair initiations
Requesting device: (C) excerpts	
Device Holder	--
Others	Direct and polite requests for purposes of wayfinding, clarifying instructions or making a recording

The importance of sharing information located on the device was seen in group members stopping to look together at information on the device and reading aloud from the device. Device holders used directives to ensure that the other group participants looked at the device to get access to relevant information. Those not holding the device used repair initiations (Excerpt B2 and Excerpt B3) to get visual access to the iPhone and also requested to hold the device for varying purposes, such as to help with identifying a location on the map, to clarify an instruction recently read aloud by a peer, or to make a video record of a location. Such transfers of the device were made relevant in talk when the current device holder indicated possible trouble in interpreting instructions or next actions.

The precise practices used are highly contingent but in general, the nature of the game and the context for its use shows that an object (the mobile device) shared

by a group of three participants is a mediating stimulus for language use as a tool for social, physical, and informational coordination; in essence, these analyses show that a quotidian activity such as walking together as a group and finding destinations in an AR game results in complex instances of coordination of physical comportment, talk, problem solving, and decision making. The excerpts from the analysis highlight how the device is a catalyst for situated, embodied, and co-constructed talk-in-interaction.

These data provide new empirical evidence for aspects of the contingencies involved in language use. One such contingency is the relevencies of the sensory environments related to place for language use and the display of particular identities as language users (Scollon & Scollon, 2003; Benwell & Stokoe, 2006). The participants are engaged in activity on the university campus where they attend school. Even more relevant, however, and specific to the nature of the activity they are engaged in, is the fluidity of the sensory environment that is made possible by movement during talk-in-interaction (e.g., Mondada, 2014).

Another is the mobility of the participants. Moving into and out of group configurations around the device as they progressed toward a destination involved a continuous process of interpreting what the participants saw on the device with what they saw and knew to be around them and exhibited an orientation to their identities as mobile interactants. The stipulation that the activity be carried out by small groups using one device per group, rather than individuals each using a device, necessitated members' cooperation within their small groups (Goffman, 1981; Kendon, 1990; Jensen, 2010). Interactionally, this choice had the effect of getting all group members to share a common orientation to the device and, thus, the device holder.

Participants in each group periodically moved in and out of their clustered 'mobile with'. This was initiated by the need to re-orient periodically to the device's indication of their location on its map. This clustering was also reflexive in that by all participants looking at the device, re-orientation was made relevant due to each member's perception of, and understanding of, relevant details in their visible physical and virtual environment. The relatively under-specified nature of the AR game design, however, facilitated a more consistent outward focus for the groups. In this outward focus we saw how what we think of as objective physical objects (a building, a bicycle, a streetcar) are situatedly and contextually re-realized by the group. Via the activity as outlined on a device that is portable and shared among a group, objects in the environment are talked about and semiotically remediated (e.g., Prior & Hengst, 2010) within the narrative frame of environmental stewardship.

Visible processes and sequential alignments included the coordination involved in making public and locally-relevant the private logic of the AR game's map. Through this process, problems in understanding as well as next actions are made public via talk-in-interaction, which served to coordinate the virtual-digital and sensory-visual information and which eventually led to successfully completing the way finding and related activities. Game participants did this by looking around, pointing, reading, and audibly communicating what they could see (and to lesser degrees hear, touch, and smell) around them. Such actions illustrate the integrated, distributed nature of language (Harris, 1998; Cowley, 2009). From this perspective, multi-party co-action arises out of embodied, purposeful, and coordinated languaging activity (Steffensen, 2015).

Although the device holder is clearly oriented to more frequently than other members of the group and may sometimes have special privileges (and responsibilities) by the fact that she/he is holding the device, the device is accessible to all group members. They may look at the device while the owner holds it and they may take the device and hold it themselves for better access. However, even with this strong orientation to the device, the participants' visual access to the physical surroundings and their interpretations using pre-existing knowledge of that visual space are necessary to make sense of the information from the device. In this way, the analyses presented above illustrate how cartographic and game information on the device, visual perception of the physical environment, and prior knowledge of the area form an emergent and distributed semiotic potential that is made meaningful and actionable via talk-in-interaction and embodied deixis.[1]

8. Acknowledgements

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[1] There is not space here to analyze or discuss the intricacies of the way that participants accomplish starting and stopping as a group, the intricacies of multi-party wayfinding (Psathas, 1979), or the interactional import of public reading. However, it is relevant to mention that the activity demanded participants walk to a series of destinations, which made movement an important contextual feature of the talk-in-interaction. While stopped, group members had more access to information available on the device. The momentary suspension of the sequential presentation of the immediate physical environment also allowed time for all group members to interpret, assess, and make suggestions about strategies for accomplishing the activity.

were approved by our institutional review board and participants gave their informed consent to participate.

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