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MOBILE AUGMENTED REALITY: HYPER CONTEXTUALIZATION AND SITUATED LANGUAGE USAGE EVENTS

Bio data

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Your abstract

Language use, second-language development, and technology mediated human activity are complex processes situated in, and in some cases demonstrably interwoven with, specific material and social contexts. Our presentation describes a project that focuses on the contextually embedded nature of communicative action. Building upon recent research on ethnomethodological analyses of talk-in-interaction while walking (Haddington et al., 2013), analyses of how communicative activity mediates our understanding of objects and environments (Nevile et al., 2014; Latour, 2005), principles of extended and embodied cognition (Atkinson, 2010), and existing research on the use of mobile place-based augmented reality (AR) techniques for language learning (Holden & Sykes, 2011; Thorne, 2013; Thorne et al., 2015), this paper investigates participants' contextually aware interactional practices as they carry out an AR activity. In response to the question of when and how action is explicitly situated in, or catalyzed by, particular aspects of the physical surround, we report on members' methods for making unplanned use of resources from the immediate physical context in order to co-construct actions (such as wayfinding and oral reporting) to accomplish the AR game goals.

Conference paper

INTRODUCTION
Language use, second-language development, and technology mediated human activity are complex processes situated in, and in some cases demonstrably interwoven with, specific material and social contexts. Our presentation describes a project that focuses on the contextually embedded nature of communicative action. Building on recent research on talk-

in-interaction while walking (Haddington et al., 2013), analyses of how communicative activity mediates our understanding of objects and environments (Latour, 2005), principles of extended and embodied cognition (Atkinson, 2010), and existing research on the use of mobile place-based augmented reality (AR) techniques for language learning (Holden & Sykes, 2011; Thorne, 2013; Thorne et al., 2015), this paper investigates participants' contextually aware interactional practices as they carry out an AR activity. In response to the question of when and how action is explicitly situated in, or catalyzed by, particular aspects of immediate local context, we report on members' methods for making unplanned use of resources from the physical environment in order to co-construct actions (such as wayfinding and oral reporting) in order to accomplish the AR game goals.

CONTEXT OF THE STUDY
The focus of this research is the empirical examination of language learners engaged in playing an augmented reality (AR) place-based mobile game which presents scenarios and prompts that encourage participants to expand beyond the traditional subject positions associated with that of 'student' or 'learner' (e.g, Firth & Wagner, 1997). AR games are a more recent entry into the arena of educationally oriented game development. But similar to commercial recreational games that have been studied as learning environments (e.g., Gee 2007; Thorne, 2012; Thorne et al., 2012), AR games represent a shift away from models of learning based on information delivery and toward theories of human development rooted in experiential and situated problem solving. AR games generally involve movement through environments (cities, landscapes) using GPS-enabled devices as a guide. As Squire (2009) describes:

> Although mobile media learning has mostly been framed as "anytime, anywhere" their more profound impact may be in the experience of place. Mobile media enables a multiplicity and hybridity of place that causes opportunities and challenges to learning and education. (p. 70)

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). Numerous projects 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 and Sykes 2011; Holden et al. 2015; Squire 2009; Thorne, 2013) 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.

THEORETICAL FRAMEWORK
This research is informed by a number of frameworks that theoretically and empirically redefine cognition as situated, embodied, enacted, extended and distributed (e.g., Atkinson, 2010; Bucholtz & Hall, 2016; Clark, 2008; Hutchins, 1995). Distributed and enacted cognition (related terms include extended and social cognition) refer to a framework for understanding human action, such as thinking and communicating, as processes that are fundamentally supra-individual and which include, but importantly are seen to extend beyond, neuronal activity of the brain. The term 'distribution' is meant to highlight the idea that thinking and doing involve the body and coordination between human as well as non-human artifacts and environments. In this sense, neither the brain nor the individual are the exclusive loci of cognition; rather, the focus is on understanding the organization of systems, or "cognition in the wild" (Hutchins, 1995), which presumes an ecological view of cognitive activity as organized by the interplay between persons and resources that are distributed across social and material environments.

Approaches to extended and distributed cognition posit that humans are open systems that function and develop within complex, historically formed, and dynamically changing social, symbolic, and material ecologies. When viewed this way, human activity and development are seen to form an 'ensemble' process that plays out along a brain-body-world continuum (e.g., Spivey, 2007). This understanding of human cognition as distributed includes a number of entailments, one of which is a focus on mediation – that objects and other people in the environment co-produce action and thinking in unison with individual human agents. Another is that cognition, action, and communication are processes that are inherently distributed across individuals, artifacts, environments, and through individual and collective memory, across time periods as well (e.g., Wertsch, 2002).

An important constraint is that the principle of distribution, applied to both cognition and language/communicative activity, is not meant to imply symmetry or equal division between individual humans and other people, artifacts, or environments. Instead, the suggestion is that the density of cognitive and communicative activity can shift from brains to bodies and to a range of physical and representational media in the flow of activity (e.g., Cowley, 2009; Thorne, 2016; Thorne & Lantolf, 2007). The notion of distribution suggests an additional entailment, namely that of units of analysis such as 'organism-environment systems' (e.g., Järvilehto, 2009), which describe how change within an organism is accompanied by change to the environment and a reorganization of organism-environment relations. In these ways, distributed, situated, and extended approaches to cognition suggest that human action and development are fundamentally emergent of, and enmeshed with, specific temporal, social, and material conditions.

THE AR GAME, METHODOLOGY AND PROCEDURES
The participants play a quest-type mobile AR game called *ChronoOps*[1]. The game scenario emphasizes green technology and environmental sustainability projects as its core focus. The conceit of the game is that participants 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 2017 in order to learn from the "simultaneous dawn and dusk of green technology" that is in evidence on and around the university campus. The game is played by accessing instructions on a mobile phone, one per group, which instructs players to find five designated green technology sites on their university campus. Once found, students file video reports that describe the advantages and disadvantages of the green technologies they encountered in the hopes that this information can be used to help improve the environmental catastrophe that is this planet's future.

Our data include video recordings (18 hours total) of small-group interactions of players with heterogeneous language proficiencies playing versions of the *ChronoOps* AR game in English, French, German, Japanese, Spanish, and Hungarian. Video recordings were made of each group of three players, with two participants wearing head mounted cameras and a third camera capturing the entire group's interaction. The video data has been transcribed using ethnomethodological conversation analysis (EMCA) methods.

EMCA research has investigated the practices that participants use to make material and environmental objects relevant for both everyday meaning making (Goodwin, 2000) and for instructional purposes (Hutchins, 1995). This research describes how talk, gaze, gesture, and physical alignment form sequences of action that bring the environment into play in conversational organization. More specifically, our analyses describe interactional practices in which groups notice visible aspects of their immediate environment and make these noticings relevant for organizing their goal-directed actions. Sequential, multimodal analysis revealed three contexts that are particularly relevant for noticing environmental resources:

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[1] The AR game *ChronoOps* was developed at Portland State University by the 503 Design Collective, a group of faculty and students focusing on technology-oriented research and pedagogical intervention.

(1) during wayfinding (figuring out where to go and how to navigate to the next location), (2) pre-planning talk in preface to making a report, and (3) embodied deixis and verbalized references to aspects of the immediate physical context during the report making task.

For the brief empirical examples to be included in this extended abstract, we focus on the orientation to, noticing of, and use of others' noticings of environmental objects in the pre-planning stage for making reports (#2 above). We present two excerpts that show the way noticings are accomplished in relation to the group's mobility, to the task instructions, and to the pre-planning activity. In all cases, gesture and gaze preface the verbalized mention of the noticed item and the noticed item is acknowledged by the other participants.

NOTE: We include technical EMCA descriptions and analyses in the two excerpts shared below. In an oral presentation format, we will show video of four excerpts in total and will describe the findings and salient points in more general and less technical terms since key analytic features are readily visible, and more easily explained, following a viewing of the video data.

EXCERPT ONE: *Noticing while stationary and public noticing as an accountable action*

The context for both excerpts we present is when the groups have located destination number four, which is one of the five places on the campus where the game directs them to make a report. We explore the practices for making noticed aspects of the physical surroundings relevant for their interaction.

In excerpt 1, the group (pseudonyms, Tamás, Beá, and Atilla, left to right) is using Hungarian and has located destination 4. Tamás asks about the task (line 16) and Beá responds by reading the instructions from the phone (starting in line 17: *The toilets in the academic student recreational center use rain water collected from the roof to flush. What are other possible uses of collected rain water?).* They briefly discuss whether to go inside the building and look at the toilets but decide not to because, as Tamás says in lines 65 and 67, since they know how toilets function. Beá's next action is to offer her interpretation of what is intended by the instructions (lines 66 and 68). During her turn, as she begins an adverbial on the word *mas* (other), Tamás shifts his gaze toward the nearby fountain-like water feature -- a kind of bioswale with trees and sedges set in a stream of falling water. As Beá ends her turn, Tamás overlaps the end of her turn with an agreement token and explicitly highlights his turn as offering an exemplar (*for example*) while pointing to the water feature, a gesture which Atilla orients to. He then offers the example of collected rain water being used to water plants. Beá's response treats Tamás' action in lines 70-71 as pre-emptive. In line 73, Tamás asks Atilla what he thinks about the task.

(1) HUJune5-2016RC1.2 8:00---------
```
15 B: itt vagyunk.
       here   be+1pl
       we are here


16 T: és mi a feladat?
       and  what the task+acc
       and what is the task


17 B: "a vécék az Akadem- a vécék az Academic and
```

The toilet+pl the Academ-   the toilet+pl the
the toilets the Academ- the toilets in the Academic and

18   Student Recreation Centerban, .hh a tetöröl gyűjtött
                                    the roof+del   collect+ppl
                                  from the roof collected

19   esővízzel vannak lehúzva:.(.)mas kép hogy lehet használni
      rainwater+inst be 3pl draw+prpl   other image how   possible use+inf
      rainwater is drawn   are there other ideas to use

20   esővízet?
      rainwater+acc
      rainwater

((lines missing))

62 T: nem kell megnézni mert tudjuk hogy
         neg   need+3s look at (inf.) because know +1pl
        we don't have to look because we know

64 B: ja
        yeah

65 T: milyen a vécé és hogy
        what kind the toilet and how
        what these toilets are like and how

66 B: és [én ugy értem hogy az esővíz
        and I   so   understand+1s how the rain water
        and as I understand it rainwater

67 T: [lehuzje
            flush+3s
          they flush

68 B: mas |a: (.) dolgokra is lehet
        other   thing+pl+sbl also possible
        and other   uses are also
           |((T looks toward a nearby water feature))

```
69          használn[i,
            use(inf)
            possible
```

```
70 T:            [igen |például
                 yes for example
                        |((points and then surveys the area))
```



```
71 T:  |locsolni lehet a növénye[t,
       water(inf)    possible the plant+acc
       watering plants is possible
       |((A gaze shift to water feature))
```



```
72 B:                              [igen azt akartam mondani
                                   |yes I wanted to say that
                                   |((Beá surveys the area))
```

```
73 T: szerinted míre lehet hasznalni az esővízet még míre.
      Think + 2s    what+sbl possible use+inf    the rainwater+acc still  what+sbl
      What do you think what can rainwater be use for what else
```

What we find relevant to our thesis is the indexing of an environmental resource, the bioswale, by Tamás for use in the ongoing interaction. It may be offered by Tamás as a second part of the action trajectory and to support for Beá's candidate understanding of the task. We also note that even though the group remains in closed-group formation during this sequence, the gaze shift and deictic gestures allow them to survey the area to find relevant environmental resources to bring into the pre-planning work for their report. The gaze and gesture make the noticing of Tamás public even before the lexical affiliates for the action and referent are uttered.

EXCERPT TWO: *Adding to the ongoing list: Noticing while moving*

In the second excerpt taken from the same location as above (but a different group, this time ESL students), the fountain/water feature again becomes a salient, noticeable item when the group is in the process of pre-task list making. The group members here are Rain, Cycle, and Air and they are speaking English. One member has just completed reading the instructions aloud. At line 17, Air makes an announcement that initiates a move by the group to the location for making their report about possible uses of collected rainwater. As they walk, Air prompts a listing activity. After a few hypothetical uses are offered in lines 26-33, Cycle, gazing forward, formulates her turn similarly to the previous listed items with an *or* preface. She points toward the fountain and then names the fountain together with a distal deictic (*there*) as a method to locate the item in space. Visual realignment occurs as Rain follows the visual trajectory and Air agrees and expands on the statement in line 29 by saying *yeah heh or a water fountain exactly*.

2) ESLALMay052016RC2.2 (Air, Rail, Cycle) 1:30/00:10

2.1 29:30 34:15
```
01 Rai: Academic and student  oh rec center,
02 Cyc: oh
03 Air: mm hm
04 Rai: (  ) hm:: "The toilets in academic and student research
05      center:, (.) flush with rain water
06 Cyc: oh::
07 Rai: Collected from the roof.
08      (2.0)
09 Rai: What are some other ways that rain water can be used.
10      (.)
11 Rai: Rainwater.
12 Cyc: Rainwater
13 Air: Mm
14      (.)
15 Air:  So we're supposed to write a note with this.
16 Rai: Mm yeah.
17 Air: I wanna go look over there and see if they have other
18      things.
19      (6.5) ((the group begins walking eastward))
20 Air: the- other ways that you u- you can use
21      rain water
22      (3.0)
23 Air: we can think (.) before we get there
24      (4.0)
25 Air: u:::[m
26 Rai:     [we we can use it for >like a drink;<
27 Air: (↑drink    [ ) hah hah
28 Cyc:            [(          )
29 Rai:            [or maybe maybe to wash like
30 Air: wash hand[s
31 Rai:          [wash hands
32 Air: or yeah you could boil and wash
33      dish[es with it maybe;
34 Rai:     [yep
35      (1.0)
36 Cyc: or like |(.5) there's a fountain;
```

```
37 Air:    yea(h) heh or a water fountain exa(h)ctly
38 Cyc:    yeah
39 Air:    maybe the water fountain is just rain[water.
40 Rai:                                          [yeah
```

While the formulation of Cycle's noticing turn (*or like*) in line 36 indicates an alternative or expansion on the brainstorming that came before, the physical environment is made relevant not only by the gaze and gesture but also by the syntactic structure that Cycle uses in her formulation. It is different from the previous formulations in the list-making. The previous listing foregrounded the actions: *use it for, wash hands*, *boil and wash dishes*. The noticing is made relevant and public with Cycle's gesture and a deictic, existential marker to indicate that a fountain is available to use for the list.

DISCUSSION AND CONCLUSION
EMCA methods were used to show the ways participants index and make relevant material resources in their immediate physical context. These findings support AR place-based task design as a way to foster participants' use of the immediate context and physical environment as raw material for improvisationally and collaborative achieving the AR tasks. Additional findings in other of our AR research projects (e.g., Thorne et al. 2015; Hellermann et al., 2017) show that movement through the environment in small groups provides affordances for language use that illustrate the significance of context on the form and content of communication. As described recently in the enactivism literature,

"we hold that to understand phenomenal experience fully unavoidably requires attending to the original, environment-involving ways in which individuals engage with certain worldly offerings through bouts of extended sensorimotor interaction" (Hutto & Myin, 2013, p. 8).

Through micro-interactional analysis of events related to pre-planning for a report, we show how gaze, gesture, and language are used in an orderly manner to co-construct and maintain intersubjectivity in a way that is enmeshed with, and supported by, physical contexts. This research shows how problems in understanding as well as moving forward next actions are made public via talk-in-interaction, which served to coordinate virtual-digital and sensory-visual information and which eventually led to successfully completing preparation for the report-making task. AR game participants did this by looking around, pointing, reading aloud, 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).

Arising from our empirical analyses, we use the terms hypercontextualization and situated usage events to describe the intentional structuring of language learning opportunities using mobile place-based AR approaches. In the conclusion to our presentation at the CALL 2017 conference, we will synthesize lessons learned from AR design interventions and make recommendations for future research and continued innovation.

CALL in Context

The focus of this research is the empirical examination of language learners engaged in playing an augmented reality (AR) place-based mobile game for foreign language learning. Designing AR games to highlight and more fully appreciate the local context of specific places is a growing phenomenon, with theoretical grounding in situated learning theory, ethnomethodology, enactivism and distributed cognition, and critical pedagogy (Gruenewald, 2003). In this sense, neither the brain nor the individual are the exclusive loci of cognition; rather, the focus is on understanding the organization of systems, or "cognition in the wild" (Hutchins, 1995), which presumes an ecological view of cognitive activity as organized by the interplay between persons and resources that are distributed across social and material environments. In these ways, distributed, situated, and extended approaches to cognition and communication suggest that human action and development are fundamentally emergent of, and enmeshed with, specific temporal, social, and material contexts. Context is not a container for human activity. Rather, building upon Latour (2005), the proposal is that digital tools and situated human experience form unified ecologies with agency distributed throughout the system. The possibility of distributed agency does not necessarily imply symmetry between humans and artifacts (see Kaptelinin & Nardi, 2006), but it does suggest that catalysts for action can shift from brains to bodies and to a range of physical and virtual media in the flow of activity. This position contests the dichotomization of artifacts, context, and humans as distinctly independent from one another. Rather, artifacts, context, and humans together create particular morphologies of action.

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