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Hellermann, John; Thorne, Steven L.; Fodor, Peter

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Mobile reading as social and embodied practice

John Hellermann^a, Steven L. Thorne^{b,c} and Peter Fodor^b

^aDepartment of Applied Linguistics, Portland State University, Portland, OR, USA; ^bDepartment of World Languages and Literatures, Portland State University, Portland, OR, USA; ^cDepartment of Applied Linguistics, University of Groningen, Groningen, The Netherlands

ABSTRACT

Literacy, and particularly reading, is critical to success in schooling and full participation in contemporary societies. As one of the primary skills needed to develop proficiency in a language, the study of reading in additional languages has attracted significant research attention. Focusing on behaviourally visible and locally occasioned literacy events, this paper reports on an analysis of how public interactional practices for out-loud reading by small groups of English language learners facilitate the routinisation of interactional practices. The learners are participants in a mobile augmented reality (AR) activity that involves walking around a university campus in order to complete five serial tasks. Data come from video recordings of the game playing of eight groups (16 h of data) and their associated transcripts, analysed according to the principles of ethnomethodological conversation analysis. Results show that written texts that are part of the activity are given local meaning via various interactional practices that include public reading, co-reading and other embodied practices. We show how these dynamics of re-textualisation provide evidence for developing interactional practices over the course of the five tasks that are part of the activity.

KEYWORDS

Public reading; interactional practices; mobile devices; augmented reality; ethnomethodology; conversation analysis

Introduction

Reading research has found its home, most often, in education and psychology departments where the primary focus has been on the individual and internal cognitive processes associated with decoding and processing graphically rendered language. A parallel research tradition observes that many reading practices involve public and observable behaviour, with such instances providing a number of insights into the processes of meaning-making with written texts.¹ In this latter vein, reading is shown to be a socio-cognitive linguistic practice of using the mediating semiotic device of inscription for purposes of communication and learning. Inscribed texts, however, achieve meaning only in their activation by readers and, sometimes, by co-participants in a cooperative reading event. Although written texts involve the use of codified, or second-order linguistic forms (although see Vachek [1989]), because of the relative permanence of the medium, they are often treated, and potentially misrecognised, only as reified and entextualised instances of meaning (Silverstein and Urban

1996). The relationship between what a written text might mean, what a reader reads, the context and goals for reading, and what relevant co-readers or participants interpret, are in many cases empirical questions that can be observed in various ways. These include investigations of readers reading (McHoul 1982), readers talking about texts just read (Hellermann 2006), and readers using texts and reading aloud to organise their interactions (Davidson 2012; Livingston 1995).

EMCA research on reading

Reading research in ethnomethodology and conversation analysis has reframed the study of reading to focus on the interactional practices involved. The embodied, interactional process of entextualisation has been a perspicuous setting for empirical research. In this tradition, researchers have been examining the public and accountable nature of reading at least since McHoul's seminal book on the topic, published in 1982. In his studies on settings outside of classrooms (reading newspapers, verbalising accounts made by readers), McHoul showed how reading might be reconceptualised as a social and interactional accomplishment, as work accomplished on and with a text, and as readers orienting to culturally understood practices for reading and interpreting texts.

The descriptive goals of ethnomethodological conversation analysis (EMCA) studies of reading begin with a fundamental question of what it means to 'read' and when it is that we know someone is able to read or has read. The question goes back to the twentieth century philosopher Ludwig Wittgenstein. Can we say there is evidence of reading after one has read and articulated one word? Or three consecutive words? Or when the reader claims to have read? To investigate this we sought to locate and analyse publicly visible reading practices. As Smith advised: '... the text-reader relation must be explored as a part of a sequence of social action which includes interpretative practices' (1984, 72).

Research on reading in instructional settings has shown how reading is made into a public activity in which spoken interaction is used to co-construct procedural knowledge, to orient to the just-read text as a source for propositional and cultural knowledge, to orient to texts as sensible, and to transfer read information into oral reproduction and socially shared knowledge (Baker 1991; Heap 1977, 1980, 1990; Hester and Francis 1995; McHoul 1982, 1991). As numerous researchers have remarked, the learning and use of reading is fundamentally interwoven with social, technological, economic, political and cultural dynamics (Gee 1992; Lankshear and Knobel 2006; Street 1995). This research reminds us, among other things, that reading is neither context-free nor value free (Heap 1991), that especially in schools it is often done collaboratively (Hester and Francis 1995), and that the process for and outcomes of reading are best understood when investigating reading done for a particular purpose in a particular context (Heap 1991). The EMCA research on reading asks what the phenomenon is that is commonly called reading and if there are family resemblances across contexts for reading (Heap 1977).

EMCA-informed investigations examine the relationships between linguistic resources available to participants, their language production, and interaction with textual objects. Our purpose in this paper is to investigate the interactional import of reading during goal-oriented activity, in this case, engaging in a mobile augmented reality (AR) game activity that involves wayfinding and other tasks, and the processes involved in reading mobile phone delivered text as an organising part of the activity. This research demonstrates that

reading is a process of negotiation between readers; the socio-cultural meaning that is entextualised in the reading material; conflicting and congruent interpretations of the text, and the surrounding physical environment.

Reading for information, for interaction, for learning

We should specify at this point that the type of reading being investigated in this research is typical of online reading (Castek et al. 2015) in that participants are searching for information, or 'reading on the prowl' (Baron 2015, 39), rather than deep, reflective reading. Texts available for the participants to read included the device, paper maps, maps posted on campus signs, and nameplates on buildings and street signs. All the texts, but especially texts on the device, are oriented to as conveying relevant information for accomplishing the mobile game tasks. Participants in the context for our research read to follow instructions for the activity (Goldberg 1975), to facilitate finding their way to particular destinations (Klein 1982; Liberman 2013), and to let group members know about procedures indicated for each step of the activity. As they do this, reading becomes both a resource for understanding the activity and a tool for developing interactional practices for accomplishing the activity.

The context for our research is as follows: clusters of three participants move through the environment as a group (Thorne et al. 2015) and use multiple semiotic resources (including location aware digital devices with GPS maps) for wayfinding in order to play a mobile AR game (described in more detail below in the section *Participants and activity*). In this context, we noted that reading from the device and other print resources was a central practice for accomplishing the activity, both for finding a destination and for reporting on the destination once found. The reading occurred in a co-constructed, semiotically rich environment while moving from one destination to another and certain encouragements were used consistently to frame and organise the groups' activity, for example, group members telling the device holder to 'read and find the next destination'. However, while the procedures for finding a next destination are similar, the specific context of situation and report made at each destination differ and show locally designed characteristics. What is more, the shift in the procedures for the participants' subsequent interactions, we argue, can also be attributed to their building experience as they played this serial-task game. We see this specifically around practices for reading and argue that this can be taken as evidence of learning.

The mobile technology made relevant multiple semiotic resources for contextualising the texts that were read and shared, and the serial nature of the activity (locating five green technologies, one after the other) allowed for micro-longitudinal tracing of learning behaviour (Hellermann 2008; Markee 2008). The questions driving the investigation were: What are the different purposes for public reading and how is public reading used during the AR game? Is there evidence of change in the practices as groups move from one activity to the next?

Our analysis reveals a two-step sequence of learning-in-action: (1) participants formulate talk using the rich semiotic resources outside the classroom both to initiate reading and to make aspects of just-read text relevant to their shared activity, and (2) participants use their just-gained experience with the text resources to alter the procedures used for making a report at the next location in the game. An assessment of what is learned is seen in how the learners manage to 'go on' (Wittgenstein 1958), that is, to continue and complete their activity using interactive reading practices indicative of experienced participants.

Research on language use while moving

The contexts for reading we explore have adult learners of English participating in an augmented reality game on a location-aware mobile telephone in small groups. Because of the emphasis on navigation towards physical locations of relevance, this pedagogical approach is sometimes referred to as place-based learning. The successful accomplishment of the various tasks (described below) depends critically on the participants' engagement with the immediate physical environment (Holden and Sykes 2011) since the locations themselves make available information that is relevant to the game activity. The fact that participants are mobile, however, and need to move from place to place during the game adds another layer of complexity to their use of language for accomplishing their task.

Research on increasing mobility, the technologisation of mobility (Urry 2000), and literacy practices and language use while moving (i.e. walking) even before the advent of smart phones (Scollon and Scollon 2003) has shown that mobility and the shifting contexts (Silverstein 2004) and contingencies afforded by mobility significantly influence how talk-in-interaction is conducted. This line of research extends back to ethnomethodological discussions of the practices for walking together (Ryave and Schenkein 1974) and to Goffman's observational research on how people maintain an identity as a group or 'with' when in public (1971). Recent video-based research has shown a number of ways mobility and talk-in-interaction are connected. Broth and Mondada (2012) describe the coordination between talk, place and mobility in their study of movement during the closing of an interaction. When a topic of talk is oriented to as having come to a close, a participant completes the closure with a movement away from a current location. Such orderly behaviour is shown to be oriented to by participants and when a move away after closing is not followed by co-participants also moving away, talk is used to upgrade, or make more salient, the closing movement. Similarly, moving through an environment makes emergent artefacts relevant for talk (street signage) and coming to a stop also makes relevant particular kinds of referencing through talk (Broth and Lindström 2013). For example, the absence of movement after coming to a stop gives the deictic element *here* a particular referential import. In a study of the use of mobile devices during wayfinding, Brown, McGregor, and Laurier (2013) show ways that the internet and maps are accessed and used via the mobile technology while walking. Acknowledging this technologically enabled communication while mobile, Mills (2016) has expanded new literacy theories of the late twentieth century to include a theory of socio-spatial literacy. The theory accounts not only for online literacy but online literacy as accomplished via particular material devices (phones, tablets), devices that 'are caught up in the entanglement of space [and] heterogeneously composed with expanded and open-ended networks of textual linkages' (98). Additionally, emergent practices of group wayfinding with the assistance of mobile devices (e.g. directions to points of interest, restaurants, etc.) has become, in less than a decade, a high frequency or even ubiquitous practice across much of the world, particularly in urban environments. The analysis we offer here contributes to the nascent and evolving research focus on how wayfinding with mobile devices is interwoven with reading text, interpreting two-dimensional cartographic maps and sharing information through talk-in-interaction.

For this report, we first describe the context, data and analysis procedures. We then discuss a range of practices for reading aloud and then present a case study of one group's public reading practices over the course of the five destinations of the AR game. The results of the

analysis show that the participants read aloud to initiate action for the AR game, that read aloud text is repairable, is used by participants in paraphrase, is requested of the device holder and is oriented to in the context of the local environment. These practices also became routinised over the course of the five destinations and it is that movement towards routinisation that we point to as evidence of learning interactional practices for accomplishing the AR activity.

Participants and activity

The participants in the interactions for this report are three English language learners at a US university who work as a small group to play a quest-type AR game called *ChronoOps*.² The game scenario emphasises green technology and 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 2016 (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. 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 filed audio and video reports of the technology they encountered (Thorne et al. 2015).

The particular focus of this research is the empirical examination of English 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 and 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. Cornillie, Thorne, and Desmet 2012; Gee 2007; Thorne 2012), AR games represent a shift away from models of learning based on information delivery and towards 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, 70) 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.

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 et al. 2015; Holden and Sykes 2011; 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.

Data collection and analysis

The corpus of data from which our study draws includes sixteen hours of intensive video recording of 10 groups of 3 students. The recording protocol is for two players to wear head-mounted cameras to provide the players' visual perspective and to have a researcher capture the interaction of the entire group with a hand-held camera. The database also includes students' video-recorded reports made for the game. Multimodal transcriptions of the interactions were made and methods from conversation analysis were used in group data analysis sessions³ to uncover the sequential structure of the talk and interaction of the groups (De Stefani and Mondada 2007).

Inventory of practices for reading aloud

After transcription and analysis of the 10 groups, we have found the following repertoire of verbal practices for public reading. Due to the mobility of the participants, reading from the device is often triggered by something the participants observe in the immediate physical environment while walking: passing a building or a street sign for example. Reading from the device may also be prompted by a co-participant, either verbally or non-verbally. This is usually done as an implicit, indirect request to read from the device. Specific examples of this are when a co-participant communicates with the device holder, as in (A):

(A) Verbal triggers for reading

'where should we go'

'where should we start'

'where's the fourth location'

'continue' – that is, continue reading the relevant text

The device holder may also index text displayed on the device as a warrant for doing a particular instructed action, prefacing a reading with *it says* as in (B).

(B) Implicit orientation to text that has been read

[13ISGT1G2HC1 19:30/HC2 20:20]

20 Rec:=> it says uh::

21 Red: yeah but

22 Rec:=> it says uh:::

23 Reu: there is a new place

24 Rec: yeah but uh we need to record your voice first

We observed that both participating students and instructors available to provide assistance explicitly oriented to the device and text on the device. In (C1), a student (Rain, line 11) makes a polite request to the device holder to read (the words in the transcript that are in bold font are words being read aloud).

(C1) Explicit requests to read aloud

[AC3G1]

10 Fauna: lets go:

11 Rain: =>what about it. (.) can you read it?

12 Flora: ah **there are more than twenty five bike parking ar-**
13 **area on the PSU campus what are (.) some of the...**

In (C2), a teacher (Tea in the transcript), who had approached students seeming to have technical difficulty, indirectly instructs students about activating particular game resources (line 399) and then explicitly instructs students to read from the device (line 406):

(C2) Explicit requests to read aloud

[SGG1RC1.1 15:38]

399 Tea:=>does anything come up when you tap it?
 400 Max: **quick travel,**
 401 Tea: quick travel. there you go.
 402 Hyb: () ((addressing Schwinn))
 403 ((Max looking at device))
 404 Tea:=>↑okay. >↑wai wai wait!< read what it said.
 405 (2.5) ((Max and Hybrid looking at device))
 406 Tea:=>read what it said you guys.

Perhaps most interesting, readers use different sound quality (different amplitude and articulation) during their reading aloud to index different interactional import. Most obviously, readers read aloud in a public and audible way to inform their co-participants of the directives for performing goal-oriented action for the game. In (D1), Max reads quietly and does not receive a response or collaborative action from his peers and subsequently restarts, reading the key directive of the task at a louder volume. This prompts Hybrid to also begin following the text with his finger.

(D1) Different voice quality for reading aloud

[T1 SG1 G1 RC]

415 Rec: °re:cord answer by:,° (1.0) >record your answer
 416 by creating a...

Participants also read text aloud that did not have the illocutionary purpose of directing players to accomplish the goals of the game. Such text (for example, 'tap to continue') is procedural and associated with technical instructions for managing the mobile AR game interface. Although this text is read audibly, co-participants can do little other than wait for other instructions. The device holder reads such language aloud to display to co-participants that he/she is advancing through procedural steps in order to access explicit directives for the group. An example of this is in (D2) when a device holder does audible scanning between clearly articulated words that are oriented to as important for the group's next action. Max is reading from the instructional text when in line 234 he reads softly and then in lines 235 and 236 reads aloud but unintelligibly. His co-participant is seen displaying an orientation to this text as less important (line 237), suggesting to Max to continue reading. Max then begins reading loudly and clearly in lines 238–240, highlighting necessary location information, which is heard and oriented to by Hybrid (line 242).

(D2) Different voice quality for reading aloud

[T1 SG1 G1 HC 2.1 6:13]

233 Max: all the button you will need to play are located
 234 on the °bottom of the screen° as explore the
 235 cam:pus (.) () will begin to show your map
 236 () °your first [() is under,°
 237 Hyb: [continue
 238 Max: (.) YOUR FIRST TRIP (.) YOUR FIRST STOP IS (.)
 239 UNDER THE SKYBRIDGE BETWEEN (.) STONE MEMORIAL
 240 and (STILL) ALTBERGER HALL. where is
 241 that.< [ah:is it?
 242 Hyb: [this Stone:¿, ((points toward Stone
 building))

Such ostensibly self-directed talk characterised by less-defined articulation and low amplitude is done, in part, for interactional reasons – sequential misalignment or loss of attention from the desired recipient (Steinbach-Kohler and Thorne 2011). In the two excerpts in set (D), we see this being done by Rec and Max as a way to show co-participants that the device holder may be reading quietly, but not privately. Others can follow and stay tuned for verbalised information that can be acted upon as a group.

Lastly, although the reading space on the device shared by the group is quite small and sometimes difficult to see in the brightness of natural light, reading aloud can also be done collaboratively with two and sometimes three participants simultaneously reading aloud from the text on the device or collaborating by reading parts of the text. The following excerpt shows all three participants reading from the device that Max is holding.

(E) Co-reading

[SGG1RC1.1 29:42/ HC1.1 28:48]

102 Sch: quick travel¿
 103 (1.0)
 104 Max: electric avenue
 105 (1.0)
 106 Max: this is electric [cars can be: can be,=
 107 Hyb: [avenue ((reading a sign))
 108 Sch: =charged=
 109 Max: =charged(.)[why: do you think that- electric cars
 110 Sch: [why do you think
 111 Max: are good for, for the environment=
 112 Sch: =environment
 113 Max: record a:nswe:r: in the game °notebook°

Progressing through the game by reading: a case study of one group and five destinations

As previously described, the AR game ChronoOps has groups locate five locations on the campus where green technology can be seen, (1) bicycle parking racks, (2) solar panels, (3) an electric vehicle recharging station, (4) a building using captured rain water, and (5) a light rail and streetcar stop as an example of mass public transportation. The map in Figure 1 shows the numbered locations on a map similar to what the participants had available to them on the device.

Figure 1. Excerpt of a campus map showing numbered destinations used in the AR game.

Figure 2. Number of minutes at each destination for the focal group to prepare and make the report.

As a first pass into analysis of the data, we counted the time it took each group to locate each of the five destinations and the time it took each group to prepare for and record their report at each destination. Although there was variation in the time it took each group to locate the destinations, the time for each group to plan and perform their report once the destination was found was much more consistent. The steady decrease in the time it took the group to prepare and make each report at each of the five destinations (Figure 2) led us to wonder to what degree this decrease in time needed for planning and reporting might be attributable to reading practices, including gaining experience and efficiency for sharing information via reading aloud.

The following excerpts show how public reading makes available to the group relevant next actions and is practised in different ways across the five destinations. Reading from the

phone was first prompted by the instructor, then subsequently carried out unprompted by the device holder, and after that, reading aloud was collaboratively engaged in by all team members. We show how read-aloud text is oriented to as information to remember, often is paraphrased by co-participants and, finally, that a developing practice of orientation to the read-aloud text is used for different purposes at the final destination.

The focal group in the data presented in the remainder of the paper was called team 'green energy'. The participants' agent names (we use these as their pseudonyms in the analysis) are Max (Max), Hybrid (Hyb) and Schwinn (Sch). The teacher appears in the transcripts as Tea.

Destination 1

Explicit directive to read from the teacher and repair of read-aloud text

The excerpts in set (1) illustrate interactional practices surrounding reading aloud events that included explicit instruction from the teacher, repair done on the read-aloud text, and creative re-use of the read-aloud text. At the point of excerpt (1a), the group had spent an unusually lengthy amount of time finding the first destination. Their instructor observed this sojourn from a distance and is nearby when the group approaches the first destination. Excerpt (1a) highlights the teacher's explicit instruction to the group to read from the device. When the text is read aloud, it is read collaboratively and a co-participant repairs the articulation of his peer. This repaired reading is re-used later in the interaction as a resource for preparing their report.

After the teacher's exhortation to the group to read the text (lines 404 and 406), Max reads aloud from the device. Max is holding the device but Hybrid is in a position to see the text on the device as well. The public nature of this reading is apparent when Hybrid (line 418) and then Schwinn (line 420) display their hearing of what Max is reading and repair Max's production of the word 'text'.

Excerpt (1a)

[SGGIRC1.1 15:38]

404 Tea: ↑okay. >↑wai wai wait!< read what it said.
405 (2.5) ((Max and Hybrid looking at device))
406 Tea read what it said you guys.
407 Max: mmhmm. **there are more than, (.) mm twenty five=**

((9 lines taken out: group visually locates bike parking))

414 Max: mmhmm. **what are some advantage of or advantage of**
415 **ridi:ng a bi:ke to school. .hh °re:cord answer**
416 **by:, ° (1.0) >record your answer by creating a tex:ee,**
417 **or [a:udio**
418 Hyb: **[teckist.**
419 Max: **a teckist [heh or aud,**
420 Sch: [**text**
421 Hyb: or video.
422 Max: °mmhmm okay.°
((lines missing - the group discussing their report))
442 Max: o:kay. tex:t °where is text:ing°
443 (4.0)
444 Max: where should I find text;

Although Max produces a non-standard variant of the word ‘text’ the first and second times he articulates it (lines 416, 419), approximately 25 lines later, when the group is planning their report, he uses a standard pronunciation three times (lines 442 and 444). Max’s change in pronunciation may indicate a change in his awareness of the sound of the word. It may also be that he is not reading the word but using a word that is part of his productive oral language abilities.

Use of previously read-aloud text

After the recording process is discussed, excerpt (1b) illustrates how previously read-aloud instructions are reused without re-reading to move forward with the game. Hybrid (line 480) initiates repair asking the group what it is that they are to record, that is, what it is that they are supposed to make their report about. Max (481 and 483) and Schwinn (484 and 487) each respond to Hybrid’s information-seeking turn. Max uses text that was read in excerpt 1a (‘the advantages of’). Schwinn also uses words from those previously read-aloud instructions (line 484) as well as gestural deixis referencing an environmental artefact (line 485) to create a holophrase that connects the nearby bicycle racks via gestural index to the lexical index (on deictic reference cf. Hansen-Thomas and Langman 2017).

Excerpt (1b)

[SGG1RC1.1 17:56]
 478 Max: okay. [record.
 479 Sch: [then we will uhh::
 480 Hyb: [°() record what; record what;°
 481 Max:=> THE ADVANTAGE the advantages of
 482 Hyb: [make uh::
 483 Max: [the:: uh:, [°(the: bi--)°
 484 Sch:=> [|what’s the advantage of this;
 485 |((pointing at bike racks))
 486 Max: mmhmm.
 487 Sch:=> parking of the:: (.) bicycles.

Excerpts 1a and 1b illustrate how instructions that are read aloud become resources that participants use to communicate about and clarify the task and to move forward with the activity.

Destination 2

Initiating task, collaborative reading and learning to hear read instructions

Destination 2 is outside a campus building that has a solar array on its roof. Being the second destination, the group’s interaction in excerpt (2) illustrates how the sequential nature of their activity affords opportunities for comparison and adjustment to their talk. At destination 2, the group does not spend time looking around for an example of green technology and does not wait for a prompt from the teacher. Rather, Max looks at the phone and announces the appearance of instructions (line 650) and begins reading in line 651. Hybrid is in position to see the device and after Max’s audible reading fades, he reads the location name from the device in line 653. After Max and Hybrid both read the task prompt again, in line 662, Hybrid explicitly requests a re-reading or re-saying of the task prompt (‘the question is’) and as Max responds by reading from the text (line 664), co-reading occurs as Hybrid also reads aloud the response for the question he just posed.

Excerpt (2)

[SGG1RC1.1 22:51]

650 Max: Hybrid! >we get we get we get< instruction.
 651 the solar plans on the roof of the °lambert°
 652 ()
 653 Hyb: Lambert hall?
 654 Max: mmhmm. three of the (percent) in energy
 655 Hyb: thr[ee (percent)? ((looks up at building))
 656 Max: [what are some °of uh the advantage°,
 657 (0.5)
 658 Max: what are some of the advantage o-(.) or disadvantage
 659 of us:ing solar energy. .hh record your ans:wer,
 660 (.) °in (the game)°
 661 Sch: [solar en[ergy,
 662 Hyb: =>[w a [i t. the question is;
 663 Max: [name the mm hmm
 664 Max: what [are (.) some advantage
 664 Hyb: [what are (.) some a advantages or
 665 disadvantages,
 666 Max: mmhm.

At the end of line 651 and into 652 the transcript indicates that Max is reading more quietly, though his reading is audible. Hybrid repeats the name of their location (lines 653), which Max acknowledges as he continues reading from the device. Max reads the prompt for their report (656) in a soft voice and, perhaps due to that, restarts the reading of the task prompt (line 658), his voice trailing off again in line 660. It is at this point that Hybrid requests clarification of Max's reading of the task prompt (line 662).

At destination 1 (excerpt 1b), Hybrid asked about what the group needed to record for their report and his peers responded with paraphrases of the task prompt. At destination 2 (excerpt 2, line 662), Hybrid asks more explicitly about the task prompt ('the question'), clearly orienting to the just-read text. He had heard the task prompt one time and it may be that clarification was requested because, unlike destination 1, the green technology at destination two (solar panels on the roof) are not visible from their street-level vantage point. By contrast, at destination 1, the bike parking was clearly visible in the immediate surround.

Destination 3***Integrating texts from multiple sources: co-constructed reading as evidence of changing practice***

The interaction at destination 3 illustrates a complex interactive reading of the task prompt that incorporates text from multiple sources. Although the device holder initiates the reading of instructional text, unlike destinations 1 or 2, when the group arrives at destination 3 a co-participant reads procedural text aloud. The rest of the instructional text is a co-constructed reading. After the reading, Hybrid, who does not have haptic access to the device, makes several requests for clarification of the task prompt. The response to Hybrid's

request is not a verbalised re-reading but is a co-participant's paraphrase of the previously read-aloud text. After accomplishing the first two stages of the task, the group seems to be orienting more to the importance of the device for information about completing their reports.

When they arrive at destination 3, Schwinn initiates the sequence (line 100) by reading the procedural prompt – the game shows a navigation bar *quick travel* which leads the players to the prompt for making their report on the green technology at the third location. He is standing behind the device holder, Max (see image in excerpt 3a). After Schwinn reads aloud that *quick travel* button on the navigation bar, Max presses the button and reads the title of the green technology that appears ('Electric Avenue', line 102), followed by reading the task prompt (line 104). Hybrid enters the collaborative reading at this point, overlapping Max's turn with a candidate completion of the opening noun phrase (line 105). Hybrid is reading a posted signage on the street near the group that is titled *Electric Avenue* (Figure 3b) and utters the reading so it is timed to make a grammatically appropriate phrase. This is followed by Schwinn, still reading from the device, uttering the past participle for the predicate of Max's turn (line 107).

Figure 3a. Schwinn reads aloud from device held by Max.

Figure 3b. Hybrid's gaze to a sign that indicates Electric Avenue.

Excerpt (3a)

```
[SGG1RC1.1 29:42/ HC1.1 28:48]
100 Sch:      quick travel;
101           (1.0)
102 Max:      electric avenue
103           (1.0)
104 Max:      this is electric [cars can be: can be,=
105 Hyb:                               [avenue ((reading a sign))
106 Max:      =ch[argued.
107 Sch:      [charged
108           (.)
109 Max:      [why: do you think that- electric cars
110 Sch:      [why do you think
111 Max:      are good for, for the environmen[t
112 Sch:                               [environment
113 Max:      record a:answer: in the game °notebook°
```

This opening sequence from destination 3 shows how group members other than the device holder orient to the device as a source for reading aloud. It also illustrates participants' orientation to reading aloud as part of their learned routine for playing the game. The evidence shows that participants are attending to what their co-participants read and make their vocal contributions to the ongoing talk at points that enable meaning-making. In the remainder of the planning phase, two students (Hybrid and Schwinn) ask for clarification of the task prompt and orient to the developing practices for making reports.

Paraphrasing previously-read material

After the co-reading of the instructions, in 3b, Max exhorts the group (line 123) and Schwinn and Max collaboratively construct a response turn – lines 124–125. This co-constructed response ends when Hybrid produces an information-seeking turn (line 127), as before, requesting the task prompt. Although all three groups had read the task prompt (excerpt 3a), Hybrid may be requesting the prompt again because Schwinn had been briefly occupied with another group (lines 122–123). After Hybrid's request, Max and Schwinn begin a co-constructed response (lines 128–130), not reading but paraphrasing what they read in (3a) *why do you think the electric machine is* and Hybrid enters to produce the predicate (line 131): *good for the environment*.

Excerpt (3b)

```
[SGGIRC1.1 30:10]
121 Sch:      ((turns back to the group after speaking with members
122             of another group))
123 Max:      okay. lets lets get some idea:s.
124 Sch:      cause, [uh:ç
125 Max:=>    [the electric machine
126            i[s uh:
127 Hyb:      [again the question pleaseç
128 Max:      why:[:
129 Sch:      [>why do you think<]
130 Max:      why do you think the:: electric machine is uh::,
131 Hyb:      good (.) [for the environment ].
132 Max:      [g o o d- g o o d- ] for the
133            environment.=
```

The responses by Schwinn and Max to Hybrid's information-seeking turn show an orientation to the read-aloud instructions and the participants' awareness of the role of the printed instructions to complete task. The fact that Hybrid answers his own information-seeking turn (line 131) suggests he knows the gist of what the group is attempting at destination

three. His turn at line 127 is a request for a re-reading or re-saying for purposes of ensuring that he and all group members are intersubjectively aligned in their action.

Destination 4

Evidence of routinisation: reading, collaboration, and paraphrase

At the fourth destination, there is evidence that the orientation to, and interactional practices this group uses around reading aloud, have stabilised. The device holder, as in destinations 2 and 3, initiates the reading. This is followed by collaborative reading, requests for a re-reading of the task prompt, and then responses to that request that are paraphrases of the read-aloud text.

Upon arriving at the destination, in line 425 Max is reading the description of the technology that leads to the task prompt line 429. As he reads, Hybrid puts himself in position to see the text and co-reads with Max in lines 430–431. Hybrid asks about the location of the fourth destination. Max, expressing exasperation, indicates they are where they need to be to make their report (lines 437, 439, 441). At this point, Schwinn asks for a repetition of the task prompt. Hybrid (who has been encouraging the group to move quickly from the start of the game) indicates that one reporter will suffice and Schwinn makes a second request for a resaying of the task prompt (line 447). Max produces a paraphrase (almost exact) of the task prompt he and Hybrid had collaboratively read. It may be that Schwinn asks for a resaying of the prompt because of the co-reading. It may also be because the prompt differs in format slightly from the first three destination prompts. Here they are asked about ‘some of the uses of rainwater’ where previously, the prompts were formatted as ‘what are the advantages and disadvantages...’. As at destination 3 with Hybrid, here Schwinn responds to his own request, giving a candidate completion in line 449 to the response Max started.

Excerpt (4)

[SGG1RC1.1 35:23]
 425 Max: ah::. the toilets es °<in the> academic () center,°
 426 <FLUSH> °with the rainwater collected fro[m the roof.
 427 Sch: [wait
 428 (0.5)
 429 Max: what are so:me [o f the ways that °the ra,°=
 430 Hyb: [the ways that
 431 Hyb: =rainwater (.) can be used.
 432 (1.0)
 433 Max: °record the answer° OKAY >just record it form here.<
 434 >we don't have to take any picture<
 435 Hyb: where is the location?
 436 ((Schwinn takes device from Max))
 437 Max: WE ARE in the ro- lo- l o c a [t i o n I think
 438 Sch: [record your answer
 439 Max: there is no:[where is it,
 440 Hyb: [okay. okay.
 441 Max: °is it exact°
 442 ((turning gaze, receives device from Schwinn))
 443 ((Max takes device from Schwinn))
 444 Sch: okay whats the question?=
 445 Hyb: =just one: uh:: an[swer. °it's enough°
 446 Max: [mmhm,
 447 Sch: what is the question. (.) was.
 448 Max: what are some other ways that, [rainwater can be used.
 449 Sch: [we can colle-
 450 Sch: mm:::, ((looking upward, a kind of thinking face))
 451 (1.0)
 452 Max: what do you think,

Destination 5

Orientation to reading aloud for a new purpose

At the final destination in the game, there is evidence for what looks like a sedimented discursive practice for this activity: a request for the device holder to read the task prompt. However, the request at different sequential positions shows it has different interactional import at destination 5. The following excerpts also show the interaction of reading aloud and mobility as the read-aloud text prompts an infelicitous movement for the accomplishment of the task. Finally, the task prompt is repeated again in a slightly different semantic formulation and requires a different kind of response than the task prompts of the first four destinations.

First, the group has moved the short distance from their reporting station for destination 4 towards the area indicated for destination 5, which is a plaza that serves as a nexus of public transport options (see map in Figure 4).

As they walk down some stairs to the plaza, at line 1556 (location indicated in Figure 4), Max, the device holder, utters a hedged assertion that the group has arrived at the fifth destination. The group continues moving northward and rather than consulting a map, Schwinn makes a request for the task prompt (line 1558) which had not yet been read by Max. Max complies, the group comes to a stop, and Max reads, keeping the group notified of his progress navigating through the game as he reads the procedural prompt aloud (line 1566). When he reads the task prompt, Hybrid is looking at the screen with him and when

Figure 4. Map excerpt of the group nearing destination 5.

Figure 5. Hybrid walks ahead of Schwinn and Max.

Max is in the middle of reading the word ‘streetcar’; Hybrid overlaps with an exclamation and deictic gesture (lines 1569–1570) pointing north to the streetcar tracks and the location of a streetcar stop. He then starts walking in that direction rather quickly – the screen capture in 5a shows him ahead of Max and Schwinn, almost out of the frame, just a few lines after his turn (Figure 5).

Excerpt (5a)

[RC 1.2 2:26]

1556 Max: I think it’s here (.) it’s here.
 1557 ((the group continues moving E then N)) (6.0)
 1558 Sch: what’s the question
 1559 (3.0)
 1560 Sch: okay we are:: in (.) the park,
 1561 (1.0)
 1562 Sch: () ((group stops))
 1563 (2.0)
 1564 Max: mmhm.
 1565 (1.0)
 1566 Max: >tap to continue<
 1567 (1.8)
 1568 Max: the portland s: stre[etcar,
 1569 Hyb: ((looking at device))[street|car! here hey! street car
 1570 |((points, walks north))
 1571 Max: mmhm. to the last line;
 1572 (2.0)
 1573 Max: °mmhm. there are many buses so (near where:)
 1574 the Portland,=
 1575 Sch: =mmhm,=
 1576 Max: =streetcar is (free both and with your)

Unlike the other destinations when the task prompt was requested for clarification purposes or to aid in the group’s concerted activity of making a report on green technology, in excerpt 5a, Schwinn’s request for the task prompt is done for purposes of locating the fifth destination. When the prompt is read, Hybrid uses visual cues that are referenced by the task prompt and moves away from the reader before the prompt is complete and we see in (5b) that the consequences are that Hybrid makes two more requests to Max to read the task prompt (lines 1577 and 1580). His distance from the group is the reason that his second request is made. He does not hear that Max had already started with the re-reading (line 1579) after his first request.

Excerpt (5b)

[RC1.2 2:58]

1577 Hyb: complete the question please. ((Hybrid has walked
 1578 ahead of the group and turns to face them))
 1579 Max: °hehheh° °**what form of [transportation**
 1580 Hyb: [complete the:: instructions;
 1581 complete; (.) complete;
 1582 Max: okay. **what form of uh: what form of uh: (.)**
 1583 **transportation do you use when you travel to school.**
 1584 (2.0)

Max orients to Hybrid's requests as not having heard and re-reads the instructions from the device as he walks (which may account for the recycled turn beginning) to catch up with Hybrid (lines 1582–1583).

Orientation to reading aloud due to a different type of task report

After Max's re-reading, there is no immediate response from other participants (line 1584) and in (5c), after indicating their arrival at destination 5, Max attempts a repair, by breaking down the task prompt question (starting in 1586) and highlighting the first noun phrase. Hybrid hears this as a parsing kind of repair and offers a receipt token. Max then completes the entire task prompt (lines 1588–1589) and after a brief gap, he explicitly nominates Hybrid to respond to the prompt. Hybrid answers with a repeat of the last part of the prompt, replacing the final noun phrase with a question word (1592), as a repair initiator.

Excerpt (5c)

1585 Max: just here. >here here here here here<
 1586 **what for:m,**
 1587 Hyb: mmhm;
 1588 Max: what form of uh:: transportation, >do you use when
 1589 you go to school.<
 1590 (0.5)
 1591 Max: how about you ((points to Hybrid))
 1592 Hyb: when: you:: go: to [go to what?
 1593 Max: [when you [go to school.

Hybrid's repair initiation is oriented to by Max mid unit and he overlaps Hybrid with another repair (line 1593).

Excerpt (5d) follows immediately from (5c). Here we see that Schwinn also hears Hybrid as having trouble and he offers an upgrade to Max's repair, reformulating the task prompt to a colloquial form, 'by what' (line 1595) and a shortened form of the entire task prompt (lines 1597). After no response, in 1599 it appears that Schwinn is about to provide exemplar type questions 'do you take the bus?' etc. but is overlapped by Max who is launching the report by nominating himself to start. Hybrid asks one more time, an emphatic plea for repeating the task prompt to which Max complies by reading from the device again (lines 1608–1609), which Hybrid responds to with a minimal acknowledgement token.

Excerpt (5d)

1592 Hyb: when: you:: go: to [go to what?
 1593 Max: [when you [go to school.
 1594 Sch: [heh heh
 1595 Sch: by what.
 1596 (1.0)
 1597 Sch: how. you come to your school
 1598 (3.0)
 1599 Sch: [do you::,
 1600 Max: [UHH: >I I I< I'm gonna
 1601 (0.5)
 1602 Max: [I'm gonna speak first=
 1603 Hyb: [again.
 1604 Hyb: ↑>again again again< the question please,
 1605 yeah.
 1606 Sch: short on minutes.
 1607 (1.0)
 1608 Max: **what form of >transportation do you use °when you go**
 1609 **to school° you will answer in the game with ()?**
 1610 (1.5)
 1611 Max: uh-huh. [**tap to continue**
 1612 Hyb: [okay

The excerpts 5a–d show different purposes for reading from the phone. As the group moved from destination four to five, they read very little from the phone due to the fact that the fifth destination is within sight of where they started. However, once the group neared the fifth destination, reading the task prompt was oriented to by Schwinn and Hybrid as a resource for finding the precise location of destination five. We have two possible explanations for Hybrid's persistent requests for reading of the task prompt. The first is that while the words of the task prompt for destination 5 are understandable, the location for making the report is not. The streetcar line and mass transportation more generally are not delimited spaces. Also, the fact the task prompt at destination 5 is not about naming objective characteristics or practices ('advantages and disadvantages', 'uses of water') but is about a personal choice regarding transportation options to get to the university. The combination of a non-delimited space for making the report and the new language for the task prompt led to the difficulty for Hybrid and the group to achieve intersubjectivity. The requests to read from the phone, the compliance in reading and re-reading the instructions from the phone, and Schwinn and Max's paraphrasing of those read-aloud instructions, are all part of the work done in order to achieve intersubjectivity.

Discussion and conclusion

The excerpts from one group's interactions at the five destinations comprising this mobile AR game activity show evidence of routinisation of the reporting done at each destination. The requirement of a report at each destination allows for the successive emergence of more experienced and routinised patterns of interaction over time (Kern and Ohlhus 2017; Zemel and Koschmann 2014). Interactional practices (including reading aloud) are improvised using recycled and reformulated discursive resources. As suggested by previous research on game playing, we characterise what went on during this AR activity as 'reading for learning to play

the game as they played it'. Game players do not, generally, read an entire set of instructions, put the instructions away and then play the game. They accomplish game playing by consulting and reading textual instructions as needed, and then accomplish the activity of the game by playing it (Lieberman 2013). The game is thus constituted as a game by the reading of the instructions at the time they are relevant and for the participants to whom they are relevant. The players cannot know much about exactly how the game is meant to be played when talking it over beforehand or preemptively constructing the 'game as it should be' (Garfinkel [2002] on *lebenswelt pairs*). The excerpts we presented illustrated how reading aloud text from the game is selective, interactive and sequentially and environmentally consequential. In this sense, reading aloud played a critically important role in how the group improvisationally, contingently and gradually assembled a repertoire of practices for how to play the game that emerged through the process of playing it.

Specifically, our examples revealed evidence of how experience catalysed adaptivity in interactional practices. We showed that public reading of the texts in the game was first prompted by the instructor some fourteen minutes into the playing of the game. The group performed their game activity in subsequent destinations by publicly reading instructional text from the device. This was done by the device holder or a group member standing close to the device holder. Reading the device was done at destination 1 by the device holder only, but that changed at destinations 2–4 when those not holding the device put themselves into position to be able to see and read aloud from the device. The reading aloud of the task prompt was oriented to at destinations 2–4 as a necessary first action for making a report. Requests for repeated out-loud readings of the written prompt were made at each destination by a group member not holding the device. The purpose for these requests seems to be clarification as well as to ensure that all participants are working together on the same phase of the game.

These data illustrated that in contexts of just-in-time concerted action, such as wayfinding and information gleaning mediated by mobile devices, reading activates and interpenetrates with social and embodied practices. While reading is often described as a solitary engagement between reader and text, this analysis showed the degree to which reading can be a negotiated phenomenon and texts are resources for the establishment, maintenance and repair of intersubjectivity. This research contributes to better understanding the social dynamics of information interpreting and sharing from digital devices, not only in the specific context of mobile AR game play, but more broadly for digital device users managing the interface between two-dimensional cartographic and graphical literacy information and multi-party movement and task orientation in the physical world.

Notes

1. Reading aloud, in fact, was a common way for written texts to be shared until the early middle ages (Fischer 2003).
2. The game was developed on the ARIS mobile gaming platform (<https://arisgames.org/>) at Portland State University by the 503dc group. (Thorne 2013).
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Notes on contributors

John Hellermann (PhD, University of Wisconsin) teaches and does research in the areas of language use, linguistic, theory, discourse analysis and learning. He has used conversation analysis to investigate the role of co-constructed language for language socialisation and learning in high schools and community colleges.

Steven L. Thorne (PhD, University of California) teaches and does research in the areas of second language acquisition, new media and online gaming environments, and theoretical and empirical investigations of language, interactivity and development. He currently works on a variety of projects that examine technology-mediated language learning occurring within and outside of formal educational settings.

Peter Fodor is a graduate student specialising in Japanese language pedagogy and sociolinguistics and Editorial Assistant for *Applied Linguistics*.

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