Using Wearable Technology to Collect Multimodal Data in the Study of Learners' Digital Literacy Practices

Freek Olaf de Groot, Asian Institute of Technology Bangkok

Abstract

Technology allows us to learn new languages and communicate with others relatively free oftime and place. Although technology has already proven its effectiveness for languagelearning outside the classroom, the potential of this effectiveness for in-class learning andteaching has yet to be explored in detail. Traditional research methods such as interviews andsurvey data tend to fall short in accurately describing digital literacy practices that are outsidethe scope of the researcher. This paper presents a study in which multimodal data, collectedthrough wearable technology, is used to map trajectories of digital English literacy practicesof students across various spaces outside the classroom. This method illustrates howmultimodal data can provide better insight into digital literacy events as they move acrosssocial spaces than traditional forms of data collection. It also demonstrates how multimodaldata can be used as the input for focus group sessions to corroborate findings and addvalidity to qualitative data in research on digital English literacy practices.

Keywords: digital literacy practices; English teacher education; mediated discourse analysis; multimodal data

1. Introduction

This paper presents an alternative method to study literacy practices in times in which our learning and communication practices are increasingly mediated by digital technology. This trend is affecting not only the way we learn and communicate, but also how we research the development of these practices. One major hurdle in this form of research is that, unlike traditional literacy practices, digital technology creates opportunities to engage in our literacy practices relatively free of time and space. This development makes it challenging for researches and educators since literacy development is no longer just situated in the bounded classroom, but rather over a network of connected spaces. In addition, learners engage in more and increasingly diverse literacy events and interact with a large amount of resources. This paper demonstrates how literacy practices can be studied taking in a more ubiquitous context using a combination of multimodal data collection through wearable technology alongside more traditional research instruments. This paper intends to illustrate that the addition of wearable visual tracking to more traditional instruments of data collection allows for a more comprehensive understanding of learners' literacy practices and the digital tools they use.

2.1 Changing (digital) literacy practices and learning in 21st century learning

Over the last decades a strong influence from the New Literacy Studies (Street, 1984; Barton & Hamilton, 1998, 2000; Gee, 2004, 2008) has made an important contribution to defining literacy as a social construct and broadening the range of skills that are involved in literacy development. Defining literacy as a social practice on its own did not only require a shift in how literacy education was approached in the classroom (Gee, 2004), but also demanded a shift in how we approach literacy as a concept of scientific inquiry. Gee (2008) argues that language and literacy are tools, instruments that allow us to say something, be someone, and do something and as a result allow us to participate in various social communities in society. As a result, a socio-cultural approach to studying literacy development also requires more qualitative, ethnographic approaches to research design to avoid a reductionist perspective on literacy as a social construct. Thus, broadening the scope of the concept of literacy also means that literacy is redefined within a context of an increasingly digitally mediated society.

An increasing use of technology in our daily literacy practices means that learners cannot only increase the intensity with which they engage in literacy practices, but also extend and diversify the range of practices they engage in (Jones & Hafner, 2012). This has created a range of "new literacy" practices that people are able to participate in. Lankshear and Knobel (2011) argue that the "new" in 'new literacies' refers to an ontological change in literacy as a concept. New literacies according to them thus refers to a new range of social practices in which technology allows people to diversify the ways the engage in social interaction leading essentially to a new set of literacy practices and discourse practices that are needed to effectively take part in these practices.

However, an ontological change to our literacy practices is not the only challenge to research design in this field. Arguably one of the most important affordances that digital technology has created is that it allows us to engage in all these new literacy practices relatively free of time and space. Digital technology allow us to develop our skills across networks of connected spaces (Leander & Aplin, 2016) and make relevant connections between out-of-class literacy practices and in-class learning and teaching (Hafner, Chik & Jones, 2013; King, 2015; de Groot, 2017). In other words, the lack of restrictions on where and when we engage in our learning and literacy practices also changes the trajectories of learning practices and the actual physical location in which people engage in learning and literacy. This also places an emphasis on the tools that create opportunities to engage in these literacy practices, a key focal point in research on educational technology.

2.2 A mediated discourse analysis approach to studying literacy practices

Within a sociocultural approach to studying literacy practices, the focus of inquiry is on the actions learners take, the tools they use to take these actions and the principles and beliefs about these practices and tools in society. This study adopts Mediated Discourse Analysis (MDA) (Scollon, 1999, 2002; Scollon & Scollon, 2004; Norris & Jones, 2005), as a versatile approach to study ubiquitous (digital) literacy practices. MDA builds on the idea that discourse and action are in a constant dialectic relationship. This means that discourse is not seen as an action, such as speech act, but rather as an intricate part of language in use in social interaction. The central unit of analysis in MDA is the mediated action. This can best be described as the moment where the tools, discourse and practices intersect and allow people to take action.

2.3 Rationale of the approach

This paper argues that considering the three elements mentioned above, i.e., the changing ontological nature of literacy practices, the ubiquitous nature of our literacy practices, and the range of tools we use in our literacy practices, the research methods we apply to the study of literacy practices in an increasingly digitally mediated society should adapt to these changes as well. The research paradigms and the tools we use should cover a more extensive and multifaceted construct of literacy that is ubiquitous in its nature and is able to cover a wide range of modalities across physical spaces. This paper does not claim to present a comprehensive solution to this complex problem but instead tries to offer a different perspective on how we observe the literacy practices, discourses and tools that learners use. This paper will continue with a description of the method and use a case study of Thai student-teachers as an illustration of the use of visual data tracking through wearable technology.

3.1 Visual data collection using wearable technology: description of the method

This section describes step-by-step how wearable technology is used and the data from this process is analyzed. The use of visual data collected through wearable should not considered as a replacement of existing methods, but instead as an addition to existing forms of ethnographic data collection such as interviews, participant observations, field notes, learner journals and so forth, that can capture a more comprehensive image of (digital) literacy practices as well as corroborated observations at other stages. This section will continue with a

vignette to illustrate the digital literacy practices of a group of Thai student-teachers that were studied as part of a year-long study using wearable technology.

3.2 Vignette

A group of Thai student-teachers of English gets together after class to prepare a peer teaching practice activity for the next day simulating an English camp activity for reading and spelling. They're all nervous since none of them feelsconfident using English in the classroom. After much deliberation they decide on a running dictation activity using definitions of animal names. One of the group members chats with a friend on Facebook messenger. He is an English teacher abroad and they know each other from chatting online. He suggests using scrabble tiles and a grab box full of letters for the activity. They go online and look up descriptions of animals on Macmillan's online dictionary website and prepare all the scrabble tiles to spell the names of the animals. They then map out all the individual steps of the activity on paper and per step decide on what the instructional language for each step in English should be and who will provide the instructions. They remember phrases from past English camp activities and they look up samples of instructional language on various websites such as Teacher Adam, English Breakfast and YouTube channels they are familiar with. They run some of their phrases by a native English-speaking friend online who is sometimes willing to help and give feedback. After that, they practice the instructions with each other. They frequently turn to Google translate and Macmillan's dictionary online to listen to samples of pronunciation and practice their lines again. The next day shortly before their activity starts each of them goes over their respective instructions individually and often refer to a little cheat sheet they have. The class gathers in the middle of the room, the group gets ready and two group members start by saying "Are you ready?"

Table1: Sample of annotated visual data

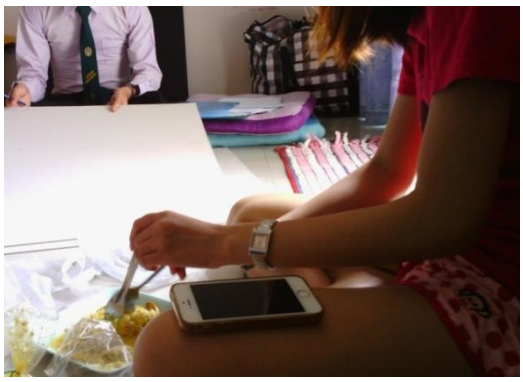
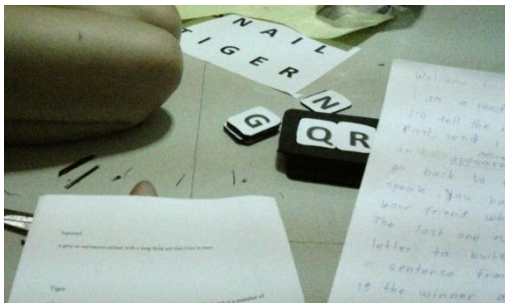
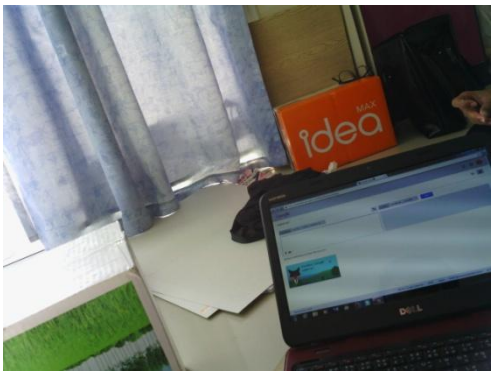
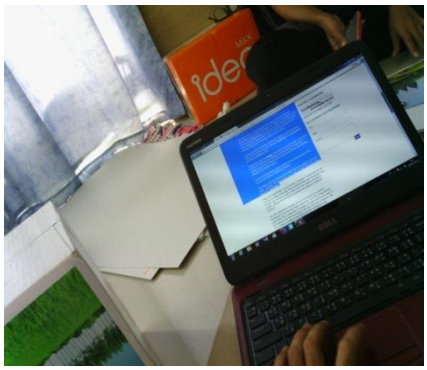
	
Actions: Ss meeting up for lunch; discussing ideas on activities gathering materials; smartphone resting on her knee Tools: Smartphone, materials, internet connection	Actions: Ss cut out letters; prepare definitions of animal names; chat online Tools: definitions, scrabble tiles, smartphones, internet connection

Table 1, cont.

	
Actions: Ss arrange letters; chat with friends on Facebook messenger; scrabble tiles produced Tools: Smartphones, scrabble tiles	Actions: Write out a script for the language of instructions in English; produce worksheets for running dictation; read definitions Tools: script, smartphone, scrabble tiles, definitions
	
Actions: Ss look up vocabulary on Google translate Tools: Laptop, internet connection, Google translate	Actions: Ss read information in English on a website for self-access studying Tools: Laptop, self-access study materials, internet connection

The vignette above is an example of an account of students' digital literacy trajectories taken from a longitudinal study in which wearable technology has been used as part of the data collection. It has been formulated as the result of a multi-step process of analysis with the goal to reconstruct students' digital English literacy practices outside the classroom as part of their preparation for English literacy events in the classroom. The following section will provide an overview of the steps of the analysis and methods of data collection. It should be noted that this form of analysis in the original study was part of an ethnographic approach to studying literacy practices in the form of a Nexus Analysis developed by Scollon and Scollon (2004) and formed a major part of the activities aimed to understand how the practices, tools and discourses converge and enable people to take actions, and how these actions relate to other practices that have been observed.

3.3.1 Step 1: Introducing the camera and collecting the data

The first step in this approach assumes that a good interaction and rapport has been built with the research participants. During this stage of my research, I introduced the Narrative clip, a small wearable camera that takes still images every 20 seconds, to the participants and explained what it did and how it was used. I introduced the camera only later on in the data collection as I felt I needed to establish a better relationship with the participants before they were ready to allow me a visual insight into their lives. I gauged their readiness to share information with me through simple hints such as their willingness to show me a Facebook post or Twitter post on their phones. As I started wearing the camera in class, student-teachers developed an interest in it and I explained what it was before handing it to them to try it out. When students asked what the camera was, I explained how it was used by people as a tool for life blogging and I showed some of the still images I had from my own use.

3.3.2 Step 2: What's it that is going on there?

Participants were wearing the camera on multiple occasions during the semester and since students spent most of their time in groups, they would often take turns wearing the camera. This provided an unintended, but highly efficient visual image of the activities that took place in my absence. The visual images were analyzed at first by asking the question that sociologist Erving Goffman often asked: "what's it that is going on here?" This question was asked for every picture or cluster of relatively similar pictures. The results from an extract of the data relating to the vignette can be seen in Table 1.

3.3.3 Step 3: Identifying the tools

Since the mediated action is the core unit of analysis in data analysis using a mediated discourse analysis approach, the tools that allow learners to take these actions play an important role. In the third step I have identified the tools. The use of these tools at this point of action is not only important, but also the personal use history that the learner has developed with this tool. This is an important starting point for the focus group interviews in

3.3.4 Step 4: (D)iscourse and discourses in place.

In a mediated discourse analysis approach, discourse is seen as language in use in social interaction. Since discourse is defined thus as an integral part of our action, and in a dialectic interaction with our actions, it forms an important part of the analysis. Here we are not looking at individual texts, but also at what Gee (2008) calls the large D discourses, or those general beliefs and principles held by larger groups in society on our social practices. The latter might be difficult to derive instantly from the images, but the presence or absence of certain actions or practices in the still images can provide useful hints. For example, in the data of this study, teachers voiced a strong belief relating to students' inability to engage in any academic activities using technology. The still images provide a completely different picture in which there is quite an efficient use of the tools and resources available.

3.3.5 Step 5: Identify issues that need to be further explored in focus group interviews

Possibly the most important step in the analysis is the identify practices, tools, and discourses that need to be further explored and seek corroboration of the actions that have been identified. An important element of mediated discourse analysis is not just to identify the actions at one moment, but also trace the practices, actions, tools, and discourses that lead up to this moment of action. The strategy that was followed to corroborate findings and seek out more information was to select several pictures to be shown to the participants in the focus groups and have them explain what it was that was going on here. Then based on these accounts, further questions were asked to retrieve the personal use histories of tools for instance or identify new discourses. Table 2 below provides example issues, among many others, that were identified for

further questioning in focus group interviews. The answer to these questions have been formulated into the vignette in section 3.2.

Table 2: Example issues for discussion in focus group interviews

• Are the observed actions routines or exceptions? • How do you use smartphones as part of preparing classwork/ doing homework that we see in the still images? • How did you compose the script for the instructions for the activity? How did the process unfold? • How did you learn to use apps and online dictionaries as part of your learning? • How do students compare the use of their smartphones outside and inside the classroom?

3.4 Privacy considerationsin using wearable technology

The use of wearable technology comes with certain ethical considerations which need to be addressed thoroughly in any study. The study was approved by the IRBs of relative universities participating in this study and complied with the local privacy ordinance on collecting visual data in public spaces. Upon introducing the wearable camera students were explicitly told that the data collected would be used as part of the study and they signed off release forms which were explained in their first language. After wearing the camera, the participants returned with the camera and I connected the camera to the computer. All pictures were then downloaded onto the hard disk of the computer and automatically erased from the camera as part of the download process. The participants were then left alone with the images and students were given first access to the data to delete any pictures they did not wish to disclose, without stating a reason. These were then permanently removed from the computer. Before wearing the camera, students were informed that when entering private spaces such as a teacher's office or a space where people outside their research group would be present, they would need to turn off the camera by simply putting it in a dark pouch that was provided to them.

4. Discussion and conclusion

What this paper attempted to demonstrate is the effectiveness of the use of wearable technology in the study of learners' digital English literacy practices. The main benefits of this method can be summarized as having access to learners' out of class digital literacy practices without physically having to be present and providing a 'point of view' perspective of the tools, the semiotic artifacts and the discourses that learners interact with. This provides a better insight in their literacy practices in addition to forming a better starting point for the focus group interviews that are often an indispensable part of ethnographic approaches to studying literacy practices. The closest alternative, recording audiovisual material, might provide a productive alternative in classroom settings or in community projects (McIlvenny, 2011; Jones & Raymond, 2012), it is much less apt in more intimate settings such as group work or homework preparation that takes place outside the classroom.

One important result from working with this method was that collecting still images of literacy practices provides the researcher with ample time to analyze and observe what is happening than with traditional observations. Although observations create the affordance of sensing the context and atmosphere, and above all, listen to what is said, it can also overload the observer and details can go unnoticed. Another important aspect is that an observer cannot get a point of view perspective which the wearable camera is able to provide. For the current study, a point of view perspective also helped the students during the focus groups to reconstruct the events in the still images and open a discussion on the practices related to the tools such as smartphones, computers, books, worksheets and so forth and the literacy practices that were associated with that. This way I was able to for instance find out more about the meta linguistic talk that was going on about the script they prepared for their classroom instructions and how

the drew on external resources such as friends from chats. These practices are not incidental events, but rather part of a larger set of related practices in which the affordances of digital technology create access to valuable literacy resources and opportunities to engage in English literacy practices in learning contexts such as Thailand in which exposure to English is relatively scarce (see de Groot, 2017 for more examples from the same study). Wearable technology provided insight into these literacy practices that had otherwise not emerged as part of the data. More work is to be done experimenting and fine tuning the techniques for visual data collection using wearable technology, but the results of the current study are promising in their potential and form a useful starting point for unearthing a more comprehensive image of learner's digital literacy practices in a context of increasingly ubiquitous learning practices.

References

Barton, D., & Hamilton, M. 1998. *Local literacies: Reading and writing in one community*. London: Routledge.

Barton, D., & Hamilton, M. 2000. Literacy practices. In Barton, D. Hamilton, M &Ivanic, R(eds.).*Situated literacies: Reading and writing in context*. London: Routledge,*7*- 15.

Gee, J. P. 2004. *Situated language and learning: A critique of traditional schooling*. New York: Routledge.

Gee, J. P. 2008. *Social linguistics and literacies: Ideology in discourses*. New York: Routledge.

deGroot, F.O. 2017. Tracing the potential of out-of-class digitally mediate language learning practice back to the classroom: A nexus of practice perspective. In M. Carrier,R.M. Damerow & K.M. Bailey (eds.).*Digital Language Learning and Teaching*. New York: Routledge, 25-37.

Hafner, C. A., Chik, A., & Jones, R. H. 2013. Engaging with digital literacies in TESOL. *TESOL Quarterly*, 47(4), 812–815.

Jones, R. H., & Hafner, C. A. 2012. *Understanding digital literacies: A practical introduction*. London: Routledge.

Jones, N., & Raymond, G. 2012. "The camera rolls": Using third-party video in field research. *Annuals of the American Academy*, 642, 109-123.

King, B.W. 2015. Wikipedia writing as praxis: Computer mediated socialization of second language writers. *Language Learning & Technology*,19(3),106-123.

Lankshear, C., & Knobel, M. 2011. *New literacies*. London: McGraw-Hill Education.

Leander, K. M., & Aplin, B. 2014. "After apple picking" and fetal pigs: The multiple social spaces and embodied rhythms of digital literacy practices. In Compton-Lilly, C. &Halverson, E (eds.). *Time and Space in Literacy Research*. London: Routledge, 166-182.

McIlvenny, P. 2011. Video interventions in "everyday life": Semiotic and spatial practices of embedded video as a therapeutic tool in reality TV parenting programmes. *Social Semiotics*, 21(2), 259-288.

Norris, S., & Jones, R. H. (2005). *Discourse in action: Introducing mediated discourse analysis*. London: Routledge.

Scollon, R. 1999. Mediated discourse and social interaction. *Research on Language & Social Interaction*, 32(1-2), 149-154.

Scollon, R. 2002. *Mediated discourse: The nexus of practice*. London: Routledge.

Scollon, R.,& Scollon S. W. (2004). *Nexus analysis: Discourse and the emerging internet*. London: Routledge.

Street, B.V. 1984. *Literacy in theory and practice*. New York: Cambridge University Press.