

# ***Trace ethnography: working with data from digital assessment***

**Cormac O’Keeffe**

*Executive Director of Teaching and Learning at YES ‘N’ YOU, 75015, Paris, France*

## **Abstract**

The multitude of practices that make up education are increasingly being shaped by data production. The digital interactions that have been intensifying existing data production technologies have been accompanied by novel ways of creating, sharing and presenting these data to educators and learners and have been influencing how educational attainment is represented, performed and managed. This presentation outlines possible ways of investigating how data about educational interactions and attainment are produced as well as discussing the characteristics of ‘trace data’. It explores methodological approaches that allow the researcher to follow the distributed agency of hypermobile digital actants. Drawing upon software studies influenced by material semiotics code is regarded as an actant, or an entity capable of having agency within the socio-material networks that produce e-assessment data. Methodically, this presentation investigates the digital data produced by human actants as well as coded ones and as such includes the log files, automated messages and algorithms that produce ‘trace data’ that can be used to reconstruct e-assessment events as socially and digitally co-constituted. Combined with ethnographic fieldwork, interviews and documentary evidence, this methodological approach is known as trace ethnography. In this respect, e-assessment is investigated not as a psychological or technical instrument used to ‘gather’ or ‘collect’ data. Rather, it is seen more from an anthropological standpoint as a practice. In particular, digital assessment practices are presented as a site of investigation for digital ethnography. I argue that assessment and its associated technologies are key to understanding how semiotic modes are rendered comparable through table-reliant data production practices that in turn influence educational practices. The presentation concludes with suggestions for how researchers, practitioners and other stakeholders can make decisions informed by an understanding of how data are produced by the various epistemic communities that perform the work of data production.

## **Keywords**

Data, trace ethnography, assessment, digital methods

## **Introduction**

The multitude of practices that make up education are increasingly being shaped by data production. Not only have existing technologies for producing educational data been intensified by information technologies that produce data more quickly and in much greater volumes (Kitchin, 2014), but novel techniques for sharing, visualizing, and presenting these data about educators and learners have been influencing how education is represented, performed and managed (Williamson, 2015).

While the scope and scale of data production may have increased and offered opportunities for new insights, it has also presented new challenges. Analysing digital data can be time-consuming and pose privacy and ethical issues. New techniques, often those requiring an ability to code or at least a certain familiarity with digital environments beyond the User Interface (UI) are becoming increasingly necessary. Furthermore, the use of

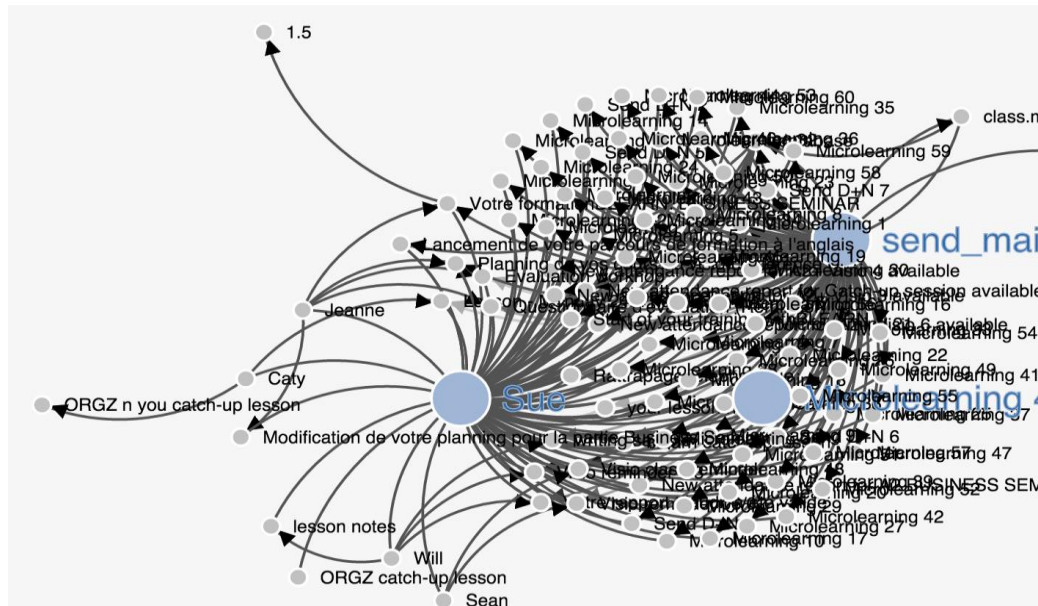
digital data, particularly ‘big data’ can also introduce epistemological and methodological complications (boyd & Crawford, 2012; T. Venturini et al., 2014).

Despite these difficulties, most of which are by no means unique to digital data, the production of data through the mundane and increasingly automated tasks associated with digital learning and assessment, offers new opportunities to better understand networked educational spaces. If educational researchers are to better understand digital interactions and the data that are created then this in turn suggests that the ‘development of analytic skills and competencies that might allow educational researchers to work *with* data as well as working *on* data’ (Selwyn, 2015, p. 77) will be increasingly important.

### Trace ethnography

One relatively new methodological approach that associates the thick descriptions of ethnographic fieldwork with the thin data left behind after learning or assessment events is trace ethnography. This methodology combines ‘the richness of participant-observation with the wealth of data in logs so as to reconstruct patterns and practices of users in distributed sociotechnical systems’ (Geiger & Ribes, 2011, p. 1). These logs or ‘traces’ are the digital artefacts that indicate the existence or passing of something or someone. These can be system log-files (connection times, IP addresses), uploaded documents, blog posts, webservice interactions, videos, audio files, code (front or back-end), chat messages or other information recorded and saved on web servers and databases (Ciekanski, 2010, p. 10). As educational practices become ever more enmeshed with the digital, inscriptions of learning, teaching and assessment events are left behind and constitute a valuable resource when tracing.

More concretely, this involves a number of steps. First, accessing user-produced texts, log files or records of interactions produced during assessment events (scores, timestamps, etc) or making database queries for human or non-human initiated communications (e.g. emails). This is then combined with participant-observer field notes and photography, interviews and focus groups. Third, taking the code that manages many interactions and analyzing the routines algorithms used. These data are analysed and can also be accompanied by visualisations to help make sense of large table-based datasets. (Figure 1).



## Figure 1: Network visualization of an assessment network

### Trace ethnography and Networked Learning

Although Networked Learning has often placed the human at the centre of its project (Hodgson, McConnell, & Dirckinck-Holmfeld, 2012), there has been an increased awareness and interest in the socio-materiality, that is, the role of human and non-human actants in the construction of social worlds of networked learning by the networked learning community (Bayne, 2014; Bell, 2010; Gourlay & Oliver, 2014; O’Keeffe & Parchoma, 2014). Ethnographies that investigate the range interactions that constitute socio-material practices can offer insights that are lost by focusing only on the social or cognitive dimensions of learning and assessment in networked contexts – by investigating the ‘unseen’ or neglected traces. The interest in these traces or the products as well as byproducts of online interactions (which can be in themselves products of offline interactions) is of relevance to researchers not simply because they are there, but because they offer opportunities to look at unassuming background processes, low-prestige routines and other scripts that taken individually may seem trivial and ‘thin’ in description compared to other interactions. Seen together however, they can provide valuable insights into how educational practices are mediated through technology.

This is not to say that an aggregated view of traces and other encoded interactions provides the researcher with a more privileged standpoint. It is rather, the combination of offline and online socio-material assemblages that are intensely relational that only make sense by virtue of their connectedness. As such, when investigating how certain assemblages, such as adaptive learning or standards instantiated through Shareable Content Objects (SCO) become relationally significant, the study of digital traces can show how network relations make ideas mobile (or immobile) and the ‘power of these assemblages is their interconnection and interdependence creating systems whose complexity and power are much greater than the sum of their parts’ (Dodge & Kitchin, 2004, p. 10).

### Tracing digital educational assessment

The practice of educational assessment is a fruitful (if neglected) site of inquiry since it has always been, since the beginning of the twentieth century, a prodigious producer of data. The growing enthusiasm for digital or electronic assessment has done nothing to curb this tendency but on the contrary has given the existing calculative technologies of assessment a new elan. Decision-making with regards to educational spending and management is often informed by data-driven analysis that relies on calculative technologies that are able to translate teaching and learning events into numbers. The technologies of assessment, accounting, and data storage both make extensive use table-reliant technologies that intensify the production of numerical data are able to inscribe and solidify the juxtaposition of multiple semiotic modes (Hamilton, 2012; Latour, 2013).

To better understand how data acts and is acted upon and how trace data is produced, the agentic force of the code used to produce trace data is investigated. Code, or ‘a set of permutable distributions of agency between people, machines and contemporary symbolic environments’ (Mackenzie, 2006, p. 19) exerts significant agency during digital assessment events. In this respect, this paper draws upon the work done by STS-influenced software studies that take a material-semiotic stance towards agency, seeing it as circulating in a fluid and dynamic way through the myriad and shifting relations between human and non-human actants providing non-humans (such technological artefacts) with just as much potential to act as humans (Callon, 2006). Although, the role of code is frequently ignored, much of the work done in digitally networked learning spaces relies on coded interactions.

This is partly because as an incorporeal entity, code resists attention but its invisible work instantiates standards

and is profoundly ontogenetic in creating highly situated versions of e-assessment. Many of the standards deployed through e-assessment software assemblages are hardcoded, that is, data and parameters are fixed in such a way that they are (often deliberately) difficult to alter. Code is thus authored but also authors, shifting agency back and forth between the many actants participating in each e-assessment event.

Digital assessment events produce a wealth of trace data and these data are often linked to tightly scripted interactions such as this function encoded in JavaScript:

```
function sendScore(score, min, max)
{
    doLMSSetValue("cmi.core.score.raw", score.toString());
    doLMSSetValue("cmi.core.score.min", min.toString());
    doLMSSetValue("cmi.core.score.max", max.toString());
    doLMSSetValue("cmi.core.lesson_status", "completed");
}
```

This is much more than a simple code snippet but it is an example of how the researcher can follow actors such as educational technologists, developers, teachers, learners and managers through the various courses of action that lead to pronouncements about what a learner can or cannot do. The number-producing capacities of testing as enunciated by the above code are closely aligned to, as its etymology suggests the digital.

## Discussion

The action of code is thus a critical factor in influencing the kinds of data that produced but also the kinds of data that are imaginable. Code inscribes specific visions, often from cognitive psychology about what it is to know or to be skilled. By reassembling e-assessment events with coded and human actants and bringing the trace data of log-files into the analysis, it is possible to have a more accurate understanding of how e-assessment is performed as a socio-material practice. Furthermore, with this more intimate knowledge of how assessment data are produced, researchers, practitioners and policy-makers are able to look inside the 'black-box' of e-assessment and see how these apparently objective and straightforward e-assessment data are produced inter-subjectively.

Trace ethnography offers a way for quali-quantitative research (T. Venturini, and Bruno Latour, 2010) to follow the deployment of the ordinary actions that take place in digital learning. Rather than choosing between the aggregated vision of big data or the fine detail of individual encounters, digital methods such as trace ethnography allow for a vision of educational practices without the false dichotomy of macro and micro-data and offer a more comprehensive understanding of how educational practices are performed.

## References

Bayne, Siân. (2014). What's the matter with Technology Enhanced Learning? *Learning, Media and Technology*.  
Bell, Frances. (2010). *Network theories for technology-enabled learning and social change: Connectivism and Actor Network theory*. Paper presented at the 7th International Conference on Networked Learning Aalborg, Denmark.

Proceedings of the 10th International Conference on Networked Learning 2016, Edited by: Sime, JA, Cranmer S, de Laat M, Ryberg T & Sime, JA. ISBN 978-1-86220-324-2

- boyd, danah, & Crawford, Kate. (2012). Critical Questions for Big Data. *Information, Communication & Society*, 15(5), 662-679. doi: 10.1080/1369118x.2012.678878
- Callon, Michel. (2006). Sociologie de l'acteur réseau. In M. C. Madeline Akrich, Bruno Latour (Ed.), *Sociologie de la Traduction* (pp. 267-276). Paris, France: Mines Paris Les Presses.
- Ciekanski, Thierry Chanier et Maud. (2010). Utilité du partage des corpus pour l'analyse des interactions en ligne en situation d'apprentissage : un exemple d'approche méthodologique autour d'une base de corpus d'apprentissage. *Alsic*, 13, 1-28.
- Dodge, Martin, & Kitchin, Rob. (2004). Code, space and everyday life. *CASA: Working Paper Series*, (81), 1-36. [http://www.casa.ucl.ac.uk/working\\_papers/paper81.pdf](http://www.casa.ucl.ac.uk/working_papers/paper81.pdf)
- Geiger, Stuart, & Ribes, David. (2011). *Trace ethnography: Following coordination through documentary practices*. Paper presented at the 44th Hawaii International Conference on System Sciences (HICSS), Hawaii.
- Gourlay, Lesley, & Oliver, Martin. (2014). *Why it's not all about the learner: a sociomaterial account of students' digital literacy practices*. Paper presented at the 9th International Conference on Networked Learning, Edinburgh.
- Hamilton, Mary. (2012). *Literacy and the politics of representation*. Oxon: Routledge.
- Hodgson, Vivien, McConnell, David, & Dirckinck-Holmfeld, Lone. (2012). The Theory, Practice and Pedagogy of Networked Learning. In V. Hodgson, D. McConnell & L. Dirckinck-Holmfeld (Eds.), *Exploring the Theory, Pedagogy and Practice 291 of Networked Learning* (pp. 291-305): Springer.
- Kitchin, R. (2014). *The Data Revolution*. London: Sage.
- Latour, Bruno. (2013). *An Inquiry into Modes of Existence. An Anthropology of the Moderns*. London: Harvard University Press.
- Mackenzie, Adrian. (2006). *Cutting Code. Software and Sociality*. New York: Peter Lang.
- O'Keeffe, Cormac, & Parchoma, Gale. (2014, 7-9 April). *Performing blended learning as a product and a service*. Paper presented at the 9th International Conference on Networked Learning, Edinburgh.
- Selwyn, Neil. (2015). Data entry: towards the critical study of digital data and education. *Learning, Media and Technology*, 40(1), 64-82. doi: 10.1080/17439884.2014.921628
- Venturini, T., Baya Laffite, N., Cointet, J. P., Gray, I., Zabban, V., & De Pryck, K. (2014). Three maps and three misunderstandings: A digital mapping of climate diplomacy. *Big Data & Society*, 1(2), 1-19. doi: 10.1177/2053951714543804
- Venturini, Tommaso, and Bruno Latour. (2010). *The social fabric: Digital traces and quali-quantitative methods* Paper presented at the Future En Seine Paris, France.
- Williamson, Ben. (2015). Digital education governance: data visualization and predictive analytics as 'real-time' policy instruments. *Journal of Education Policy, (ahead of print)*, 1-19.

**Author contact details:** [okeeffe.cormac@gmail.com](mailto:okeeffe.cormac@gmail.com)