Dear Learner: Participatory Visualisation of Learning Data for Sensemaking

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ABSTRACT
We discuss the application of a hand-drawn self-visualization approach to learner-data, to draw attention to the space of representational possibilities, the power of representation interactions, and the performativity of information representation.

CCS Concepts
• **Human-centered computing~Visualization** • *Applied computing~Education*

Keywords
Learning Analytics; Visualization; Sensemaking; Participatory

1. INTRODUCTION

1.1 The Quantified Self in Learning Analytics
Quantified self approaches are increasingly present in educational contexts [5], raising the potential to increase reflective learning [11]. As Eynon notes, various learning activities "e.g., time on one task, number of words written per hour, emotional state, could be tracked and connected to specific learning outcomes" [5]. In this way the 'Quantified Self' trend for self-tracking devices to monitor step-counts, heart-rate, calories and other quantifiable activity measures, can be applied to learning. Learning Analytics, then, has developed as a research area in part in response to the greater availability of data to inform learning *and* a desire amongst educators and students that this tracking be applicable in personal – not only institutional – contexts [6].

1.2 Human Data Interaction
As approaches such as learning analytics become increasingly available, the need to explore human interactions with this data/information grows. Thus, fields such as 'Human Data Interaction' (building on work in human computer interaction – HCI) have emerged to explore how to "support end-users in the day-to-day management of their personal digital data..." seeing data as having, "inherently social and relational character" [3]. Conveying learning analytic information across stakeholder audiences with their respective skills and needs (from individual students up to institutional leaders) is a challenge, requiring consideration of collaborative sensemaking [8]. In such approaches, interactions with analytic devices would be seen as a "distinctively socio-technical problematic, driven as much by a range of social concerns with the emerging personal data 'ecosystem' as it is by technological concerns, to develop digital technologies that support future practices of personal data interaction within it" [3].

During their studies in the Master of Data Science and Innovation (MDSI) program at the University of Technology Sydney (UTS), our students explore this self-tracking phenomenon as part of a core subject in which they are asked to track their activity over an extended period. Students explore and analyze their own data, and with randomized data from others, in a small group of 10 and at a class/community level. The Assignment is intended to humanize the exploration of big data by providing a real-life case for exploring relationships in data, policy debates about data privacy and insight into one's own life. Students thus report that the experience is 'confrontational' in drawing their attention to the social characteristics of data analysis. When introducing the assignment we emphasize students can gather data about anything and need not limit themselves to data measureable by an activity tracker. Nonetheless, our experience has shown students do generally stick with these measures because the sensors and tools available make it so easy for them to do so in automated fashion. Despite this, we are keen to encourage the students to be creative in the data they collect and its analysis, and widen their gaze about the possibilities of data practices, to support people in understanding and investigating their data.

1.3 Algorithmic Accountability
In learning analytic contexts, the meaning inscribed in personal data both shapes the ways that learning is understood and enacted as objects of assessment, and is interpreted, reinterpreted, and acted with as a dynamic part of that very context. Broad discussion of this concern has noted that code 'acts' in education [14], such that:

> *as algorithms are increasingly being designed to anticipate users and make predictions about their future behaviours, users are now reshaping their practices to suit the algorithms they depend on. This constructs 'calculated publics,' the algorithmic presentation of a public that shapes its sense of itself.* [14]

Thus, the ways in which analytic devices become active agents in learning – both inscribed with policy and practice commitments, and enacted or enactive informative artefacts – has led to calls for greater 'algorithmic accountability' [4], to ensure that the pedagogic aims of analytic devices are transparent across a range of stakeholders. Analytic devices, as objects that both shape and are shaped by learning contexts require complex analyses to make them *legible* to learners and educators. To do so, analysis should be given of the theory and operationalization behind any given learning-target, as well as the methods for collation and feedback. Moreover, agents should understand data-feedback as both an analytic ends, and a shaping component in the analytic device.

1.4 Playing With Data to Build Data Literacy
We have thus begun piloting a 'personal-data-visualization' approach. Rather than *personalizing* where representations are

designed for individuals – but there is an '*us*' designing *for* you – our approach takes a micro-level perspective on making sense of ones-own data traces and processes of data visualization. As Ben Williamson notes, analytics a representational tools that provide a 'given' reading of the learner's activity, can be seen to present 'visualized facts' in a way that separates learners from their own learning [15]; bringing students into this process marks a shift away from passive consumption.

We have begun thinking about this concern in terms of how we engage learners with increasing their analytics literacy through playful interaction/performance. To orient our students' considerations of 'big data' to the personal, representational, and qualified in a manner similar to that discussed in [2], we invited students to engage in a visual data practice that mirrors the 'analogue drawing project: dear data' (www.dear-data.com), in which two visual designers send hand-drawn personal-data postcards to each other [see, 9]. Each week they both draw by hand a representation of some pre-defined (and shared) data-theme for that week. Their process is to take a topic each week, and then, in parallel, collect data about the topic (but not necessarily the same types of data), only creating the visualization at the end of the week (and again, these differ). So, inevitably, the collection and visualization of the data itself has a performative quality, impacting on the very behavior being 'observed'.

With our students, we are informally prototyping an activity in which they are asked, over a period of weeks, to collate data on a theme, by whatever means they wish, and visually represent this data for sharing. As this work develops, we intend to foreground learning activities that could be targeted by them for data collection and visualization. These early experiments with the activity suggest that by encouraging students to articulate the data collection and representation through hand-crafted artefacts, we can draw attention to:

1. The space of possibilities in representation – highlighting the variety of ways in which the same thematic data might be collated, segmented, and visualized.
2. Representational interactions – by engaging with each other's representations, not only is the range of potential spaces highlighted, but the necessity of human sensemaking, explication or qualification, on a personal level.
3. The performativity of information representation – that representations are created for a purpose, that they are situated in that purposeful context, but that they also act on it to frame discussions and actions (in this case, both through raising awareness of the data one is collating about oneself, and through the sharing of these personal-data artefacts).

2. PRODUCT(ION) AS PROCESS: POSTER AS VISUAL PRACTICE

This poster builds on this data play to invite conference participants to consider how learners and teachers can tap into the creative capacity of visual ideation for individual and collaborative learning about (their) learning data, exploring tactile, visual modes of self-expression, sense-making and communication. Casual, rough planning and design activities intertwining text, image and drawing help explain ideas and make sense out of complexity, social variance and uncertainty [1, 7]. This (proposed) interactive and emergent poster invites conference participants to dabble and doodle and think visually.

Exploratory approaches to visualisations of ideas, text, and data are increasingly recognised for their role in knowledge production and organisation, particularly with large sets of qualitative and quantitative data [12]. Harnessing the power of "mapping dialogues" in environments that bring together people, data and technology, is a necessary literacy for 21st century work [10, 13]. As our students grapple with complexity and seemingly overwhelming sets of data, the enabling of collective sensemaking becomes a necessary feature of their creative intelligence.

3. REFERENCES

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