**A genealogy of Learning Analytics:**

**Caring for Cognitive Computing & Automated Cognition in Post-human approaches to the Sciences of Learning**

What does teachers do? What ‘work’ do they perform? And can it be measured? That is the question that I am asking. With this application to the scholarship offered by the Science Studies Colloquium I want to suggest an answer. I pose these questions not simply because of my concern with schooling, or even politics. Even though these questions also also just as relevant within these academic circles my interest here lies with the education as a branch of (multidisciplinary) science. And by implication ‘education’ as a term with much wider connotations than only that of schooling, and the school system. It is a scientific question - and an intricate one – simply by the fact that it goes unanswered, and the one (unite) that can answer this question wields a lot of influence.

Many intricacies; such as who and what that is to be the research object.

So what I’m thinking is that this is really a question of being able to ‘see’ the subjective position of the teacher among the inter-subjective interactions of the school (and its materialities).

And an answer require two things as far as I can see:

-first, one has to be able to understand how to study the ‘opposite’ of the student-pupil perspective (in Sørensen, 2009). I use the term student-pupil to clarify that I am a researcher watching this inter-subjective scene.

-and, secondly, one has to figure out how to be an outsider within the architecture of the education technologies that inhabit the materiality of the school. Like Sørensen has shown, this is just as hard in relation to the invisible infrastructures of the culturally bound – ‘traditional’ in Sørensen’s words (or sunk, to use a term from the economic sociology of innovation) - as it is with the invisible infrastructures of the virtual (or digital; or algorithmic).

The later represents the mediating influences of the media(technological-plural).

\*could also be understood as the relationship between ideas of ICT and IT, that I learned about at the bar after the EdTech fair: the fact that they historically have had a much more pronounced ICT strategy in Sweden.

\*\*or, the relationship between information and communication – as technology and memory practice (machine and human).

This is the triangular model that describes the relationship between the actors (teacher, student-pupils, and media) in this imagined network. My interest is how imaginations of this network(s) are changing, and especially according to the metaphors used about the digital. This is what could with an advantage be thought of as a post-human approach to what I describe as cognitive-computing - literally a form (i.e. fluid) of computing.

This triangular model describes forms of agency, and is used not least because I found this analytical abstraction (in different forms) in models at the core of both the literature on Learning Analytics (LA) and Actor-Network Theory (ANT). No doubt, it is one of the most general models there are (reducible to the idea that if one and two equals three, then one and three also equals two in some sense). Yet, I believe that this should not be understood as a random coincidence.

\*My ambition is therefore also to be able to theorize the role of ANT within applied education research, and its relationship with LA.

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To be able to see how the ‘local’ is produced is a related question that I think I described in the following text.

My thesis is about the genealogy of the emerging field of Learning Analytics (LA) in the education system, and the changing measures that are being taken to account for child care.

At the end of last year I did a participatory observation at a secondary school in the throws of implementing a cloud based computer system and was at that point trying to investigate the influence of financial technologies (Fintech) on the education sector. My focus was the position of the teacher in relation to the accounting devices that are co-produced in the new technology. From this starting point I however also ventured out from the original location and began to follow the position of the teacher within its abstractions; its ontology within the large information infrastructures of the wider education system.

I now ask how these information infrastructures are converging throughout the sector, and how education - its research and politics (technopedagogy) – and the public ‘knowledge machinery’ at large, do boundary work at the onset of the Internet of Things (IoT) and Industrial Internet(s). The Science Studies Colloquium have raised a series of questions related to our understanding of the epistemic effects of the digital. I therefore hope that my application will come at a time in which an heightened awareness around the burgeoning influence of field of LA will let you see the importance of studying the politics and ethics of the reforms that are now under way throughout the educational sector and beyond.

Description of a topic

My thesis is about the evolution of the Education Technology (EdTech) landscape. I follow LA as one important configuration of forces within this landscape. LA is becoming increasingly important in shaping the experimental cultures that make up education research (both higher and elementary), both by virtue of its its influence on the meaning of ‘evidence-based’ professional practice and goal oriented management. The field of LA has long roots in the world of business intelligence, and a pressing question is therefore how we can study the influence of such ontologies on the boundary institutions that mediate the relations between politics and science.

In this respect LA represents a narrow but important element within the surveillance systems of the public domain, and the role of the university. An investigation into the genealogy of LA as a accounting practice offers a counter weight to the idea of the algorithm’s inherent ‘recursive logic’ and bureaucratic nature. It makes for a singular imaginary within a highly heterogeneous phenomenon. Taking a socio-ontological approach to LA therefore highlights exactly the way it deals with heterogeneous associations. It allows for an investigation into the productive power of the science and its infrastructures. And, as such, it allows us to ask broader questions about the role, purpose and cites of participation in research in a new information infrastructure.

How is surveillance performed in the tension between openness and security, and how does it shape science? How does openness in education, science and data perform as issues of security in politics? And, how does digital surveillance practice becomes an issue for educators, education politics and education science (technopedagogy)? These are all important questions to understand how new experimental cultures re-assemble the human outside of the classroom and traditional experimental setting.

By studying cognitive computing as the surveillance of interactions between humans and machines I study the performance of a post-human approach to the human sciences. This influence of computer science in the science of education does not come without consequences, and it should not only be important to education researchers. For one thing it should be of interest to everyone with an interest in computer science. But moreover, the question of how we can study the influence post-human perspectives have on society should be of interest to anyone with an interest in science studies.

So how these controversies over infrastructure and information security interact with the strategic routines of the school, and not least its relationship with educational research?

Surveillance studies and pragmatic approaches to Science and Technology Studies (STS) have been influential within the study of algorithms. Yet, by investigating the epistemic consequences of the IoT and Industrial Internet in the education system I try to go beyond an social scientific approach to ‘digitalization’. Rather, I investigate broader questions about epistemic consequences of a changing objective-frame, also known as networked realism.

*Ethnomethodology*

My research has taien me across sights, issues and expert cultures that I could not quite have predicted, but that I have found a whole lot from and that I have taken the time to pursue to understand how they relate to my original goals.

Throughout the last year I have been conducting ethnographic research on the role of EdTech in the school system. The first part of the study happened in two intervals of two weeks each, in which I participated as a substitute teacher, and as an observer in the classroom, in meetings and seminars, as well as in daily life in the teachers’ office. Both then, and later on, I have also talked to other staff, like IT-, teaching-, and administrative-supervisors, about changing tasks, systems and strategies. Over the course of my research I have also been in a meeting with the managers of the municipality’s IT services.

By studying how Microsoft 365 developed as a framework for a ecosystem metaphor that co-evolved between these cites and communities of practice I developed an understanding of the personal computer as the object of my investigation. In the second part of the study, I began investigating cites outside of the spaces of the school. I had already partaken in several conferences (small and big) in which I learned about the education technology market. Both within the school and within these forums for the technology providers the idea of ‘deep learning’ gained a lot of attention. The term also caught my attention because it was identical to the name of Google’s new ground breaking Artificial Intelligence technology.

By working on the problem of how to analyze ‘deep learning’ as a knowledge/boundary object within the school system I came to shift my gaze towards the sociology of high-tech in education and the politics behind of LA. By pursuing these questions further I got a permission to be an observer at the meetings of the ‘Learning Comity’ (Læringkomiteen). The comity is an open forum for interested organizations, hosted by Standards Norway, but in practice run by the Center for ICT in Education. It is a hybrid forum, giving unofficial recommendations on the application of international (transnational) standards in the Norwegian education system. The body consists of representatives from the Norwegian Directory for Education (UDIR), Institutions in the higher education sector, publishers, research bodies and the education technology sector.

My observations has yielded great insights into the ontologies of both computer scientists and pedagogues.

that make the ‘business intelligence’ roots of LA into an object of mediation (re-purposing) within the boundaries work of different actors.

How are opinions about teaching mediated through routines of information gathering (i.e. meetings) and accounting practice? These are practices of scaling in which issues are formed, but they are also mediated by technologies of scale, or (very) large information infrastructures.

I have wanted to study the ontology of the one-laptop-per-child policy in action. By studying the laptop as what Latour has described as ‘object institution’, the investigation moves beyond the the idea of ‘society through the algorithm’ and looks at the construction of openness as a technoscientific achievement. I look at how openness is valued as new technologies, oriented towards analytical devices, translate into the educational setting.

This autumn I therefore began investigating cites outside of the school system per se. I had already partaken in several conferences in which I learned about the education technology market, yet I now got a permission to be an observer at the meetings of the ‘learning comity’, an open forum for interested organizations, hosted by Standards Norway, but in practice run by the Center for ICT in Education. The body is responsible for discussing applications of international (or transnational) standards in the Norwegian education system, and the body consists of representatives from the Norwegian Directory for Education (UDIR), Institutions in higher education, publishers, and the education technology sector.

Through this process I began to follow Uninett’s Feide technology. I ask how it acts as a mediator within the education technology landscape, and a framework of ‘interfaces’ between different contexts of regulation. I ask how technical convergence is enacted as social convergence?

At the end of November I am going to the Uninett 2017 conference. At the end of the year Uninett splits up into two organizations; a infrastructure specific and application specific . There I want to extend my investigation of information infrastructure and the security politics that it performs.

*Theoretical work in Science and Technology Studies (STS)*

In the last few years there have been several research papers outlining a framework for the critical study of digital data and education (Selwyn, 2014) and the idea of open education (Bayne, 2015; Edwards, 2015). Such approaches to education are also intrinsically linked to the study of governance, and similar calls to a critical framework has emerged in relation to the study digital educational governance (Williamson, 2016). Nonetheless, few, if any, employs minimalist methodologies, and especially multicited ethnomethodology as such. This is why I argue for the novelty of an STS approach to Learning Analytics and its genealogy in the situated ontology of the professional teacher and the monetized spaces of the (virtual) classroom.

Adopting a focus upon the construction of openness in education I concentrate on a specific case of a school opening the school computer to the mobile (education) reach of a cloud computing platform. The co-construction of the cloud as a virtual space within the local context of work and use has a politics of design, which variably is performed as open or closed. This way scale becomes enacted at the level of the region, nation and transnational communities. This approach therefore engages with an investigation of a contemporary genealogy of the performance of science in the setting computerized learning.

Over a year ago I begun asking how educators are accounting for learning in a time of rapidly changing information technologies. Moreover, I asked how these accounting devices changes the materiality of learning (Sørensen, 2009) itself, and the position of the teacher in the flow of teachers and things with it. However, instead of focusing exclusively on the teacher community I build on Kelty’s (2008) investigation to the spread and influence of ‘recursive publics’, concerned with the life of the computer. Kelty states that very few approaches to network analysis take the materiality of networks of wires and machines seriously. My contribution to Science Studies is therefore the effort to investigate the question of how to critically engage with historiological accounts of the computer. How does digital educational governance translate into the governance of computer networks, in which contexts does it intervene into the role of the teacher, and how does it again translate into learning science?

Not long ago Monika Nerland presented a talk at the Science Studies Colloquium that shed light on a possible epistemic shift in the expert knowledge cultures of teachers. I look at the genealogy of such epistemic shifts within the school system, and its broader relations to the information infrastructures of the higher education landscape.

Socio-material approaches to the investigation of the tools that design and produce measures of progress within the context of schooling itself are still rare. I use a pragmatist-feminist approach to STS to investigate the context in which this epistemic shift within the teacher profession is co-produced as evidence-based work and goal-oriented management. What are the actor-networks and the spatial configurations within this convergence? And, how does an understanding of the computer as translated into education change our understanding the mediation of the user-multiple? These questions are important to address if one is to engage with LA as a field that is itself worked upon by boundary institutions in the education system – locally, nationally and internationally.

I argue that it is impossible to distinguish the historical origins of computerization as manual labor (i.e. mathematicians) from todays ‘information machines’. Studying history in the present therefore means studying the way that computerization effects epistemic relations across sectors. I follow Ruppert et al. (2013) in their critical approach to ‘2.0.’ ideas about computing (i.e. web2.0.), science and the radical transformation of the digital in general. Rather, I approach the translation of computerization mechanisms as ‘digital governance’ and biopolitics. I am interested in the market- and political-technologies inherent in computerized systems, and therefore try to adopts a pragmatist perspective on the institutional dynamics involved in the configuration of systems that happens in a process of integration ‘in the cloud’.

*Timeline*