When the algorithm knows you:
How digital assessment practices reconfigure the organisation of learning

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Datafication of (social) life

• Increasing trend to capture social life in numbers
  • ‘Audit society’ (Power 1999)
  • Relevance of algorithm (Gillespie 2014, Introna 2015)
• Data for sense-making, accounting, and evidence-based decision making affect e.g. in **education**:
  • the organisation of teaching and learning,
  • school choice,
  • recruitment,
  • educational governance
  • policy discourses
Datafying education

• Schools as ‘data platforms’ (Williamson 2015)
  • Assessment and ranking activities have become key aspects of national and international educational policy-making (Selwyn 2015)

•Rankings
  • ‘do more than simply describe a setting but [...] also intervene within a situation’ (Pollock 2012, p. 94).
  • ‘are reactive because they change how people make sense of situations’ (Espeland & Sauder 2007, p.10).
Data practices

• Data do not just exist but rather data are ‘generated’
• ‘Data need to be imagined as data to exist and function as such, and the imagination of data entails an interpretive base” (Gitelman and Jackson 2013, p.3).
  • Process perspective: Data help to frame a phenomenon by demarcating boundaries in space and time.
  • Interpretations of data as representation of e.g. learning outcomes elicit particular social imaginaries of learning and teaching, and are as such deeply normative and political.
Data & algorithms

• 'We’re living in a world now where algorithms adjudicate more and more consequential decisions in our lives... Algorithms, driven by vast troves of data, are the new power brokers in society‘ (Diakopoulos 2013, p.2).

• Digital technologies as ‘algorithm machines‘ (Gillespie 2014)
Algorithms

... set of instructions to solve a well-defined problem

- Algorithm express the computational solution: **logical conditions** (knowledge about the problem) and **structures of control** (strategies for solving the problem)
- algorithm = logic + control

- What does the algorithm do?
  - sorts/ranks?
  - compares (8) in order to swap (10-13) in order to sort (1-21) in order to allocate?


```c
void bubblesort3( int *a , int n)
{
 int temp,swaps;
 for( int i = 0 ; i < n - 2 ; i++)
 {
 swaps=0;
 for( int j = 0 ; j < n - i - 1 ; j++)
 {
 if ( a[j] < a[j + 1] )
 {
 temp = a[j];
 a[j] = a[j + 1];
 a[j + 1] = temp;
 swaps++;
 }
 }
 if( swaps == 0 )
 {
 break;
 }
 }
}
```

Algorithms as relational, contigent, contextual

• 'Public relevance of algorithms’ (Gillespie 2014)
  • ‘In reality then, a great deal of expertise, judgement, choice and constraints are exercised in producing algorithms’ (Kitchin 2016, p.5)

• Algorithms as 'temporal flow of sociomaterial practices’ (Introna 2015)
  • ... have to be initiated by prior action (human or non-human) -> heterogeneous assemblages
  • ... cannot be divorced from the conditions under which they are developed and deployed (Geiger 2014)

• What kind of knowledge do algorithms produce?
Case #1: Student assessment and digital data practices

- 2001, NYC department of education contracted Grow to 1,200 schools
- Data-driven decision support system to teachers, district and school management
- Improve standards-based learning in the classroom

Source: Author paper copy of Grow reports
Case #1: Student assessment and digital data practices

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Case #1: Student assessment and digital data practices

How did my students do?

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<th>Far Below Standards Level 1: 475-617</th>
<th>Scale</th>
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Case #2: Teacher value-added

- Strongly linked to the Education Act ‘No child left behind’
- State had to demonstrate yearly progress in improving students’ test scores

Los Angeles Teacher Ratings

About 11,500 Los Angeles Unified elementary school teachers and 470 elementary schools are included in The Times' updated database of "value-added" ratings.

Most third-, fourth- and fifth-grade instructors who taught at any point during the 2004-05 through 2009-10 academic years were given ratings in the Times analysis. Most district elementary schools are included. Test scores for most charter schools were not available.

A teacher's value-added rating is based on his or her students' progress on the California Standards Tests for English and math. The difference between a student's expected growth and actual performance is the "value" a teacher added or subtracted during the year. A school's value-added rating is based on the performance of all students tested there. Small differences in ratings are not statistically significant, particularly for those rated near the average.

Although value-added measures do not capture everything about a teacher or school's performance, The Times decided to make the ratings available because they bear on the work of public employees who provide an important service, and in the belief that parents and the public have a right to the information.

Find a teacher...

Or, find a school

Source: www.projects.latimes.com/value-added
Case #2: Teacher value-added

Source New York Times, 7th March 2011
Case #2: Teacher value-added

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Find a teacher...

Search

Or, find a school

Search

Amy P. Miller
A 5th grade teacher at Park Western Place Elementary in 2010

These graphs show a teacher’s "value-added" rating based on his or her students' progress on the California Standards Tests in math and English. The Times' analysis used all valid student scores available for this teacher from the 2003-04 through 2009-10 academic years. The value-added scores reflect a teacher's effectiveness at raising standardized test scores and, as such, capture only one aspect of a teacher's work.

Source: www.projects.latimes.com/value-added
Case #3 IBM Watson not only description but prescription

In five years, the classroom will learn you.

Today, nearly 2 in 3 adults worldwide haven't achieved the equivalent of a high school education.

"In five years, the classroom will learn about each individual student and provide a tailored curriculum from kindergarten through high school and toward employment."

Dr. Katharine Frase, CTO Education, IBM

The classroom of the future will learn about individual students over the course of their education and help them master the skills critical to meeting their goals.

This system will level the playing field by ensuring that barriers to education become less of a factor for success.

A system fueled by sophisticated analytics over the cloud will help teachers identify students who are most at risk, predict their roadblocks, and then suggest measures to help them overcome their challenges.

https://www.youtube.com/watch?v=hwJc_B9_6sl
Materiality

• Barad’s (2007) apparatus offers a useful concept for understanding the sociomaterial dynamics of digital assessment practices in education:
  • material-discursive, boundary-drawing practices; specific material reconfigurings through which “objects” and “subjects” are produced’ (p.148).

• Data practices and associated information infrastructures produce different learning and teaching subjects
Analysis case #1

- Results are not mere representation but invite teachers to reflect about their work; they become an engagement tool that is only meaningful when embedded in a teachers’ web of work practices such as observations and conversations.
- Apparatus works as a specific configuration of data, online system, teachers, parents and the school district to produce particular learning subjects.
- Data practices of teachers (e.g. interpretation of test results) are complex and boundary spanning as they are also employing other types of information.
- Data are only meaningful in relation to practices outside the digital assessment apparatus.
Analysis case #2

• Data are not mere representation of students’ performance but also of the teachers’ work; this leads to new teaching practices (e.g. teaching to the test)
• Emergence of ‘bubble kids’
• Material-discursive data practices hence perform different ‘cuts’ and subsequently produce different teaching and learning subjects, but also different ways about what is knowable and observable about teaching and learning outcomes
Analysis case #3

• Teaching subject is configured as an association of the embodied and physically present teacher entangled in a web of smart devices and algorithms to facilitate the ‘ideal learning outcome’.

• Learning subject is constituted through algorithms: the individual student is rendered as a learner that is observed and observable throughout their education, and each account builds on the previous.
Discussion

• Students become part of ever improving algorithm; the learning child comes to know about itself by relying on the ‘knowledgeable’ algorithm

• Algorithms or ‘calculative practices are enacted as technologies of governance’ (Introna 2015) as they govern a child’s learning, classroom organisation, teacher and school performance

• Learner becomes governed by data and software (Williamson 2015), children grow up constituted as learners through ‘algorithmic power’, accountability is shifted to the system as it knows best and predicts any future development
Conclusion

• The very systems meant to improve schooling have become effective control instruments (‘infrastructures of accountability’)

• These ‘technologies of governance’ transform the classroom from a physically bounded place into a transparent and visible space.
  - Classroom activities seem to be ‘represented’ in the digital realm but in fact they become reconfigured: e.g. the learning subject is rendered predictable and passive

• Important ethical and political consequences as such evaluation technologies are not value neutral