Book Review [1]

Big Data in Education: The Digital Future of Learning, Policy and Practice
by Ben Williamson.
Sage Publications, 2017, 236 pp. $35.15 (paper).
ISBN 978-1-47394-799-3

Zi Hu
Teachers College, Columbia University

The Future of Education: A Sociotechnical Imaginary

Tablets in their hands, students in the class are working on projects specifically designed for each of them: John is drawing a rectangle and a cylinder on the screen, deciding which one will hold more water and is thus better as a gift of a vase for his friend; Jane has her earphones plugged in, listening to speeches from Lincoln to Reagan and Obama − Jane's goal for the new semester is to enhance her public speaking skills. In front of the classroom stands the teacher, Ms. Lee, holding a slightly different tablet: the algorithms embedded in her tablet allow her to see not only the real-time progress made by all students but also the students' levels of concentration and other emotional responses, captured through the tiny bio-sensor stickers worn on their wrists. Noticing Jeff has a much higher level of boredom, Ms. Lee walks over and asks if he wants to switch from geometry to poetry, an area in which Jeff has previously shown more excitement. Before lunch, Ms. Lee goes in to the faculty room and logs onto an ATM-shaped computer designed to track and design meaningful cognitive development trajectories for students − an artificial tutor termed *Joe* by faculty members. Joe reads that two students are missing their targets today. What to do with these two students? Ms. Lee clicks on the *Recommendations* icon and it reads *add more visually stimulating materials for Sarah and Adam this afternoon in their coding classes*. Ms. Lee nods and decides that she is going to pick from the 15 widely used visual stimulants from Singaporean classrooms.

This above scenario looks like a sci-fi movie clip set in the far future. Nevertheless, Ben Williamson's recently published text *Big Data in Education: The Digital Future of Learning, Policy and Practice* notes that with the growing datafication and digitalization of education, and the momentum given to such visions of the future of education by powerful private and public sector actors, these sci-fi-like scenarios may not be far from our present time or reality. In fact, some of these visions are already in existence.

Williamson's (2017) text offers a rich account of the most recent technological developments, particularly big data, algorithms and coding, learning analytics, artificial intelligence (AI), neuroeducation, and digital citizenship, as these relate to education. As

Williamson (2017) clearly shows, these technological trends are evoking new and oftentimes radically different understandings of education. In other words, they are set to "disrupt" or "revolutionize" education (Williamson, 2017, p. 2). As an example, in Chapter 6, Williamson (2017) looks at the growing interaction between psychology, education, big data analysis, and the resultant emergence of affective computation, which uses computer science methods to track psychological and behavioral changes in students, offering pre-emptive strategies to 'nudge' behavior. Devices, such as those to measure students' moods, already exist, e.g., EngageSense, a computer-mounted webcam connected to facial and vision algorithms, designed to measure students' engagement levels through facial expressions and eye movement. In the case of EngageSense, measurements are sent automatically to teachers in real time so that they can adjust their teaching to improve students' engagement and minimize negative emotions (Williamson, 2017, p. 134).

These new visions of education, according to Williamson, are guided by powerful sociotechnical imaginaries. Drawing from Jasanoff (2015) and many others (e.g., Huxley, 2007; Mager, 2015), Williamson (2017) defines sociotechnical imaginaries as future visions of society as reflected in technical projects. Often seen as a model for a preferred way of life and formation of society, these imaginaries exert significant power over the setting of aspirations and norms, in effect shaping behavior. As such, these imaginaries have important implications in multiple dimensions of education. Notably, as data is collected in larger volumes and increasingly analyzed and used in education, it [data] becomes one of the most significant education policy instruments. As a corollary, education policy-making has started to manifest features primarily attached to big data, e.g., a preference for quick fixes; shorter policy cycles or fast policies; and increasing porosity between different locales in policy-formulation and implementation.

As education policy-making becomes more data-driven and evidence-based, we are also witnessing a governance turn wherein the authority over policy-making is increasingly dispersed or redistributed from governments to actors with access or ownership of educational data, be it international organizations or private companies. One prime example is the growing influence of the OECD in the field of education with its rapidly expanding *Programme for International Student Assessment* (PISA), the results of which are now used as performance indicators of countries' educational systems as well as predictors of national economic competitiveness. Data-based evidence has also become increasingly used as an accountability measure. In particular, Williamson (2017) invokes the notion of 'intimate accountability 'to reflect the shift in educational accountability schemes from bureaucratic practices enacted in distant governmental offices to more 'intimate' calculative practices closer to the action to be measured, e.g. schools now need to provide highly intimate details about students, teachers and school-level factors and these details are also being discussed in intimate spaces, like the home.

Whose imaginary and what consequences?

The belief that big data can help transform and improve education is based upon the premise that data is neutral and scientific and thus reliable and trustworthy evidence [2]. Williamson (2017) refutes this premise and, at the risk of repeating himself, in almost all chapters reiterates that big data is both socially produced and productive. He contends that the collection, analysis and use of big data is by no means neutral or objective but affected by a wide array of factors marked by clear ideologies and values, begging the question: whose educational imaginary is being enacted? Relatedly, Williamson (2017) pushes us to look beyond data and to examine the information infrastructure that underpins the production, circulation and use of educational data, but which remains *hidden* or *invisible* most of the time. Indeed, the infrastructure itself can be saturated with built-in biases. As an example, one might consider how an Anglo-American oriented education measurement metric may privilege individualism over collaboration or collectivism, a trait more valued by Asian education systems such as in Japan and China. It is conceivable that the latter trait [collectivism], among others, could be devalued or overlooked in the metric. Yet, when such measurement is finalized and presented, the many decisions and preferences that guided the formation of the measurement become self-evident and taken-for-granted.

This example helps shed light on what Williamson (2017) means by the *social* production of data. By arguing that data is socially productive, Williamson (2017) highlights the function of data as being normative and performative. Namely, data does not just describe the current state of affairs, it actively constructs the social world by privileging certain interpretative frameworks, setting norms and articulating new concerns and directions for future, via the built-in classifications, preferences and decisions embedded in the data infrastructure (see also Gorur, 2017). It is because of this productive power that Williamson calls us to take more seriously the moral dimension of educational big data. This is imperative as data and technology can exacerbate existing inequalities or create new sets of educational problems.

For instance, Williamson (2017) notes how ClassDojo, a software designed to help teachers collect, store and visualize data about students' behavior in classrooms, can contribute to normalizing the constant surveillance of students in schools while encouraging teachers to reward only observable behavior, particularly behaviors that are aligned with the psychological norms inscribed into the algorithm. Or, as another example, if indeed big-data-supported personalized learning can improve student learning, student groups who have no access to such data or technology may be further marginalized. These troubling issues echo the call by other scholars to engage more critically and productively with increasing standardization and usage of data in education (e.g., Gorur, 2012; Sellar, 2015). As Williamson (2017) states, we need to be cautious, if not downright skeptical, and a little

resistant to the so-called transformative potential of these new technological developments (p. 8).

Given the multidisciplinary nature of educational big data, Williamson's (2017) ability to critically examine these new technological developments in education from an interdisciplinary perspective is yet another strength of the book. Drawing on science and technology studies (STS), for instance, Williamson (2017) shows how imaginaries of education embody a mixture of interests from different groups, e.g., private companies driven by profits through the selling of their educational products, and governments motivated to use big data to enhance governance through tracking and nudging citizen's behavior. Studies of these different actors, and their agendas, encourage us to move from surface analysis of data usage in education, to exploration of earlier data-making stages, which can allow us to peek inside the black box of the rapidly expanding global education industry, and its increasing collection and use of educational data (Komljenovic and Robertson, 2017).

To conclude, there is no denying that new technological developments have significantly reconfigured the social world, education included, and the trend is unstoppable. The study of educational big data has indeed become a worthy subject in its own right (see Busch, 2011; Easterling, 2014) and as Williamson (2017) rightly points out, the field of education needs to closely engage itself in these topics, and new agenda for educational research should be initiated. Further, it is crucial to continue to engage with diverse disciplinary views to better understand the role of technology and big data in education (e.g., Gorur, 2017). Some practical questions related to this new educational research agenda include: How to bring together scholars and researchers from various fields to undertake more collaborative interdisciplinary studies of educational big data? And, given the dispersal of authority over education policy-making from the government to other powerful actors like private companies and international organizations, how to coordinate and regulate actions of these non-state actors? Lastly, as we take more seriously the moral dimension of education big data and technology, what kind of ethical guidelines should be put in place to ensure that educational technological developments are facilitating quality and equitable education for all?

Zi (Grace) Hu *is a Ph.D. student in the International and Comparative Education Department at Teachers College, Columbia University. Her research interests include sociology of education, global education policies, educational big data and comparative education. Her current research involves international large-scale assessments and education policy transfer between China and England.*

Notes

[1] I would like to thank Camilla Addey, Oren Pizmony-Levy and Regina Cortina for their valuable comments on an earlier version of this article. Special thanks also to my ICE doctoral cohort who were there for my presentation of my understanding of this book. I also appreciate the careful comments by the reviewer of the *Current Issues in Comparative Education*.

[2] See Porter (1995) for a brilliant critical analysis of the power and prestige of quantification methods, i.e., numbers, in the modern world. The pursuit of objectivity in science and public life lends to the trust in numbers and vice versa. Yet the notion of objectivity itself is, according to Porter, weakly defined; it is anything but impersonal and is instead saturated with deliberate human and political decisions.

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