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Big Data

As was the conclusion in Chapter 3, digitalisation, even as third wave activity, does not necessary mean that teaching is really *Bildung* orientated. In this chapter, we discuss the mediatisation of education in relation to *Big Data* as an exemplary *Bildung* issue. We address the question of how schools and teachers can and should deal with digitalisation – here exemplified by *Big Data* – seen from a *Bildung* perspective (see Chapter 1). Yet, we do not put forward definitive answers but only discuss how one could and should understand and respond educationally to *Big Data*. Before we can begin to elaborate on different educational responses, we must clarify our understanding of *Big Data*. This means asking: What is *Big Data*? How can one understand this new phenomenon? We suggest that *Big Data* should be understood as a new type of machine (and medium), referred to as a ‘*Big Data Machine*’, that has technical, social and cultural components and that other machines (big organisations) like states and companies can develop and use to optimise and automate their activities. Based on Levi Bryant’s onto-cartography (Bryant 2014, see Chapter 1) and the literature on *Big Data* (Boyd and Crawford 2012, Chen et al., 2016, Han 2016, Sivarajah et al., 2017, Williamson 2017, Hansen 2018), we try to identify how *Big Data* machines operate and transform input into output. In doing so, we show that *Big Data* machines can function with different inputs and generate different kinds of output. We are particularly interested in the citizen aspect both on the input side (e.g., tracking, collecting, calculating data) and in the output side in regard to nudging and manipulating citizen behaviour. When we highlight this human aspect of the machine, we call it the ‘*Citizen Big Data Machine*’ and it is primarily this type of machine that forms our focus.

After defining our concept of *Big Data*, we discuss how different political systems on a world societal level might respond to *Citizen Big Data Machines*. We will focus on educational policies and ask the question: Does it matter educationally how political systems respond to *Citizen Big Data Machines*? When discussing responses, we will ask: Do states like China, the US and the EU

try to make use of the new machines and/or impose restrictions on them and/or try to educate (new) citizens to relate to them in certain ways? More precisely, China is used to exemplify Big Data for state control and surveillance; the US is used to exemplify Big Data for marked business; and the EU is used to exemplify Big Data for democracy. Yet, the point is *not* to give a full description of how Big Data is treated in each of these three contexts. What is at stake is more basically to point out three different ways of dealing with Big Data. This also implies that when we, for instance, analyse 'state control and surveillance', we primarily refer to examples from China, ignoring, for instance, the National Security Agency (NSA, US) or the many surveillance cameras throughout the UK.

Thus, what we suggest is that at least three different responses to Citizen Big Data Machines can be identified. The first response is to begin to develop and use Citizen Big Data Machines to optimise the state's activities directed towards its citizens (and perhaps also foreign citizens), including state educational activities. This is perhaps the response mostly adopted by China (though also, in part, by other states). The second response is to allow big companies to buy, develop and make use of Citizen Big Data Machines to optimise their market positions and/or sell Citizen Big Data Machines, or products generated by such machines, to their customers, including 'the educational sector'. This is perhaps the response mostly adopted by the US (though also, in part, by many other states). Both the 'state' and 'the market' response strategy fits with the educational outlook we, in previous chapters, have called the 'engineer' and the *technical and causal understanding* of teaching and media, constraining education as a pure techno-bureaucratic space. This means that, equipped with new Big Data technology, the technical mainstream view of education seems to be reinforced globally. Yet, there might also be a third response and thus an alternative to mainstream education which is to protect civil society from states and companies that use Citizen Big Data Machines to monitor, control, manipulate and affect citizens. This protection can be established through laws but also via educational policies that aim to teach people to be critical and on guard. This is perhaps the response adopted, at least in part, by the EU (representing a minority in the world society). This response fits with the educational outlook we in previous chapters have called (a) the *voluntaristic* and *facilitating* understanding of teaching and media, constraining education as a totally free and safe space for pure individual self-development, but also with (b) the *critical* and *explorative* – understanding of teaching and media. Yet, the latter view would also suggest that students are not only protected against the new Big Data machines but also develop both a critical understanding of them and power to use them, if possible,

to take over the machines and modify them for good reason. Further, the even more creative and experimental understanding of Bildung (see again Chapter 1) would suggest, that teachers and students, if possible, should make creative experiments in teaching with Big Data machines. We return to these suggestions in the end of the chapter.¹

What is Big Data?

According to John Caputo (2018), Big Data is the ‘Great Other’ of our age and is typically viewed as the mythical non-human algorithm able to understand us better than we can understand ourselves and, as such, decide everything for us. Thus, today, there are business owners, politicians, educators, researchers and others who dream and work on developing Big Data that can replace human thinking. As Chris Anderson (2008:1) describes:

This is a world where massive amounts of data and applied mathematics replace every other tool that might be brought to bear. Out with every theory of human behaviour, from linguistics to sociology. Forget taxonomy, ontology, and psychology. Who knows why people do what they do? The point is they do it, and we can track and measure it with unprecedented fidelity. With enough data, the numbers speak for themselves.

As we later elaborate, however, numbers do not speak for themselves. The myth of the big algorithm contains problematic assumptions and consequences. First, however, we must clarify what Big Data is. The phrase ‘Big Data’ originated in the 1990s and referred to large amounts of data stored, processed and analysed by supercomputers. However, the datasets that were considered enormous in the 1990s can today be processed on ordinary computers using ordinary software. Furthermore, today, the term ‘Big Data’ also applies to data sets that are not necessarily large but complex. Thus, as a *technical phenomenon*, Big Data is about developing computing power and algorithmic precision to gather, analyse and compare complex data sets. *Socially*, however, Big Data is about developing and using data analysis for social purposes (e.g., to target companies’ advertisements, to optimise politicians’ election campaigns, to control learning in school and much more). *Culturally*, Big Data emerges as a mythology in which the new data sets are ascribed validity and objectivity (Boyd and Crawford 2012).

¹ This chapter is based on Paulsen and Tække (2020).

On the technical level, Big Data presents engineering challenges, such as designing computer systems that can store, assemble, analyse and visualise complex data sets (see, e.g., Sivarajah et al., 2017 about the main challenges of Big Data). At the social level, however, the challenge is how to collect, analyse and use Big Data to monitor, predict and make social decisions in areas such as law, health, economics and journalism. For instance, in a split second, the AI Watson can review millions of patient records, research articles and clinical studies (Chen et al., 2016), yet Big Data is also used to decide who should receive certain news, how long prisoners should spend in jail and what constitutes appropriate assignments and student behaviour in school. Such challenges regarding the application of Big Data are of a social nature and are connected to our view of what society should be. They also relate to the cultural level, which concerns how Big Data is understood and evaluated (i.e., what understandings and norms evolve around its use?). For example, does it become a norm that it is legitimate for states and companies to monitor, record, analyse and try to influence human activities down to the smallest detail (e.g., our heart rates, moods, political views, shopping habits, sexual inclinations and knowledge)?

Big Data Machines

To get a clearer understanding of how Big Data works, we will now try to build a theoretical model by drawing on the *onto-cartography*, developed by Levi Bryant (2014). The aim of *onto-cartography* is to understand machines and media and thus make it possible to map relations between machines and media *and* address political, social and ethical issues. We will attempt to understand Big Data as a new machine/media type and analyse how it works, what it can do, where it can be applied and with what political and educational consequences and dilemmas.

First, Big Data can be understood as a machine that operates using only one thing: Big Data. Ever since Aristotle, we have struggled to understand the causes of everything. But that is changing. In the Big Data age, we can process unimaginable amounts of data that give us insight into how things are *connected* – but not why they are related as they are. An increasing number of decisions are based on knowledge of statistical correlation – the way things are statistically related – rather than on knowledge of causality (Han 2016). The machine – able to use Big Data – is built to collect, analyse and structure complex data sets and, through its operations, transform data into new informative data products – revealing something valuable about the data set collected; for instance, identifying patterns in the data set, predicting future states or actions in the world from

which the data set is derived, or suggesting different kinds of actions (given certain rules).

Yet it is important to note that all machines, as Bryant argues, are pluripotent, meaning that they can be used not only for one thing but for many things. Where a vacuum cleaner has a rigid coupling to its function (it can be used to vacuum), a computer has a loose coupling to its function and can be used for almost any purpose, which is also true for Big Data Machines. They can be structurally coupled to different machines and purposes, fulfilling different tasks.

Furthermore, the Big Data Machines can be good or bad at these things and their operational structures can be rigid or more or less flexible depending on their programming. However, the important point here is that all Big Data Machines essentially transform collected, stored and analysed Big Data into output data that differs from the input. In other words, they function as input-output-machines, selectively open to only certain inputs and only able to produce certain outputs through their internal capacity and operations. In this way, the Big Data Machine is preconfigured or programmed; even machine learning algorithms and neural networks follow a programmed grammar (with incorporated values and logics). This is illustrated in Figure 5.1.

An example of a Big Data Machine is that used to calculate the weather forecast. Such machines may appear to objectify how nature works, but we should remember that machine learning algorithms will always be biased, since there is always programming involved (e.g., what is registered in the first place, how the data is processed and what output is requested). Big Data Machines play an active, but not neutral, role in the construction of reality, since they are constructed and operated by the scientific communities and, perhaps through these communities, also influenced in their design by the interests of commercial and political actors. In the next section, we examine Big Data Machines that not only involve such actors but also involve the users they serve (monitor and

Figure 5.1 A Big Data Machine.

potentially manipulate) as components of the machine: in other words, as a set of sub-machines.²

Citizen Big Data Machines

Let us now look at the type of Big Data Machines we call Citizen Big Data Machines (CBDMs). The special thing about this type of machine is that it collects data about citizens. These data are transformed by the machine into new kinds of information about citizens: information that identifies patterns (correlations) in citizens' behaviour (including expressed values), that predicts future behaviour and actions and that suggests certain content to send to certain individuals, based on these predictions in order to influence their behaviour. In principle, this machine works in the same way that Cambridge Analytica, who called their method psychographic segmentation, was alleged to have worked. The method combines Big Data with theory of persuasion and personality tests (Hansen 2018, 24). Between 2007 and 2012, a research team at Cambridge Analytica found a connection between personality tests and Facebook profiles (especially what people 'Like' on Facebook) (Hansen 2018). They did this by asking millions of Facebook users to complete personality tests, which they then crossed with social media behaviour (Hansen 2018). This project revealed that, by using this technology, it is possible to predict with some accuracy people's preferences, orientations, emotional states, financial circumstances and much more.

The CBDM trawls the internet and digital media and collects digital data produced by citizens, including data about what websites people visit, what they write, whom they befriend, what they do online and economic transactions – in principle, if relevant to the specific machine, all their digital activities and footprints (it also gathers offline data such as geotagging and credit card use). Furthermore, the machine can predict (with different degrees of success) what a citizen's 'next move' will be and what they will most probably like, agree with, or vote for. Using this information, a state, for instance, can either order a citizen to do what it wants, or to nudge them in its preferred direction. With regard to the latter possibility, a state theoretically can nudge a person to think or buy something that they otherwise would not have done, or for instance, could manipulate a person to not vote if they are predicted to vote for the 'wrong' candidate.

² We here followed Bryant's (2014) suggestion that a new big machine emerges when new powers emerge from combining machines and where these new powers cannot be found in each of the machines combined.

Such a machine is likely to be in high demand by big organisations who wish to keep track of citizens and influence their behaviour. Furthermore, it is only such big organisations that will have the required financial and/or political power to make claims on the CBDMs. It can also be assumed that the complex CBMs can only function efficiently if they are operated by big social organisations. To obtain socially relevant output, many human users must interact with the machines in a coordinated manner. We therefore predict that the new CBDMs will mainly be developed into media that can be used to improve, optimise and automate the powers and capacities of states and big companies to keep track of and influence citizens – their behaviour, choices, attitudes, learning and desires. This is illustrated in Figure 5.2.

Figure 5.2 Citizen Big Data Machine as state or corporate medium.

As illustrated in Figure 5.2, the CBDM mediates between states (S) and/or companies (C) and citizens. States and companies control the programming of the machine (how the machine learning algorithms works) and they can use the CBDM to keep track of citizens' behaviour and activities as well as try to influence the citizens based on analyses of the data collected through this tracking.

Big Cyborgs

We can speculate that a new type of socio-technical-political machine will emerge from the combination of states and/or companies and CBDMs: a new Big Cyborg. Just as water (H_2O) emerges with unique properties when two hydrogen atoms and one oxygen atom are combined, it is likely that combining states/companies with CBDMs will give rise to new big powers and capacities that neither the state/company nor the CBDM possess separately. Will these powers be (a) a structural power to keep track of citizens; or (b) an operational power to form, select and relate political or commercial messages (in the widest sense) to specific segments/groups and individuals?

Concerning the tracking of citizens' behaviour, one could perhaps object that the CBDM can do this alone – because it is this machine alone that is structurally open to complex digital data input and that makes the tracking possible. However, strictly speaking, the CBDM does not track citizens' behaviour and values. What it does is collect digital data and digitalised analogue data. A social machine like a state or a company must (a) work out and maintain criteria for selections and (b) form strategies for intervening (e.g., sending special messages or killer drones). This is complex and needs to be worked out by different combinations of decision makers, engineers and computer programs. In other words, to obtain the power to really track citizens' behaviour, values and desires, the political/commercial, social and technical apparatus must be stitched together. The same is true for the operational power to form, select and relate political or commercial messages to specific segments/groups and individuals.

Perhaps one can best describe the relationship between the state/company and the CBDM as the relation between a knight and his armour or a gunslinger and his gun. The point would then be that the media we use contributes to the type of being we become. A man using a gun becomes a gunman to use Latour's (1999) famous example. And, in the same manner, a social machine like a state or company that uses Big Data, becomes a new creature – the Big Data State or the Big Data Company. Yet it is not only gunmen who arise from the combination of men and guns. In a certain way, the gun also uses and modifies the man – it encourages the man to become a certain person (the gunslinger) with somehow modified motives, powers and capabilities. One could perhaps argue that the gunslinger is not only a gunman but also a man-gun; that is, an extension and activation of the gun-creature who becomes alive through being incarnated 'in human hands', urging man to develop the gun's manifest being by picking it up and using it. In the same manner, the CBDM could be expected to modify both the powers and motives of states and companies and thus rule the social machines. From this point of view, the new CBDM needs states and companies to become alive. Thus, the Big Data State or the Big Data Company could also be

Figure 5.3 The new emerging Big Cyborgs.

understood as two modalities of the Big Data Monster – the State Big Data mutation and the Company Big Data mutation. In Figure 5.3 illustrates the situation where states/companies (S/C) and CBDMs have become parts of one bigger emerging machine type – the new Big Cyborgs.

If we are right here, it means that we are today confronted by the rise of Big Cyborgs – implying that states and companies are becoming stronger and different creatures than we have seen in the past. Before, companies had to advertise and perhaps prove the value of their products and politicians had to ‘sell’ and prove their political programmes. Now we are subliminally measured and nudged and spoken to in individualised ways (through dark posts).³ Before, a politician would have an opinion that everyone could discuss and, for example, the mass media could analyse and confront. Now the politicians can ‘whisper’ to us all differently. The public and the press (the democratic institutions) have now become disconnected unless transparency is re-introduced in the CBDM through democratic co-involvement.

The relevant democratic and educational question then becomes: is it possible/desirable to educate individual citizens to be able to cope with these new mega powerful creatures? If we assume that it is not possible for the individual to merge with a CBDM (because it is too ‘big’ and only suited to big social machines), what should the citizen strategically do or be encouraged and supported to do educationally? Should they act with or against the new Big Cyborgs? Could/should they join each other and form NGOs that can also take on new Big Data powers? Should/could they refuse to uphold companies and states that use Big Data, or should/could they co-manage the new cyborgs in good ways? To be even more frank: how can democracy – that is, ‘the rule of the people’ or, even more etymologically correct, ‘the strength of the people’ – be possible if Big Cyborgs monitor, control and steer the citizens? Or the other way around: How can citizens control and modify the Big Cyborgs – either directly or indirectly – through social organs like parliaments?

The core of these questions concerns the relationship between the new Big Cyborgs and the citizens. If this relationship resembles that between the sun and the flower, that is a one-way structural coupling, democracy is ruled out (in favour of a big cyborg dictatorship or oligarchy). If, on the other hand, there is a

³ Dark posts are targeted ads on social media. Unlike normal posts they do not appear on user’s timeline. They also do not show up in the feeds of the user’s followers. Because they are not ‘published’ the same way as organic posts (unpaid posts), dark posts are more formally known on Facebook as unpublished posts. They are not formally on the user’s page. Effectively, they only exist for the targeted users that see them.

two-way structural coupling between the Big Cyborgs and the citizens, some kind of democracy is possible. A two-way structural coupling means that both parts – the Big Cyborgs and the citizens – can respond to each other and modify each other. In this case, the cyborgs will be media for the citizens and the citizens media for the cyborgs. Both parts will extend their powers through the other.

Yet none of the machines are cable of directly modifying each other. The Big Cyborgs can only access the citizens and their doings and preferences in the form of digital data. Moreover, they can only (as cyborgs) generate digital output. To modify citizens, the Big Cyborgs can do one of two things. Firstly, they can generate digital changes – sending digital content to citizens and making digital restrictions. In this case, they use digital media and the internet as contact media. Secondly, they can be structurally coupled to human/social beings or other digital or analogue machines that respond to the output of Big Cyborgs by, for instance, carrying out ‘orders’ that affect citizens (e.g., preventing the citizen from obtaining a loan or traveling abroad). In other words, to manifest their powers, the Big Cyborgs need human beings, digital media and/or other machines – by themselves, they cannot actualize their powers. It therefore matters which media ecology they are part of. It is similar for citizens. Citizens cannot directly modify the Big Cyborgs (being all too big). To modify Big Cyborgs, citizens must organise themselves (i.e., build stronger social machines, NGOs, unions, networks, democratic assemblies, public media, democratic research institutions and other democratic social formations and movements) or somehow gain democratic representation on the boards of Big Cyborgs.

Assemblage of Machines

It is worth adding that all machines are composed of networks on different scales. That means that they are constituted by endo-relations between machines that generate an emergent whole with unique powers – a bigger machine. This bigger machine is thus an assemblage of machines that can be in conflict with each other, since they each possess their own powers, selectivity, operations and dynamics. This is evident when it comes to the Big Cyborgs. These consist of states or companies combined with CBDMs. But states and companies are extremely complex machines that consist of many social machines (e.g., departments) that, in turn, consist of people with different goals (that, in turn, also consist of many things, e.g., brains). States and companies also consist of other machines – such as technology, buildings, rules, myths – that are required for the state and company to function. The same is true for CBDMs, which are

Figure 5.4 The inside of the new Big Cyborgs.

not only technical machines but are also constituted by a mix of different machines. No CBDM can run without having social and human machines as essential components – e.g., big engineering departments that maintain, develop and adjust the machine ‘from the inside’ but also big lobbies who generate and maintain myths about the CBDMs (often by using them). Without all this, the machine would be less powerful (if powerful at all). In Figure 5.4, we have tried to illustrate this internal complexity of the new Big Cyborgs.

The implication of this internal complexity is that the new Cyborgs consist of heterogeneous elements that make them more or less stable and place them in a constant state of disintegration. If observed only from the outside, they might appear as powerful, ‘unbeatable’ and impossible for citizens to catch up with – and, in a sense, they are. Yet if observed from the inside, that is, if we open up the black box, it becomes clear that they are shaky in their internal order. It might not be possible for citizens to affect the Big Cyborgs from outside, but some citizens – for example, those who work in the social departments of the machines and can become whistle blowers, saboteurs, hackers or ethical subjects – can, on different levels, affect many of the smaller machines that operate inside the cyborgs.

How to Respond to Big Data?

Until now, we have treated states and companies abstractly as being cable of using and merging with CBDMs. However, it is possible to observe different

contemporary strategies for and views on Big Data at the political and societal level. We will discuss three such different ‘models’ (media ecologies): a state model, a market model and a democratic model. Our aim is not to comprehensively describe what is happening in China, the US, the EU or anywhere else. We instead wish to highlight *tendencies* and speculate about the implications of these tendencies. Our goal is to show that the way societies respond to Big Data on a political level is also important educationally. We therefore also wish to emphasise the educational implications of each of the three models. This is because education (and educational policies) essentially involves modifying citizens and/or encouraging and supporting citizens to modify themselves for the better (whatever this may be). We will, therefore, examine whether the respective models imply that Big Data is used to modify citizens educationally (in a certain way) and/or citizens with or without Big Data are encouraged and supported educationally so that they can use and/or modify/restrict Big Data powers. We conclude by raising the democratic question: How can democracy – that is ‘the rule of the people’ – be possible in a world with Big Cyborgs and Big Data machines?

The State Model and Media Ecology: The State Rules

Let us start with what we call ‘the state model’, which is understood as a certain political way of responding to Big Data. The core premise of the state model is that the state (i.e. the most powerful organisation) should collect, own, control and use Big Data about citizens to control their behaviour and thus maintain order. This includes controlling students, thereby the shaping of citizens with Big Data. An analogy is Tolkien’s famous lines: ‘One Ring to rule them all, One Ring to find them, One Ring to bring them all and in the darkness bind them.’⁴ In this media ecology, the state’s power is reinforced and the people’s power (i.e., their democratic potential) is weakened by the partnership between state and technology.

We will now highlight some of the tendencies that China is displaying towards such a state model (Liang 2018; Backer 2018, Helbing 2019). In China, the totalitarian regime is rolling out a kind of digitalisation that makes it possible to monitor the population in ways that were unthinkable a few years ago. One example is the use of GPS in school uniforms. The so-called intelligent uniforms record when students arrive and leave school – and pass this information on to

⁴ Tolkien, J. R. R. (2012). *The Lord of the Rings: One Volume*. Boston: Houghton Mifflin Harcourt.

the state (and perhaps also to parents and teachers). Cameras with facial recognition technology at school entrances help detect cheating and set off an alarm when necessary. Likewise, there are schools that have software and cameras installed in the classrooms to monitor children's facial expressions and assess whether they are concentrating (Reed 2018). Another example is WeChat, which, aside from being a chatting and writing tool, has (among other things) a built-in card service, video conferencing service, payment service and taxi booking service. Both the company behind WeChat (Tencent) and the Chinese government can thus keep track of what their 700 million users are doing. In addition, China is developing a 'social credit system' that awards each person a number of points based on their observed behaviour. As a result, citizens can be rewarded, punished or prevented from taking part in various activities (Zuboff 2019: 455). For example, parents with a poor credit score might be prevented from enrolling students in certain schools (Liang 2018, Backer 2019). Also, the Chinese authorities are setting up a lot of surveillance cameras in China (Wong and Dobson 2019). These cameras will, among other things, send information to the national 'social credit system'. This system ensures that people comply with political requirements and can thus be viewed as the implementation of the world's first digital totalitarian state (Wong and Dobson 2019).

Figure 5.5 illustrates how the state model works. The big state cyborg tracks the behaviour of students and citizens by being structurally coupled to surveillance cameras, sensors, digital media and devices (e.g., smartphones, GPS uniforms and chips). Thus, schools (and other social institutions and areas), citizens and students are made into *small* cyborgs, enabling the 'big state cyborg

Figure 5.5 The totalitarian state Big Data Cyborg.

machine' to track them. The big cyborg can also analyse the obtained data and produce citizen predictions, rewards, punishments and permissions. By being structurally coupled to digital systems, social systems (like the school) and state employees (like teachers), the big cyborg can *affect* citizens with these rewards, punishments and orders. However, it can only function internally if the government/state feeds the Big Data machine with political values, that is definitions of preferred behaviour and order that the system should maintain, which functions as necessary input for the Big Data Machine. This means that the big cyborg is not only a technical machine but also a big social, cultural and bureaucratic system, with many different elements and interests as well as potential conflicts, bribery, corruption and other social-cultural phenomena. The machine is officially designed to maintain order in the interests of everybody, but, in reality, the inside of the machine is perhaps better characterised by social power conflicts and economic, political and technical inequalities.

The Market Model and Media Ecology: The Market Rules

Another way of responding politically to Big Data, which can complement or be combined with the state model, is what we call the 'market model'. The core of this model is that companies are politically non-regulated and thus free to develop and use Big Data to monitor, manipulate and nudge citizens and students as well as to sell and buy collected data about citizens and students. To illustrate this model, we will highlight some of the tendencies that Anglo-American societies are displaying towards it. According to Shoshana Zuboff (2019), the use of Big Data by companies in western societies is just as – if not more – shocking than the use of Big Data by the Chinese state: citizens in the West are profiled, categorised and their behaviour is anticipated; this not only leads to nudging but also to assessments on whether people are deemed creditworthy, can get insurance, or are able to rent an apartment. All these things are at risk of being decided by algorithms in Silicon Valley.

Although Edward Snowden demonstrated that the American state is highly active in its surveillance, the USA is dominated by private actors. A commercial company like Facebook can collect, own, control, use and sell personal data about citizens. Facebook is one among other Big Data company cyborgs based in the US that has a tremendous impact on citizens' desires, views and behaviours. In this media ecology, the market's power is increased, though new media people become enslaved to acting only as consumers, optimising their consumer lives. In the Anglo-American world, this also applies to the education system, which is

seen as best driven as a CBDM by the big company cyborgs under the influence of the shared myth of Big Data.

In his book *Big Data in Education*, Ben Williamson describes how the development of Big Data takes place within the education system in the Anglo-American world. This development is driven by cooperation between scientists, Silicon Valley companies, venture capitalists and politicians (Williamson 2017: 12–15). These systems have gathered around the myth of Big Data. Williamson describes this as a *sociotechnical imaginary* defined as ‘collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology’ (Williamson 2017: 16). This imaginary is instantiated as computer-based functional specifications that determine the social and educational life of the school system, forcing its norms and logics onto the teachers and students.

According to Williamson, algorithmic machine learning makes it possible to predict students’ possible future progression through predictive analytical processes and to control the knowledge students acquire and the tasks they are assigned through prescriptive analyses (Williamson 2017: 111). The selection of tasks for the individual student is matched by the machine learning algorithm not only in relation to all the data on the individual student but also against all the students’ progression curves, which determine their next specific task (Williamson 2017: 112). It is, of course, smart that students are assigned tasks that correspond to their closest learning zone but, in the larger context, the way one is measured and circulated through the system, also dictates how one is treated. This means that people will live a predictable life that they will adapt to. In addition, even machine learning algorithms must have feedback to learn, which means that they can never do anything really new or experimental in terms of teaching (Williamson 2017: 113).

However, it is not only cognitive learning and the technical part of science that are important when it comes to Big Data and machine learning within the teaching area. Psychology is also important. This is a school of thought called *growth mindset* central. This behaviouristic theory suggests that, since students have been able to contribute to the socio-technical imaginary, they can develop their intelligence and become better decision makers through self-optimisation and hard work (Williamson 2017: 141). The CBDM then becomes a Student Big Data Machine (SBDM). This machine is not neutral in the sense that it merely helps students (e.g., to develop their own unique personality to become a self-regulating critical citizen); it is a citizen system that conforms with the imagined CBDM society.

Figure 5.6 Student Big Data machine as a medium for producing the desired citizen.

As illustrated in Figure 5.6, the Big Corporation and State Cyborgs colonise the education system by forming the SBDM, which monitors, calculates and nudges students in an attempt to produce a desirable citizen. According to Williamson, the SBDM normalises surveillance and, because the reward is based on visible behaviour, such a practice constitutes raw behaviourist nudging, designed to make students conform with specific behavioural norms. Williamson refers to this as *psychological governmentality*. The model is reinforced by persuasive computing including hyper-nudging and online intervention through social media platforms (Williamson 2017: 144). According to Williamson, we are approaching an actual *nudgeocracy* (Williamson 2017: 145) and *governmental psycho-policy* (Williamson 2017: 147; Han, 2016). Like in the private sector, where companies quantify emotions in the CBDMs, we can now see psychometric methods for measuring and managing mood and behaviour within the SBDM.

The datafication of the student's non-cognitive learning is part of a biopolitical strategy designed to shape the citizens into pathology-secured individuals. Up to 100 emotions have been identified (Williamson 2017: 137) to help 'improve' student performance (including academic persistence, self-regulation, engagement and motivation) through appropriate practices (Williamson 2017: 135). Various techniques to measure things such as facial expressions, eye tracking, skin temperature and conductivity can reveal the learner's emotional attitude. Treating students in this way is edging towards a quantified self, which, based on behaviourist rationales, must align with an individual who is encouraged to enter the capitalist system with an emotionally appropriate mindset and the correct cognitive settings.

In this scenario, we find a classroom which is monitored and in which the teachers and students must follow the grammar predetermined by other systems and executed by algorithms (Tække 2019). However, according to Williamson,

such a politically initiated and automated performance culture leads to an increase in stress and anxiety (Williamson 2017: 146). Such a culture features a dystopic (first order) cybernetic system in which students are treated as trivial machines and expected to adapt to a commercialised society in which freedom is limited to the few rich individuals who control the Big Cyborg.

The Democratic Model and Media Ecology: Protecting and Empowering Citizens

Both the state model and the market model – and combinations of these two – increase the power of Big Cyborgs and decrease the power of citizens. They therefore undermine and weaken ‘the power of the people’ (i.e., democracy). Also, they both, in different ways rely on the educational outlook we, in previous chapters, have called the ‘engineer’ and the *technical and causal understanding* of teaching and media, constraining education as a pure techno-bureaucratic space. This means that equipped with new Big Data technology, the technical mainstream view of education has become globally hegemonic. Thus, it has become mainstream norm – among politicians, companies, researchers and educators – to accept, that education is about shaping, nudging and producing conforming citizens with technological means (including programme for international student assessment (PISA) and the like), both in schools and elsewhere (e.g., on the market, producing desirable consumer behaviour and nudging people to buy certain products etc.). In Chapter 1 we called this a vulgar idea about education, which we criticised as being based on problematic assumptions and aims, seen from a more reflective *Bildung* point of view.

Against this background, we will now discuss a third way of responding to Big Data, which we can call a ‘democratic model’. The core of this model is that citizens and students are protected against Big Cyborgs and empowered to be on guard and act collectively both with and against Big Data Machines. To illustrate this model, we will highlight some of the potential tendencies that the EU is displaying towards it. We will not attempt to describe the relevant situation in the 27 EU countries but will consider how citizens within the European *Bildung* tradition could be empowered to ‘counter’ Big Cyborgs and act both with and against Big Data in a democratic way.

On the societal level, in the EU, we have seen the introduction of GDPR (General Data Protection Regulation) and other initiatives, among them the will to protect the privacy of EU citizens. However, since the EU also contains liberal capitalist systems and this freedom is used by Big Companies to monitor and

restrict the freedom of citizens, the Anglo-American Big Data tendencies described above have also been seen within the EU. This is also because American Big Companies also wish to play the same game in Europe (as described above). But what about teaching in the EU? What are the chances of safeguarding teaching from the Big Cyborgs?

As the research we have put forward until this chapter suggests, it is possible to perform teaching in the digital medium environment that is in line with the *Bildung* tradition (Klafki 2005). This research describes an empowering of the students and a view of the classroom as a cooperating education community that is free to update old forms of literacy and curriculum in line with the development of contemporary society in *contact* with surrounding society. In line with the *Bildung* tradition, this research puts forward critical thinking, democracy, emancipation and humanism and defines *Bildung* pedagogically as the task of critically working with and challenging a combination of three overlapping components: a student's *knowledge*, *attitude* and *existence*. For instance, when students upload photos to Instagram, the *knowledge* component involves working with and challenging *what* the students takes as a good photo, but also knowledge about whether it is desirable to use Instagram. The *attitude* component involves working with and challenging *how* students approach social media – e.g., naïve or critically, egoistically or altruistic – but is also concerned about what it means to others and what body ideals are reinforced when they are portrayed in uploaded photos in one way and not in another. The *existence* component involves challenging *who* the students are – or who they want to be – but is also concerned with what kind of a person a student becomes if they upload a photo with a specific way of portraying a body/person. This way of working critically with knowledge, attitude and existence must – according to the *Bildung* tradition – penetrate every social and educational activity from coding algorithms to writing essays.

It seems logical and in line with the development until now in the continental European tradition of *Bildung* that teaching should encourage and challenge students to understand Big Data and algorithms, helping them to become critical of the CBDMs and the Big Cyborgs. But will this be enough to safeguard the independence of the school? And what about the potential to use BDMs in school for good proposes? Is it also possible to educate students to use BDMs themselves?

Technology in this book is viewed as pluripotent and can take on different purposes/values according to which other machines/media they are structurally connected to. Furthermore, social systems (for example) can expand their

capacity and power through such couplings (Bryant 2014). In this way, digital media, not least the algorithms steering the CBDM, can be programmed to perform certain functions, which will have a built-in motive. Big Data involves statistical calculations and finding correlations. Yet the technology has the inherent problem that it therefore, in a time-dimension, only ever 'looks back'. You are your history, or the history of those with whom you are matched in the profiling.

If a SBDM is to be used in schools, there must still be a teacher with an holistic perspective on an individual student when cognitive help is received from the SBDM (e.g. what the next math problem should be). Behaviourism (e.g. reading emotions in students' facial expressions through the use of webcams) seems far away from the *Bildung* tradition. Yet perhaps, in a better world, such behaviourism could be used to detect students' anxiety, loneliness or stress so that they could be offered help? And perhaps the psychologist could also use BDMs to identify different forms of assistance that have previously helped students correlated with those in question? In our view, the BDM or the SBDM can never stand alone. However, with the right modification, critical sense and knowledge, we propose that the BDM and CBDM and some sort of open and transparent SBDM under democratic control could perhaps find its way into schools. But, to include the Big Cyborgs, the CBDM and the SBDM and create a school that strives for *Bildung* in terms of democracy, emancipation and humanism and work critically with knowledge, attitude and existence in all aspects, a high degree of transparency and democratic control is required.

Within the model displayed in Figure 5.7, it is the teacher and the students that decide on the use of the different BDM and this demands critical thinking, extended forms of media practices (BDM literacies) – and a continual work

Figure 5.7 Democratically controlled SBDM.

with *Bildung*. The students must be encouraged to learn the principles that the different BDM employs, including not only the correlative nature of Big Data and how the maths works but also the values and logics of commercial companies and governments built into the CBDM and SBDM. This involves continual analysis of how the different machines work in all the special cases where the BDMs are involved in relation to both cognitive and behavioural aspects. This might require the use of open-source software to remain free from the influence of the Big Companies' CBDM and SBDM, but perhaps an EU regulation about transparency and school democracy would force the Big Companies to design systems that can be trusted. New social structures must also be created with regard to designing school councils that can be trusted to hold the Big Data correlations of individual students and the roles and level of authority for the individual actors, such as parents, psychologists, students, school management and teachers, must be decided. It is important that it is not just the school management and functionalists and/or representatives of Big Companies and governments that have a say. Perhaps they should have no say at all, other than in reference to hearings and specialist statements. In relation to the voices and *Bildung* of the students, the students must be supported and encouraged to gain *knowledge* in relation to how a BDM works, how it is built and programmed, how the neural network functions and with what bias. Some maths students can most likely also learn how to design machine-learning algorithms and train neural networks, but the important thing is that all students are challenged and supported to learn the relevant principles so they can voice their opinion at school and become critical citizens. The students must also be challenged to reflect on their *attitude* and be encouraged to assume the perspective of others subjected to the correlative dictatorship of the CBDM and SBDM. They must be encouraged to become citizens who can recognise how others are influenced by the implemented norms, values and logics of systems regulated by Big Data. This concerns not only the healthcare system and the cord system but also fake news, commercials and echo chambers. The students must also be *existentially* challenged in relation to who they become and what it means for them as people if they construct, use or participate in processes that use BDM. Finally, if one wants to take up the track of more creative and experimental kind of *Bildung* (see Chapter 1), it might also be possible and desirable to let students experiment with using, modifying and re-building Big Data Machines in different school subjects, but also reflect critically on this and work to generate 'benign effects' through assembling social, cultural, technological and physical elements.

Conclusion

Inspired by Levi Bryant, we have developed a conceptual framework to discuss Big Data as an exemplary *Bildung* issue. This has enabled us to distinguish between (1) Big Data Machines ((BDM), a machine that collects, stores and analyses big and/or complicated data sets), (2) Citizen Big Data Machines (CBDM), a BDM that monitors, stores and analyses data about the citizen and perhaps also treats them according to its preprogrammed values depending on statistical correlations, (3) Student Big Data Machines (SBDM), which is the same as a CBDM but designed to control the learning and behaviour of students, (4) Big Cyborgs, Big States and Companies who empower CBDMs/SBDMs and control their grammar (but are not mentioned explicitly) and (5) Small Cyborgs (citizens who use digital technology to modify and strengthen their power but who risk being monitored, manipulated and controlled by Big Cyborgs).

Through our analysis and considerations, we have also described three ways of responding politically and educationally to Big Data: (1) a state model where the state develops and uses CBDMs and becomes a dominating Big Cyborg which rules and manipulates its citizens and students; and (2) a market model where companies are free to develop and use CBDMs and become dominating Big Cyborgs who rule and manipulate citizens and students. In these scenarios, we see a development or at least a tendency towards controlling, nudging and even suppressing citizens, which works against the creation of a critical and autonomous people who can participate in a democratic society. The tendency in the first model is towards total lifelong control and suppression while the tendency in the second model is a nudgeocratic shaping of the citizen to behave, feel and think in accordance with capitalistic structures. Both models rely on and reinforce a *technical and causal understanding* of teaching and media, constraining education as a pure techno-bureaucratic space. As an alternative third response to Big Data, we have outlined a democratic model which, based on the continental *Bildung* tradition, tries to find an answer to how one could respond democratically and critically to Big Data. In this model, students and citizens are educationally and democratically encouraged to become critical Big Data users, securing democratic control over the new technological powers and being protected against the new Big Cyborgs. We have suggested that one could supplement this with creative experimentation, letting the students experiment with using, modifying and re-building Big Data Machines, but also reflecting critically on this and working to generate 'benign effects'. Thus, in this model, students and citizens are protected against Big Cyborgs, but are also supported

to become empowered small cyborgs that can be on guard and act both with and against Big Data machines. Only this third model seems to secure democracy understood as 'the rule of the people'. However, this is highly unlikely to be successful in a world dominated by Big Cyborgs creating 'super humans' in the image of their values and logic. Think, for example, of super workers or soldiers controlled by and subjected to the Big Cyborgs. The big question of Big Data therefore becomes: What should we do if we wish to sustain democracy?