Competing Pedagogies for the Biodigital Imaginary: What Will Happen to Teachers?

Christine Sinclair

1 Imagining a Teacher in the 1960s

In 1964, an 11-year-old child wrote about a robot teacher on an imaginary planet (Yoksrilla) orbiting the star Arcturus.

> They had robot control. Yoksrillans caught on with the idea years ago. They had robot teachers, chalk, marker and books. The books could speak if there was something in it you did not understand.
>
> 'Good afternoon,' said the robot. 'Science Fiction for everybody. Starting with the first form.'
>
> Tolifa answered her question perfectly. Everybody was asked a question. Franinina was also correct. Unfortunately Yokri and Yohola were always muddling the robot up because they were alike and because they were always playing tricks on it.
>
> Yokri's question was, 'Could there be another solar system?'
>
> 'Er yes, no impossible, oh wait a minute yes, of course, um never. I suppose so, er I don't know'. A robot cannot take all that in. Whizz! Zzzz! Ssss! Its head went whirring round. The marker was not there, or there would have been trouble. Robots cannot remember things like that so Yokri was safe. (Extract from unfinished novel, *The Other Solar System*, 1964.)

An only child, the author of the extract (and of this chapter) was an avid reader, fascinated by school and adventure stories, slightly transgressive children, and sibling relationships especially between identical twins. She also enjoyed comedy and science fiction on TV, and all these influences on her imagination can be seen in the extract. Also in evidence is a comforting attitude to robots: they can take on supporting roles but are not as capable as the dominant lifeform on the planet. Fictional robots were widely prevalent in 1964, especially in the US; the main source for this

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one, though, was likely to be Robert the robot of the British TV puppet series, Fireball XL5. Robert was transparently more of a machine than a humanoid, responding fully and literally to orders, though he was prone to overheating if flustered. When a child tells a story, she is influenced by other narratives and stories around her, some of which will have become integrated into her thinking as second nature. She will additionally draw on her own experience and her associated assumptions, for example about the nature and role of teachers.Also relevant to this chapter, is the imagined classroom that is supported through such technology. Apart from the robotics, the classroom in the story is remarkably similar to those in other tales, with an emphasis on a teacher's responsibility to ensure correct answers and good discipline, and children organised by age into forms, even though the different year groups are brought together for this class. Books (and even chalk) are still present, though somehow turned into robots. The robot marker seems to have some authority over the robot teacher, suggesting separation of summative assessment, a hierarchy and possibly teaching inspection.

Preservation of most elements of a recognisable classroom is a recurring feature of many imagined educational futures, as is evident in the well-known French postcard from the 1900s in Fig. 1. In this image predicting the year 2000, there are serried ranks of young white boys apparently being force fed some facts extracted from books and presented via a radio mechanism, initiated by the teacher. Like the child's novel in the extract, this expresses a depressing view of teaching and learning, despite its futuristic focus.

There are many similar images of imagined future technology amplifying traditional conceptions of classroom practices (see, for example, Watters 2020a, whose blog I return to later) based on a rather instrumental notion of education, where packets of knowledge are transmitted to students by teachers in the fastest possible

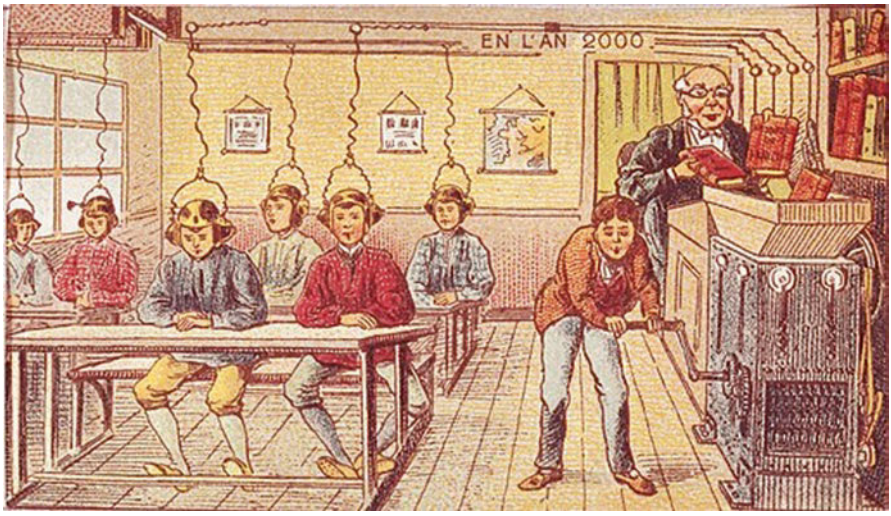

Fig. 1 Françoise Foliot (1972)—La radio à l'école (CC BY-SA 4.0)

way. The pupils in Fig. 1 look as though they are being subjected, through modern approaches, to what the philosopher Gilbert Ryle summarised and dismissed in 1962 as a 'crude, semi-surgical picture of teaching as the forcible insertion into the pupil's memory of strings of officially approved propositions… Yet, bad as the picture is, it has a powerful hold over people's general theorizings about teaching and learning.' (Ryle 2009: 467)

Sadly, the 11-year-old child in 1964 shared a similar picture of pedagogy, as do many other writers. More than half a century later, the author of the space story can reflect again on recognizable classroom tropes across the ages, including 'types' of teachers in the public imagination, ranging from dull didacts to inspirational dissidents. She can now articulate alternative ways of imagining the relationship between teaching and technology, and has even taught alongside a teacherbot (Bayne 2015). However, she can also observe how direct instruction and instrumentalism are still pervasive and present, for instance, in some aspirations for 'personalized learning' and discussions of 'learning loss' during a pandemic. She can trace the preservation of educational narratives via media channels that would have been unthinkable in 1964. She has easy online access to collations of cultural artefacts showing retrofutures, and to theoretical papers tracking and analysing 'imaginaries' from that epoch and others.

Imagined futures can fail to materialize, of course, and that is often the case—especially those with the promise of technology that will revolutionize education (Cuban and Jandrić 2015). To conclude my initial provocations, here is an observation from a curator of the history of the future, Matt Novak:

> Every generation has its shiny new technology that's supposed to change education forever. In the 1920s it was radio books. In the 1930s it was television lectures. Here in the second decade of the 21st century, it seems the Massive Online Open Course (MOOC) is the education tech of tomorrow. Let's hope it pans out better than previous attempts. (Novak 2015)

Now in the third decade of the twenty-first century, we can be certain that the way the MOOC is panning out is not straightforward; we already know that many different pedagogies are competing in the educational imaginary that encompasses MOOCs (Bayne and Ross 2014; Macleod et al. 2016).

2 Why Should We Attend to Imaginaries?

2.1 Imaginaries Are Useful Constructs

'The educational imaginary' mentioned above refers to a prevailing view of education and how it ought to be conducted. It incorporates some of the debates, myths and conflicting opinions surrounding education; it is arguably just one aspect of the broader social imaginary. The social imaginary refers to the current communal and normative way of thinking about society and its practices, enabling people to do things together. It may also be contested and in tension with other imaginaries, but

has become stabilized over time to affect (and constrain) what we can do and how we can do it. It feeds into imagined futures as well as our understanding of the here and now. Thus, the educational imaginary is not just about how a single person imagines education, even though elements of it might possibly be traced back to an individual. In this section, I explore not only what an imaginary is, but why it is important, especially at a time when a new 'biodigital' social imaginary may be emerging rapidly. At this juncture, potential imaginaries may even support us in our post-pandemic quest for 'really useful knowledge' focused on emancipation and social justice (Jandrić 2021).

'We must reimagine…' has been one of the most frequently encountered phrases in response to the Covid-19 pandemic—or 'The Great Pause' as various writers have dubbed it. The pandemic has arguably drawn the public attention to the mutually constitutive relationships between society, biology and technology with effects on our daily lives. Some academic writers have chosen to talk about the processes of originating and sustaining such development as 'imaginaries', with various definitions and applications. I visit a few imaginaries in this chapter: they are all social imaginaries, or could even be construed as aspects of one prevailing social imaginary, but are sometimes given other names to highlight a particular focus. The sources I draw on reference sociotechnical, technological, educational, ed-tech, neoliberal, algorithmic, ecological and biodigital imaginaries.

I am interested in how the educational imaginary and reimagining education might combine to affect teachers and pedagogy at all levels of education. I am not focused on promoting a particular pedagogy; indeed, I explicitly want to avoid that. If a single pedagogy triumphs, there is a danger that it will be the one I imagined for my alien robot teacher, which also emerged in contemporary counterparts in the US, both fictional and real. Mrs. Brainmocker, the robot teacher practising the push-button pedagogy of The Jetsons, bore a remarkable resemblance to the behaviourist teaching machines of the time (Watters 2020a). At least we were imagining (and talking about) robot teachers in the 1960s and we probably should still be doing so, more than we currently are (Kupferman 2020a). But that does not mean we have to accept a reductive view of what they have to offer. We can also recognize, for example, that a 'teacherbot' might be playful, experimental and 'pedagogically generative' (Bayne 2015: 465), especially when good teachers possess the agency to work with it.

To explore the idea of imaginaries, there are many theoretical lenses for observing a process that begins with human imagination, co-operation and co-production directed at a shared future. They include work from writers on robotics, sociology, futures research, dialogic education, and ecology to name but a few. Although I draw on these to illustrate some points, my main method here is simply to seek out teachers and pedagogy in accounts of social imaginaries. Towards the end of the chapter, I shall draw lightly on the work of the philosopher and psychologist A. N. Leontiev (1903–1979) whose reflections on hunting identified humans' shared imaginations, goals, mediating tools and division of labour, illustrating the genesis of human activity and human consciousness (Leontiev 2005). We relied on a social imaginary and technology to move from individual hunting and foraging to

anticipation of future meals based on co-operation and domestication of animals and plants. We continue to rely on our social imaginary and bioinformational technology for today's future-driven social activities, including education.

2.2 Social Imaginaries Underpin Current Social Norms

The philosopher Charles Taylor (2004: 23) is keen to make a distinction between academic theories and 'modern social imaginaries', which he describes as the common understandings of society held by large groups of people and 'carried in images, stories, and legends' as well as in strongly-held moral beliefs about how society ought to be ordered. The contemporary conditions and imagined futures envisaged by the authors of our book, for example, are more appropriately called theories, bringing together carefully-honed theoretical analyses of bioinformationalism and the postdigital to provide new perspectives on knowledge which may apply to future social practices. The other chapters do, however, draw on existing social imaginaries so that the reader understands what is being said; they also address problematic societal situations through new theories and forms of practice derived from them. They may thus contribute to future imaginaries that take hold in our globalized societies. It is in this context that I want to explore what might happen to teaching, teachers and pedagogy. I also hope to encourage readers to consider the other chapters of the book with the same question in mind.

There is then a process of migration from theories to social imaginaries and *vice versa*: they are not unrelated. Along the way, Taylor suggests, tensions, resistance, penetrations of new practices and ideas, revisions and redactions to theories combine and resolve themselves to produce a society's understanding of its contemporary culture and practices, including some prescriptive narratives that will help sustain those practices, at least for a while. Social imaginaries are never just ideologies: 'They also have a constitutive function, that of making possible the practices that they make sense of and thus enable.' (Taylor 2004: 184) There are negative aspects too: Taylor admits that 'the social imaginary can be full of self-serving fiction and suppression, but it also is an essential constituent of the real' (Taylor 2004: 185).

2.3 Sociotechnical Imaginaries Have a Focus on Futures

Successive notions of imaginaries have intersected with theoretical perspectives and become important signifiers of contemporary and future practice—especially sociotechnical imaginaries as elaborated and analysed in the discipline of Science and Technology Studies. This discipline strives to avoid the separation of science and technology from their socially constructed uses and desired futures. The recognition of sociotechnical imaginaries fulfils a need for 'conceptual frameworks that situate

technologies within the integrated material, moral, and social landscapes that science fiction offers up in such abundance' (Jasanoff 2015: 3).

Fiction, especially science fiction, is itself an aspect of such material, moral and social landscapes and is a recurring theme in this chapter, especially when referring to the possible. As well as ideas for changing technology, science fiction offers a language for reflecting and developing a shared understanding of what is possible, including possibilities for science and teaching that at the time lay far beyond the reach of the child who wrote the extract from the beginning of this chapter. Even those who dislike science fiction will recognize its penetration into our shared understanding: for example, words such as robot and cyborg have suggested new ways of thinking and talking about possible futures, allowing for their realization. There are even researchers who use science fiction as method (for example, Gibbons and Kupferman 2019). While I am not doing that directly here, I have found their insights invaluable, if disturbing, for explaining in sci-fi terms what may be currently happening to teachers and pedagogy. In contrast, non-fictional accounts of technology frequently tend to overlook its social origins and interrelationships (Jasanoff 2015).

Sociotechnical imaginaries are focused towards a 'desirable future'. They are 'animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology' (Jasanoff 2015: 4). Jasanoff herself privileges the word 'desirable', highlighting the inevitable interplay of possible utopian and dystopian futures in our thinking, as I am also doing here. It is useful to draw attention too to her expression 'animated by': there are alternative futures but reaching the more desirable ones may depend on what is already present in our current social imaginary as well as in the knowledge of our scientists and technologists. And of course there may be competing 'desirable' futures. Jasanoff stresses the importance of considering the historical aspects of imaginaries: how they emerged and constituted and stabilized communal practices where alternative routes were also possible.

Sociotechnical imaginaries provide Jasanoff and her colleagues analytic power for their work across a range of research in science and technology,[1] but pedagogy and teachers are not their focus. However, similar discussions of 'desirable' futures can be found in futures studies, especially in the work of Wendell Bell who distinguished possible, probable and preferable futures (Bell 1997). When picked up by an educationist, this has been worded as: 'for educational futures, we can focus on what is likely to happen, what could happen, and what we want to see happen' (Kupferman 2020a: 4). Kupferman encourages us to do this creatively, recognizing the multitude of possible futures, rather than with a view to proscribing or prescribing. What counts as desirable futures will, of course, be in the eye of the beholder, but there will be more than one.

The role of advances in science and technology in animating imaginaries affects all teachers, across all levels and in all disciplines, in ways that have recently become

[1] See https://sts.hks.harvard.edu/research/platforms/imaginaries/. Accessed 28 June 2021.

increasingly obvious though not always positively, and provide the background to this chapter.

2.4 Competing Pedagogies and Myths Are Influenced by Imaginaries

The 'teacher-centred' model of education based on transmission has co-existed in the social imaginary for some time with the apparently contradictory 'student-centred' model based on transformation, with both views competing for dominance in education policies in several different countries (English 2016). Teacher-centred is often unfairly equated to an unimaginative form of direct instruction measured by what the students can repeat. Although an instrumental approach to teaching may sometimes be useful, it is certainly not the only approach available nor the only one actually used by teachers. It has been too easy for people to share the impoverished conceptions of teaching as the passing on of propositions or narrowly-defined and decontextualised competences, and this has encouraged the perpetuation of such forms of teaching for those who have an interest in them, including commercial organizations.

One result is recurring cycles of educational myths that feed into other potentially damaging narratives, such as the view that our current education is 'broken' because it was designed for a long-past industrial age: a factory model of education. This view 'is now *and has been for a century* the rationale for education technology' (Watters 2015, in her blog that considers the history of the future of educational technology). Moreover, Watters observes that this view is not only based on historical inaccuracies, it also preserves the emphasis on efficiencies and control associated with the actual educational model it critiques. She reveals how inventors of 'teaching machines' in the 1930s expressed much the same desires that we hear today for new technology to standardize, personalize, and revolutionalize an outmoded education system. Like then, the aim today is still to hand responsibility for education over to the ed-tech commercial market in preference to teachers.

Yet the move towards personalized learning also draws from the prevailing educational imaginary the idea of one-to-one dialogues between students and excellent tutors, envisioning the possibility of using technology to create these at scale. In a discussion framed by 'the technological imaginary in education', Norm Friesen (2020) suggests that educational dialogue itself has taken on the role of a myth to promote EdTech transformations. He traces the history of dialogue and its famous proponents, including Socrates' dialogical methods, Rousseau's utopian one-to-one experiential and constructivist teaching, and Dewey's vision for democratic and inclusive education based on dialogue in the classroom. The technological imaginary first introduced the teaching machine, based on Skinner's behaviourism, and then later attempted to emulate Rousseau's and Socrates' forms of dialogic exchange, associated with different pedagogical approaches. They were not

successful, because dialogue is not actually amenable to such quantification; it is irreducible. However, we should perhaps be grateful that social and sociotechnical imaginaries still retain some positive myths around teachers, even if they also postulate a future where teachers are superseded by algorithms.

2.5 Social Imaginaries Could Have an Impact on Teachers' Futures

As we formulate our new theories about the bioinformational world, therefore, we need to be aware of the persistent and powerful social imaginaries that may already (mis)represent education and the role and nature of teachers. We should be aware of attempts to undermine the agency of teachers. Those who value teaching and teachers must ensure that their voices are discernible in the emergent imaginaries of the future. Borrowing a metaphor from Jasanoff (2015: 21), teachers and their allies need to be part of the collective 'glue' that preserves what societies value, or the collective 'solvent' that leads to change where it is needed. We should attend to imaginaries because some of them have shaped our present realities; we should attend to imagined futures to assess what future imaginaries might endure. I hope to demonstrate that it is important for teachers to still have agency in those futures.

In the rest of the chapter, I look at what happens (or doesn't happen) to teachers in discussions of a small range of contemporary imaginaries to tease out some likely tensions for a biodigital imaginary that might emerge through our current direction of travel. I look for teachers in analyses of imaginaries and in related discussions on imagined futures. I review effects on teachers and pedagogy from the social imaginaries identified in these accounts. In this brief exploration I consider further how imaginaries actually work in normalising certain forms of practice. Drawing lightly on the explanatory power of cultural-historical activity theory, I conclude the chapter with an argument for the retention of teachers and suggest some ways of infiltrating, subverting and resisting dominant imaginaries that seek to hide or exclude them.

3 Finding the Teacher in Neoliberal and Technological Imaginaries

Neoliberalism features strongly in contemporary imaginaries affecting education. By neoliberalism, in this context, I am referring to economic and political theories promoting the values of free market capitalism, the transfer of the public to the private sector, and self-interested individualism that have led to the commodification of education with the support of national governments. The growth of the neoliberal imaginary has raised questions about how neoliberalism is 'done' in education (Ball 2012: 2), and the answers expose 'a great deal of political and ideological work that

is highly organized and well funded' (18). Finding out the mechanisms of neoliberalism is a feature of my search for the teacher, starting with a look at the issue of globalization. Neoliberalism is, however, only one dimension of contemporary globalization (Olssen and Peters 2005) and it is important not to conflate the two as there will be alternatives.

3.1 Globalization, Educational Policy and the Curriculum

Writers who are interested in the application of social imaginaries to education have invariably been focused on the impact of globalization (Berniyazova 2018), and it is in this area of research that I initially looked for discussion about teachers. Taylor's (2004) distinctions between theories, ideologies and social imaginaries offer an explanation of how education has been subjected to a neoliberalism fiercely critiqued by many educational researchers, writers and practitioners, while still influencing widely-held educational social imaginaries.

Rizvi and Lingard (2010) use Taylor's ideas to explore how a neoliberal global imaginary has emerged within largely knowledge-based economies afforded by information technology. An ideology—globalization—has been 'translated into actual material practices steering our sense of possibilities and conceptions of the future' (Rizvi and Lingard 2010: 33). They trace the movement and impact of this translation via the neoliberal social imaginary and how it affects policy, and in particular, educational policy. At this current stage of this translation from ideology to social imaginary, education policy in most countries is now firmly established as having to respond to the global competitive environment, highlighting economic issues and exacerbating social inequalities. How that is realized through policy will differ between countries because of other social imaginaries in play, but all our options seem to be constrained through the hold of the rationality of the global market and competition.

Hodge (2017) uses Rizvi and Lingard's work as a starting point for analysing an aspect of the work of teachers that has been affected by the neoliberal social imaginary—control over the curriculum. Following Taylor's (2004) account of penetration of new ideas into the social imaginary, Hodge illustrates how neoliberal economic and market-oriented theories (for example, Public Choice Theory) have been given 'both explanatory and normative power' (Hodge 2017: 340) to infiltrate our shared understanding of curriculum practice. Hodge has identified three main problems for teacher control of the curriculum brought about by the infiltration of the neoliberal imaginary. I have summarized these in Fig. 2, possibly risking the same kind of 'glossing' of theory that Hodge is himself critiquing. However, the three problems are uncomfortably recognizable, with hindsight, to experienced teachers who have seen the erosion of their autonomy with respect to curricular decision-making.

The first problem arises because of a view that professionals in the public sector are inefficient because their self-interest is not constrained by the mechanisms of

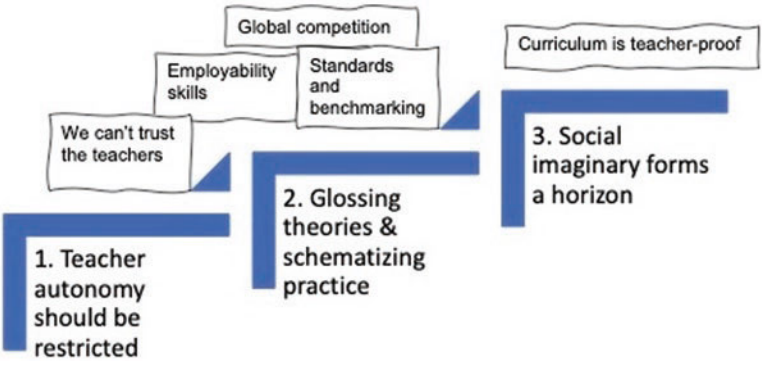

Fig. 2 Problems from infiltration of a neoliberal imaginary (based on Hodge 2017)

the market (Public Choice Theory). In education (at all levels, but especially in state schools), this means that the government must step in to ensure that other 'stakeholders' in education do not suffer because of teacher inefficiency. Public Choice Theory and other neoliberal theories are glossed or simplified for application rather than elaborated, and this gives rise to the second problem.

The theories are coming into the social imaginary through schematized practices and are rationalized through policy. 'Generalisations, keyword vocabularies and fragments of arguments circulate and are on hand to give sense to new and modified practices.' (Hodge 2017: 341). I have suggested some such fragments in Fig. 2; there are many examples. Indeed, this has resonances of the 'McDonaldization' of society (Ritzer 1993) and its effects on educational policy where it succeeds in rendering invisible the labour of teachers and students through buzzwords, attributing the work instead to policy and strategy in higher education (Hayes 2019).

Hodge's third problem is the success of the social imaginary in normalizing practice. This means not only that teachers' curriculum skills will have 'atrophied' through lack of use, but also that their participation in curriculum decisions will have become unthinkable. A horizon for thinking and imagination has been established.

A decade after Rizvi and Lingard (2010) wrote about globalization, material practices affecting education policy joined forces with a global pandemic that had a further impact on what we could do together, in our social and educational practices, with and without technology.

3.2 Infiltration of the Educational Imaginary During the Covid-19 Pandemic

Hodge's revelations about the infiltration that affects all education levels in the social imaginary were clearly borne out during the Covid-19 pandemic and especially in the aftermath of the closure of school, college and university buildings. Examples might include: an attempt to use algorithmic determination of grades for school leavers in the UK; quantification of 'learning loss' through institutional closure; EdTech investment in 'desirable' forms of reimagined learning. It is useful to consider Hodge's three problems with the infiltration of the social imaginary in these cases.

In the absence of formal national exams, governments in the UK were clear that teachers could not be trusted to assess school students' work, exemplifying another illustration of the first problem identified in Fig. 2. In Scotland, both the First Minister and the Education Secretary expressed concern about the 'credibility' of teachers' results. 'Mr Swinney said last week that he believed teachers were often "optimistic and aspirational" about their pupils' abilities, while an exam system "does something different".' (BBC 2020) This proposes a convincing horizon to teachers' agency (the third problem in Fig. 2).

Without the opportunity to sit an exam themselves, students learned that the algorithm determining their results would be partly derived from results of previous pupils at their school. This was clearly unfair. The students', parents' and teachers' strong resistance to such 'postcode lottery' (BBC 2020), along with the associated media frenzy, resulted in teachers' assessments being allowed for the year 2020, but discomfort and mistrust of teachers remained, with a sense that all the grades were inflated (see also Hayes 2021).

A subsequent concern about 'learning loss' invokes all three of the problems seen in Fig. 2. The expression 'learning loss' was shorthand for an attempt to quantify in terms of time and money what students, and ultimately society, missed during the pandemic. Initially, it might seem less damning of teachers. Indeed, the consultancy group McKinsey and Company even sought teachers' views on learning loss to make their case for reimagining education (Chen et al. 2021). Nevertheless, glossing the educational impact of the pandemic as 'learning loss' in terms of productivity and economics, established in the public imagination a need to supplement teachers' work with catch-up strategies to cover the 'lost' packages of knowledge, including private sector initiatives, leaving a sense of teachers being unable to cope by themselves. There is some truth in this, of course, as the emergency meant that teachers all over the world were suddenly expected to double their course preparation: providing classroom-based and online courses on the same topic. Added to that, the prevalent educational imaginary deprecated online provision, seeing it as necessarily inferior to the classroom, despite many strong examples to the contrary (Bayne et al. 2020). Excellent online provision, however, takes time to develop (as does excellent classroom teaching) and is not the same as 'emergency remote teaching' (Hodges et al. 2020).

Ben Williamson of the University of Edinburgh has been tracking the use of the term 'learning loss'[2]—along with other glosses, schematizations and algorithms that promote neoliberal values in education. He is concerned about the direction such reimagining is taking. Along with Anna Hogan of Queensland University, he has written a report on Pandemic Privatisation in Higher Education: EdTech and University Reform (Williamson and Hogan 2021). This highlights the closure of educational buildings as conditions 'animating' sociotechnical imaginaries that ed. tech companies had already been promoting for years. These companies were positioning themselves to forge and strengthen the public-private partnerships and commercialization of education which they had been preparing long before the pandemic struck. For the commercial providers jostling for leadership in higher education's future, it has been an opportunity to transform and revolutionize education, 'fixing' it through digital technologies (reminiscent of the promises of the television programmes and teaching machines of the 1930s referred to earlier in this chapter).

Indeed, the report highlights concerns about technological 'solutionism' such as the replacement of teachers with artificial intelligence (Al) and personalized study packages for students, approaches that might support an instrumental vision of teaching and learning while also echoing the science fiction of our retrofutures. Yet these are simply outputs of one form of neoliberal imaginary based on EdTech; there are other possibilities for the uses of technology. Williamson and Hogan (2021: 4) do stress that teaching and learning online 'is neither inevitably transformative nor necessarily deleterious'. They suggest that alternative imaginaries will be needed to counter those dominated by commercial interests.

3.3 The Algorithmic Imaginary

Commercial interests may go beyond just selling hardware and software and extend to the curriculum itself. In an earlier paper, Williamson (2018) draws attention to the ways that some of the commercial EdTech companies have been creating their own alternative schools. This means that the 'solution' to the problem of education rests not only in the provision of supporting technology but also in teaching the values and methods of the technocrats themselves. The lack of trust in teachers highlighted in Fig. 2 has been the first step towards this apparent solution to the 'broken education system' of the current social imaginary.

> They firmly lodge the algorithmic logic that everything is objectively calculable, predictable and manageable through technical systems – and the associated technocratic mentality that value-free technical expertise is preferable to political conflict – in the institutions of schooling. (Williamson 2018: 232–233)

There is support for this concern in a chapter from futures researchers who use science fiction as method. Extrapolating on the point in the story (in the *Terminator*

[2] See https://twitter.com/BenPatrickWill/status/1380626733376888837. Accessed 7 June 2021.

series) where 'the curriculum became self-aware', Gibbons and Kupferman (2019: 167) ask 'what Algorithmic Intelligence will think of the human teacher once it becomes self-aware'. Adapting the work of Philip K. Dick in imagining a data-driven society, they theorize a proposed new digital curriculum in New Zealand:

> the self-awareness of the digital technology curriculum will be evident in the tendency to prevent any questioning of not just its privileged status, or of the status of digital technologies in contemporary and future societies, but in the tendency to argue that all children are future workers for the digital system and the big data society (Gibbons and Kupferman 2019: 176).

The 'algorithmic imaginary' combined with significant resources from venture philanthropy was thus already being trialled in what Williamson calls 'silicon start-up schools' and university plans, before the Covid-19 pandemic struck. The potential for infiltration of both public schooling and the educational social imaginary is strong. If we want to avoid the implications of a reductionist and technocratic approach to education, we will need to create or animate alternative imaginaries. It may be difficult if a horizon is already established, but there is still hope as long as teachers can recognize that there are alternatives (Gibbons and Kupferman 2019).

4 Teachers, Imaginaries and the 'Not Yet' Futures

The neoliberal imaginary is undoubtedly affecting our present times and influencing much academic policy, teaching, research and writing. Some aspects, such as AI replacing teachers, might be more related to the near future and for many people would still be classified as science fiction. While imagined futures are an aspect of our contemporary social imaginaries, they will not necessarily be realized. There are alternatives, both actual and emergent, and there are ways of avoiding 'an unproductive cycle of critiquing overly optimistic *and* overly pessimistic narratives' (Ross and Collier 2016: 19) about technology and education. Ross and Collier argue for a stance of 'not-yetness' in relation to emerging technologies: working with them to see where they can take us, rather than using technologies to attempt to replicate classroom practices, or to simplify and tidy up complexity. They urge us 'not to narrow our vision to see only what we *can* account for' (Ross and Collier 2016: 28) and also reject the 'education is broken' claims, seeing emerging technology as full of possibilities, but not a quick fix to anything. The complexity of education requires a broader view.

The social imaginary is itself complex (Taylor 2004) and also relates to what is emergent. Not-yet futures feature in a comparative study of educational imaginaries in a PhD thesis by Assem Berniyazova (2018). Seeking to establish opportunities for collaboration in educational innovations between Scotland and Kazakhstan, Berniyazova has investigated the compatibility of social imaginaries in the two countries, with a focus on technological and social innovations. She traces the social imaginary at three levels: practitioners' (school-teachers') perspectives; the

industry perspective through academic publications and conferences, and the societal perspective through folk stories and political speeches. She finds commonality between the two countries: for instance, '[m]ost of the interviewees believed that teachers played an indispensable role in the lives of the young people' (Berniyazova 2018: 88). (This includes the suggestion that teachers should not be replaced by robots.) There are also some subtle differences, including different perceptions of time, and different attitudes to newness and technology. She is keen to highlight that her findings are not 'cultural diagnoses', and she makes some valuable observations on the realization of social imaginaries:

> The aspects of social imaginary are not the algorithms that prescribe (let alone predict) behaviour; rather, they are levers resorted to in order to navigate through events and experiences. In other words, an aspect of social imaginary is somewhat like a proverb: what matters is not so much what it 'says', but what it 'does' - how it is used. In that sense, some aspects of the social imaginary in each country encourage stability, while others encourage flexibility. Together, they pose as the necessary tools that eventually serve the adaptability and sustainability of the community. Therefore, some aspects of social imaginary that, at face value, may seem to be in conflict, could actually be very similar to each other. (Berniyazova 2018: 114)

Berniyazova's thesis provides a rare opportunity to counter the stereotypes of teachers from the neoliberal and other imaginaries, while at the same time explaining teachers' and others' views on 'the desirable one of us' that is nurtured by the social imaginaries in each country. The relationship between policies, envisioned futures and teachers' practices, is refracted in this thesis through narratives of folk tales, politicians' speeches and the interviews captured here, giving a complex picture. It is a fine illustration of the view that teaching plays a complex role both sustained by and contributing to the prevailing social imaginaries. It would not be easy to reduce this role to algorithms.

5 Finding the Teacher in Ecological, Biological and Biodigital Imaginaries

Given my concern about the teacher's potential presence and role in biodigital imaginaries, I sought evidence in books and articles that expressly refer to such imaginaries or those that might be related.

5.1 Education in the Ecological Social Imaginary

Buckles (2018) traces the effects of the modern social imaginary on education and makes the case for moving from an anthropocentric social imaginary to an ecocentric one that is global and future focused. As with proponents of the neoliberal and other imaginaries, the aim of Buckles and the authors he cites is transformation;

also like the neoliberal imaginary, there is an interest in systems thinking, both in terms of biological systems and educational design. Unlike the neoliberal imaginary, the transformation should not be focused on material gain for individuals and groups, but rather on stewardship of our natural resources. The resulting pedagogy, glossed as 'Connective Education', is a form of 'learning by doing'. Ideally, it should take place outside in the natural world, reminiscent of Rousseau with the young child Emile learning 'not in a classroom or through explicit instruction, but in the countryside by experiencing things of nature directly for himself, as they are relevant to his immediate desires and interests' (Friesen 2020: 148).

The focus, then, is on curriculum and values, aiming for promotion of ecological literacy that go beyond immediate desires and interests and lead to 'the development of competences, cognitive skills and dispositions that enable ecological literacy to be enacted' (Buckles 2018: 160). The chapter 'Education in the Ecological Social Imaginary' contains a considerable unpacking of the potential syllabus of 'Connective Education' and what the learner needs to understand, but there is no mention at all of the teacher and what their role might be, if any. The relationship between student and teacher is left as a question in the book's conclusion. Arguably, this could leave a teacher some agency and creativity in contributing to the vision; equally, it could lead to an assumption that a teacher is not needed, especially in curricular decisions. The book is interesting and worthwhile, representing an individual's imagined but 'not-yet' future rather than an actual social imaginary. Its observations on imaginaries are useful, though not particularly so for a reader looking to find the teacher among them.

However, visionary books and papers on sustainable and ecological futures that are inclusive of teachers do not have to be claiming to be an ecological social imaginary or imagined future, even if the work might have aspirations in that direction. A more recent work (Lautensach 2021) with some of the same values—the need for transformation, a transition from anthropocentrism to ecocentrism, attending to the ethics of sustainability education and to curriculum needs—adds a strong focus on the importance of teachers and teacher development. Despite some stark messages in the book, or indeed perhaps because of them, Lautensach positions teachers' professional capacities as giving them power along with 'the obligation of teachers worldwide to reach out across cultural divides to combat parochialism, to compare what works, to co-invent and to share pedagogical "wheels" rather than to reinvent them' (Lautensach 2021: 285).

This obvious respect for teachers is accompanied by a proposed pedagogy: a transition pedagogy aimed at sustainable education, which incorporates both progressive curriculum revisions and making the best of the existing curriculum. One key notion of 'protecting and supporting positive deviants' (92–94) indicates why Lautensach talks about power and the need for teachers: Greta Thunberg is the example given of a positive deviant. While some of the themes of this book are not yet in the prevailing social imaginary, Greta Thunberg most definitely is already present, supported by many (though not all) teachers, and across many different countries.

5.2 *Advances Hidden in Plain Sight: A Prompt from the Biodigital Imaginary*

Scholars writing about our biological or biodigital futures do not specifically address the teacher as part of the imaginary around education, and it is important to highlight this absence. It is perhaps not surprising; the topics themselves have other pressing messages for our culture. A rare reference to biodigital imaginaries (O'Riordan 2011) took me to an interesting point about the convergence between spectacular science fiction and more mundane practice, where the connection is almost unnoticed. She is referring to the establishment of circulation of people's genomic information as socially normative. 'Biodigital practices have arrived rather quietly—this, together with the rhetoric of convergence, obscures a dynamic move that could benefit from some disaggregation.' (O'Riordan 2011: 308)

O'Riordan's point has been picked up by Peters et al. (2021) as something to look out for when considering how biodigital communication will affect meaning-making. Availability of students' biodigital data would seem to move teaching into a new realm. The biodigital imaginary from O'Riordan's perspective has not included reference to teachers, though. However, it does chime with Williamson's (2016) report that biopedagogies, psychopedagogies and neuropedagogies are emerging with the potential to enhance bodies, emotions and brains respectively and feature in teachers' future repertoires in the formation of a biodigital child. Biodigital information about human bodies is very different from digital information (for example, avatars and online profiles) or analogue information (for example, descriptions, taxonomies and statistics) about them. Biodigital information can be extracted via digital processes directly from the body, at last allowing the biological to 'flow back through the circuits of the machine' (O'Riordan 2011: 257). An interesting aspect about O'Riordan's analysis is her strong emphasis on science fiction, both as a point of comparison and to aid with the language with which to talk about what is happening. Once again, science fiction has alerted us to the notion of convergence of the biological and the digital (or the human and the avatar) in the form of the cyborg: it is perhaps happening sooner than we think, which will have an impact on teaching and learning as well as other things we do together.

In turn, this prompts further reflection on what else might be missing from contemporary social imaginaries, simply *because* near-future events seem so like science fiction that they can be dismissed as such. Changes in human bodies as they merge with data and artificial intelligence may end up cutting off alternatives, with no point of return. If there are moves towards this, they should actually be represented in the social imaginary in a way that goes beyond myths and science fiction. In a moving autobiographical account of his journey towards becoming a 'cyborg' to overcome the ravages of motor neurone disease, robotics expert Peter Scott-Morgan[3] writes of a 'fork in the road' of the future direction of AI: an irrevocable

[3] For more information see his website at http://www.scott-morgan.com/blog/. Accessed 7 June 2021.

choice between biologically-enhanced robotic intelligence developing independently (the Hollywood dystopic version), and AI-enhanced humans developing collaboratively. In a pivotal moment, he tells his husband:

> We're charging down the independent AI route! We haven't all discussed it, let alone agreed to it, we're just doing it! Practically no one has even noticed that there's an alternative route, an alternative future that we're shooting past—like missing a motorway exit—we'll never be able to reverse back and take it. And we'll never have that choice again. (Scott-Morgan 2021: 118)

His story is about the great effort he and Francis Scott-Morgan put into making that alternative future a reality—supported by a wide range of scientific, technological and caring expertise—using AI to ensure his own continuing existence, presence, creativity and activity despite the failure of his body. When biodigital futures start to merge with science fiction, we need to be looking out for such forks in the road. They may also appear to be dead ends, such as the forms of horizon-setting seen in Fig. 2, which may require resistance and subversion. We also want to ensure that if there's a fork between a biologically-enhanced AI in teaching and learning route and an AI-enhanced human teacher one, that we take the right one *if we need to* do *anything at all.* There are again alternative narratives in the social imaginary and its fictions; for example, that AI enhancement may lead to new problems of inequality (see Ishiguro 2021).

6 The Effects on Teachers of Contemporary Social Imaginaries

6.1 A Lens on the Activity of Teaching

The theoretical concept of social imaginaries and what people say about them has been useful for drawing out some contemporary issues affecting teachers. To theorize beyond this would benefit from a lens that can help identify what people do to make things happen in a particular culture. One candidate that might be appropriate to investigating the imaginary that might form around the biodigital, is cultural-historical activity theory (CHAT). As Blayone (2019) explains: 'Activity theory draws attention to agentic humans inquisitively exploring and strategically instrumentalising digital technologies to extend their native capacities for achieving goals.' (Blayone 2019: 452)

The above quotation is a good summary of what Peter Scott-Morgan has done; it is also worth exploring it as an ambition for teachers and their champions in our new biodigital environments. I would therefore tentatively propose activity theory as a candidate for further analysis of teachers' not-yet futures which may be highly technologized and ecocentric. However, there is a debate about the continued use of activity theory, which was developed for the era of printing. It may not be adequate for the biodigital world. Blayone (2019) draws attention to different possible

emphases in activity theory that will affect the extent to which technology can be accounted for:

> On the one hand, Kaptelinin and Nardi (2012) emphasise that humans are uniquely capable of 'higher' mental functioning and acting with intention. On the other hand, Rückriem (2009) argues that our digitalised world has exceeded the limits of this anthropocentric view. (Blayone 2019: 454)

Kaptelinin and Nardi (2012), from the quotation above, are known for their work on human-computer interaction and their positive attitude toward activity theory is expressed in their preface: 'Activity theory is animated by an optimistic, positive, forward looking prospect in which imaginative reflexive activity always holds possibilities for just action.' (Kaptelinin and Nardi 2012: ix) They believe this is key to the use of technologies 'inflected by figurations of theory': we need good theory if they are going to work well. The other author cited, Rückriem (2009), does not actually use the word 'anthropocentric', but his warning strikes a note of concern. Rückriem (and also Blayone) privilege the theorizing of Leontiev (over Vygotsky or Engeström) for conceptualizing human activity in our digitalised world.

I would also like to privilege Leontiev's view of activity, albeit on a much smaller scale. For my current purposes—to suggest that if there is a biodigital imaginary then teachers ought to have a place in it—I am particularly interested in the potential explanatory power of Leontiev's (1981) account of the structure of human activity. In Fig. 3, I use his initial illustration of hunting, referred to earlier in the chapter, but I then apply the structure to teachers and their activity and associated actions in the accounts of social imaginaries. I particularly emphasize the role of operationalizing actions. Once an action has become a routine process, it becomes second nature or automatic, and may even be done by a machine instead of a human (such as gear changing when driving a car).

The object of the activity of teaching might be worded differently in different sectors and in different cultures. Berniyazova (2018) found that it was always expressed in Scottish secondary schools both by teachers and through

Fig. 3 Leontiev's hierarchical structure of activity (based on Leontiev 1981)

documentation as 'development of the whole child'—an example of policy becoming part of the teachers' shared imaginary. There may also be hidden objects of teaching, as we have seen: to do well in league tables, to attract further students, to make money. For teachers themselves, teaching will also be motivated by the need to earn a living, but of course there are other ways to do that.

There is no shortage of candidates to consider as goal-oriented actions involved in the activity of teaching: including planning a lesson, marking a paper, setting up a task. Once an action becomes routine, it can be done without thinking and can thus be operationalized. Cleaning the whiteboard, for example, has been an important operation in teaching and is likely to be done without involving too much conscious effort. Experienced teachers will also recognize a potential danger of operationalizing aspects of their teaching repertoire (going on autopilot) as they explain a method or deliver an anecdote that they have done many times before. While it can be useful and indeed necessary to be able to draw on such resources, a teacher can rarely get away with doing things 'unconsciously' all the time.

Some of a teacher's actions have now been routinized for them. Often this happens through bureaucracy and standardization, which can then be fully automated by software or apps, such as plagiarism or proctoring software. It is even possible to operationalize and then automate marking papers. As Audrey Watters has observed in a recent blogpost following a Twitter debate (Watters 2020b): 'We've taken that drudgery of analog worksheets and we've made that drudgery digital and we call that "progress."' Her argument is that if it is drudgery for the professor to mark it, it is probably also drudgery for the student to write it. That is what happens when teaching and learning are operationalized to the point of automation, which perhaps explains why teachers do not notice that they are losing more than a boring piece of marking.

An operation can be de-automized if required, turning it back into an action. A driver who suddenly needs to change gear, will be able to revert to the fully conscious goal-directed action of doing so. Even fully automated processes can often be overridden to revert to human actions, as long as the human still retains the skills and agency, and the technology and social imaginary permit it. If the automated marking does not work, the professor can return to the worksheets. Alternatively, and more productively, the professor might engage in academic actions assessing students in a way that contributes to the teacher's own learning and reflexive future use in teaching. This is not something easily replicated by technology.

6.2 Actions that Cannot Be Operationalized: Dialogue and Caring

One action that might be subordinated to the activity of teaching is 'engaging in dialogue' and there could be further subdivisions of this such as: listening, giving feedback, asking/answering questions, paraphrasing, summarising, reviewing,

challenging. Dialogue depends on conscious action and is unlikely to be operationalized, let alone automated. Apparent dialogue as used in chatbots, virtual assistants and other forms of AI, is not the same as here-and-now purposeful dialogue between two humans. This is not to deny the potential for apparent dialogue in teaching; one student has described interactions with a teacherbot as 'ambush teaching' (Bayne 2015: 463). At best, though, this is anticipated dialogue—part of a repertoire but not consciously delivered, even if it may appear to be so. This point is the same as was raised earlier, by Norm Friesen, when discussing approaches to 'personalized learning'. 'Dialogue, in short, is a ubiquitous yet irreducible experience.' (Friesen 2020: 155)

Dialogue has more than one interlocutor, which is sometimes overlooked in both research and teaching. Teachers are the people who know about students and their levels of understanding, and they get to know them through dialogue (spoken, written and digital). Taking away opportunities for teachers and students to be in dialogue brings an emptiness to the learning process. Teachers should be able to feed back their understandings from their students into decisions made about the curriculum and approaches to teaching. The loss of such dialogic knowledge would be profound, especially if the teacher cares that students are engaging and learning successfully.

Caring is perhaps more of an attitude than an action, but there are caring actions (including those seen above for dialogue). Teachers have a responsibility to care about their students' learning, and, usually, an inclination to do so. Moreover, it is through dialogue that teachers and students can activate this care: 'The response of the cared-for completes the caring relation. Without it, there is no caring relation—no matter how hard the carer has tried to care.' (Noddings 2012: 773). Noddings is talking about school students, and the caring relation includes finding out what the learner needs and not just making assumptions about it. But both assumed needs and expressed needs have to be met. Not all teachers are adept at this, of course, but the necessity for it is becoming greater than ever, and while technology may be able to support the care, it does not feel it.

The analysis above brings out the point that an algorithm is the automatization of a once human action. Not all human actions are amenable to such automation. Even for those that are, while they are still at the 'not yet' stage, it is important to decide whether automatization is the correct route. It might lead to a loss of human knowledge and understanding.

7 Endings and Futures

The main message from this chapter concerns the consequences of reducing or erasing teachers' agency. If there are competing pedagogies in our new practices, we need practitioners on the ground who understand those practices as pedagogies and not 'just the way things are'. Teachers need to ensure that resistance and change can emerge before a fork in the road has been missed or a horizon has been set and we

are left with no choices other than the pedagogies and curricula of the venture capitalists and technocrats.[4] It helps to be aware of the ways that our social imaginaries affecting education are infiltrated, and we need to engage with those imaginaries not just in academic papers and book chapters researching its damaging effects, but also in the wider media. Influential thinkers such as Audrey Watters and Ben Williamson are good at spotting emergent trends in our imaginaries, and sharing them widely through Twitter and blogs. They set us a good example.

Spotting such developments in the social imaginary is important; they are sometimes surreptitious while they are infiltrating our current understandings. To this can be added the complexity of organizations and professions affected by the social imaginary at local level but each with their own 'unwritten rules' (Scott-Morgan 1994). This is the same Scott-Morgan who has now become a cyborg; his expertise in decoding 'unwritten rules', which themselves show some similarity to imaginaries, guides his thinking about many aspects of his own future, including which are the right rules to break.

Just knowing about these matters is not enough: we need action for our own infiltration, subversion and resistance and the imagination to support this action. Scott-Morgan's autobiography ends with a fantasised account of later stages of his future, a story which originated as a fantasy novel that he started writing when he was 13 years old. It is probably the most utopian account of the end stages of a life lived with motor neurone disease. It contains much more imaginative use of technology and AI than my own unfinished fantasy novel from 1964. (To be fair, my main interest then was more in the application of technology to amusement parks than to teaching and pedagogy.) Like Scott-Morgan, we can do our own appropriate rule-breaking by going beyond the horizons set for us by previous imaginaries. Kupferman (2020b) encourages us to ask 'what if…' questions to aid our post-pandemic reimagining, saying '[l]et's play in the future by writing it.' (Kupferman 2020b: 50), following techniques from the 'good theory' he finds in science fiction.

As well as embracing the contributions of science fiction, social media, positive myths and deviants, for our new social imaginaries, we will definitely need good theory. Our success in finding appropriate uses for technologies that are 'not yet' impacting education will be dependent on theories that can properly account for what we are doing. If there is no room in the biodigital social imaginaries for teachers, then we will have lost more than we can possibly imagine. If we find ourselves heading for a world with a single pedagogy focused only on the reproduction of neoliberal values, it will demonstrate that we have missed an opportunity to the infiltrate the social imaginary with more stimulating and creative pedagogies.

[4] For many more examples of this trend, follow Ben Williamson's blog Code Acts in Education. See, for instance, https://codeactsineducation.wordpress.com/2021/04/20/valuing-futures/. Accessed 7 June 2021.

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