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*Digital twins and the terminology of “personalization” or “personalized learning” in educational policy: a discussion paper*

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# Digital twins and the terminology of “personalization” or “personalized learning” in educational policy: A discussion paper

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## Abstract

There has been a policy push in K-12 educational settings towards personalized learning in the last decade. Commercial platforms and learning designers have responded, offering learning tools to support teaching and learning through data-driven insights and recommendations. Trending towards the augmentation or replacing human teachers with non-human technology, this paper argues that personalized learning with human teachers is an entirely different process from personalization with digital twins. Drawing on new materialist thinking, it explores the impacts and implications for discourse concerning teacher quality and disadvantages within educational systems. It clarifies the conflation of the terms “personalized learning” and “personalization” to illuminate the power, positionality, and privilege enabled for some, in conflating terms in Australian educational policy.

## Keywords

Education, personalization, personalized learning, digital twin, metaverse, policy

## Introduction

In this paper, I explore the implications and impacts of conflating two terms: human-led “personalized learning” with technologically led “personalization” in K-12 educational settings. The paper explores the risks and benefits of conflating the terms, in relation to the concept of digital twins in an educational Metaverse. Digital Twin technology is one of the key technologies for building new online learning platforms in smart learning spaces (Yang et al., 2022) and McKinsey (2022) expect the Metaverse to experience \$5 trillion worth of investments by 2030. Notably—the Metaverse is not “Meta” or Facebook. The Metaverse is a series of interconnected digital realities

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or spaces online, and associated with offline realities that is expected to replace the internet as we know it today. [Accenture \(2022\)](#) states:

We have a distinctive perspective: that the metaverse is a continuum, a spectrum of digitally enhanced worlds, realities and business models. It will revolutionize nearly all aspects of life and business in the next decade, allowing collaboration in virtual spaces, augmented physical places and a blend of both. And it will create new lines of business and transform interactions between customers and companies.

[Zheng et al. \(2022\)](#) has forecasted that nearly 30% of people will spend at least 2 h a day in the Metaverse for education, socialization, work, and entertainment by 2027 and [Kye et al. \(2021\)](#) call for evaluation studies on data collection to support teaching and learning. Although, there are well identified risks ([Australian Human Rights Commission, 2021](#)), it is the difficulty in policy to distinguishing between technological innovation and human centered approaches that make it hard to keep pace.

With the “goal posts” currently undefined on a global scale, the commercialization of the Metaverse will see the benefits of interoperability, and predictability arguably over speak teachers’ practice in policy futures in local settings. Technological integration has long been referred to as “teacher challenges of engaging and implementing technology,” however, this paper argues that by conflating terms—implementation objectives are not explicit enough to enact. With the Metaverse expected to replace the internet as we know it today, enhanced capacity for educators to develop rigorous educational systems at any level of digital maturity needs explicit guidance. This paper provides an exploration of how digital twins connect with teachers’ negotiation of emergent technologies, educational practice, and educational policy. The intended outcomes of the paper are the development of robust debate and discourse about the adequacy of educational policy, and training claimed to improve educational practice associated with digital twins in the Metaverse.

To unpack discourse around educational policy associated with teacher quality and disadvantage associated with digital twins on a global scale, I begin by delineating two terms: personalization and personalized learning. I then contextualize the narrative to local settings, within the context of Australia, acknowledging that such issues are of global significance. By drawing on the context of Australian policy and educational settings I can provide grounded truths that can then be discussed in other contexts. I begin by explaining why “personalized learning” is an entirely different process from “personalization.” I then explore why these terms cannot be effectively discussed regarding their impact on education without a shared understanding and language, as digital twins and the Metaverse evolves. I explain the implications of the lack of a common language as a global phenomenon. I argue that personalized learning is entirely different from personalization because personalization is the educational equivalent of mass customization. In separating these terms into their constituents in educational policy, we are offered a nuanced means of revealing the correlation between socioeconomic disadvantage and teacher quality.

## Background

Digital Twin technology underpins the functioning of the Metaverse and is described as “virtual representation of a real object or system which is updated from real-time data, uses machine learning, simulation, and reasoning to help decision-making” ([Fourtané, 2022](#)). In simple terms, Google Earth may be conceived as a digital twin as it simulates the geographical location of multiple contexts globally. An educational Digital Twin generates a highly complex virtual model of people (teachers) and places (classrooms), that is the exact replica of a physical thing or person, and

underpin the ways in which personalization, automated decision making, and various simulations occur. [Accenture \(2021\)](#) states

Companies have experimented with digital twins for some time now, usually creating “digital doubles” of small pieces of their organization or processes. But that’s not enough to become an expert at change. Leaders are beginning to connect massive networks of intelligent twins: linking many twins together, powered by in-depth and real-time data, to create living models of factories, product lifecycles, supply chains, ports, or whole cities. This “mirrored world” gives companies an unbroken thread of data about their current state of being. It requires a comprehensive re-thinking of data practices, and a strategy for keeping data sources updated as processes throughout the company change. But combined with the power of AI, the mirrored world offers complex system modeling and simulation – the ability to ask “what if” questions and pivot as needs change. What if this vendor can’t provide the parts needed to keep production going? What if I need to take a factory offline for a day?

However, as [Biesta et al. \(2021\)](#) argue, fulfilling the desires of different groups can lead to the privatization of education. Instead of solely catering to the wants of different publics, education should prioritize meeting their actual needs. If we solely focus on satisfying individual desires, education becomes a commodity rather than a public good. As such, Digital Twin technology brings about impacts and implications requiring essential consideration in relation to teachers’ workplace, human, and consumer rights ([Arantes, 2022](#)). In Europe, the General Data Protection Regulation (GDPR) is a set of regulations aimed at protecting the privacy and personal data of individuals. One of the key ways in which the GDPR relates to AI is by recognizing the rights of individuals in relation to automated decision-making processes, including those carried out by AI systems. In the context of Australia, in 2021, the Australian Human Rights Commission tabled in the federal parliament, a new human rights report into technology calling for the appointment of an artificial intelligence safety commissioner to address concerns about the risks and dangers that artificial intelligence poses to privacy and human rights. Globally, there is a growing body of research around personalization in education that uses fine grained information on individual people, to identify and determine deviations from the norm. However, much of this research is guided by computational research into learning analytics and human computer interaction.

When considering the way that teachers will engage with the Metaverse, research into Digital Twins as an emerging technology that redefines the concept of quality teaching and learning, needs to include teacher representation. As [Janrić et al. \(2021: 1124\)](#) states,

There is a growing expectation that more and more courses will be taught in a hybrid or fully online mode, with seeming limited consideration of what might be lost by removing teaching and learning from the physicality and materiality of classrooms and lecture theatres.

Acknowledging the growing research base ([Gulson and Sellar, 2018](#); [Gulson and Witzemberger, 2022](#)) about how teachers are negotiating the Metaverse from a rights based approach, Digital Twin technology could function as a social equalizer in educational systems across Australia and the globe. As we evolve into the Metaverse, research into Digital Twin technology could lead to policy and practice, addressing concerns about inequity, segmentation, and discrimination. As [Buchanan et al. \(2021: 1179\)](#) state,

Ethical dilemmas do not come out of nowhere - there is often at least one antecedent moral failure which cascades into multiple tensions inside and outside of the educational sphere, bringing with it difficulties in both evaluating obligations and executing them.

Able to drive innovation, but with apparent risk, this duality in an educational Metaverse that needs effective governance. Without it, as this emerging technology matures, measures that ensure transparency of data collection, usage and derived educational benefits, as well as data privacy and consent will be unable to provide effective interventions.

Effective interventions to the Metaverse that aim to embed operative equalizing enhancements via educational policy and practice require a common language. This is essential and timely as [McKinsey \(2022\)](#) suggests that we will see a 58% rise or over \$48 billion invested in the Metaverse and digital twin technology by 2026, yet conversations around what Digital Twin technologies entail remain focused within computational realms. Able to provide innovation, and a more secure and seamless information sharing process, digital twin technology as part of the Metaverse is also challenged with technology integration, data security and bias, in part as a result of terminology. As Atwood “It’s impossible to say a thing exactly the way it was.”

The development of the right data governance structures and ownership models for using digital twins in interconnected global educational systems requires scaffolding language to proceed. This is seen to be a critical component of a strategic imperative for the digital transformation of educational systems. It is impossible to fully quantify the many nuances, gestures, and colors in teaching through digital data. As such, recognition of differences in approaches to teaching and learning are required in policy, to provide mutually beneficial outcomes for both education and enterprise.

To explain, technology-led personalization that needs human students and teachers as quantified beings, as a result, cannot ever provide the experiential learning provided by human-led personalized learning, which has impact and implication for educational systems at large. Currently, how digital twins inform personalization approaches in education are “Out of sight, out of mind” ([Atwood, 1998: 125](#)), thus keeping personalization celebrated as a solution albeit without a justification as to why or how. This is not new. For example, students are not instructed on, nor are they assessed by PISA (Global) or NAPLAN (Australia) in their understanding of how their old digital devices, which were once treasured possessions, ultimately end up as electronic waste discarded by their governments in developing nations as new technologies emerge ([Papastephanou et al., 2020](#)). All the while, teachers personalizing learning for students are like a “rat in a maze... free to go anywhere, as long as it stays inside the maze” ([Atwood, 1998: 165](#)), in a tiring, time consuming method that is largely relational and under celebrated.

Just like in Atwood’s “The Handmaid’s Tale,” the women of Gilead are not allowed to receive an education, as allowing the women to read and write makes them more likely to rebel. Teachers in Australia’s media does not provide teachers in K-12 educational systems to praise for human-led pedagogies ([Mockler, 2022](#)), making them more likely to rebel against the digital twins being presented as a “solution” to all their perceived failures. The move to embrace technologies in education has strengthened on the back of the ongoing teacher-deficit discourse ([Thompson et al., 2020](#)), and a generalized response to the industrial mass production models now common to the delivery of public services ([Peters, 2009](#)).

As such, embracing technology in the classroom is positioned as a technological imperative. Educational governance systems are therefore, guided by seemingly rational choice-making, albeit modulated by commercial goals and drivers ([Peters, 2009](#)). This dichotomy is further emphasized in a conflation of terms (Personalization vs Personalized learning) that has shifted the center of attention from the impact of quality teaching, to the power of a non-human classroom. With Digital Twins, like Google earth arguably replacing human teachers with data driven simulations, the classroom of the future may be a space where *things* speak to students through personalized insights, adaptive responses, and chat bots. It is critical that we scrutinize these *things* and their claims of

offering a means to provide opportunities and efficiencies not otherwise available without technology (Buchanan, 2011; Kant, 2020; Bernacki et al., 2021), and consider alternative perspectives to personalization and personalized learning. To enable effective interventions to the many risks discussed about the Metaverse, we need literature to speak back to the implicit suggestion that technological *things* provide greater opportunity than the capacity to improve educational outcomes than the human teachers who use them (Milan, 2020; Morozov, 2013).

## Theory

In this paper, I draw on St Pierre (2014: 374) where, as a writer, I am neither an author, “nor individual, nor present but always already entangled in an assemblage of reading, writing, and the world.” I collaborate with my understandings, knowledge, and histories rather than follow a specific, defined, systematic method. I shift between post-humanist and post-structural theory to think towards the (un)imagined, and transgress the things that inform technology and the human being (Brown, 2001).

Acknowledging that there are various arguments supporting the quality of teachers as capable professionals, and numerous calls for smaller class sizes and better conditions (Barnes and Cross, 2020; Churchward and Willis, 2019), this paper considers how the inconsistent use of the key terms “personalization” with “personalized learning” confuses the narrative about quality teachers and masks the implications of this suggestion. Claims that teachers are in a deficit and need technological solutions are predicated on a chimeric understanding that education cannot engage people that personalize learning promptly with teaching (Gore, 2021).

Teachers’ understanding of how digital twins are associated with, or not associated with, personalization or personalized learning is challenging to interpret, as the terms are conflated in policy, government reports and research. The conflation of these key terms has resulted in policy drivers that promote the augmentation or replacement of human teachers with non-human technology, which has disadvantages. From St Pierre’s (2014) thinking, I decenter the meaning making of policy enactment of personalized learning to ask questions about the socio-technical assemblages that are working to give value to the already-said. Although policymakers appear to have reached a consensus about the benefits of personalized learning (Bernacki et al., 2021; Graham, 2019), whether “personalized learning” means a human-led practice or technology-led in such policies remains unclear. Personalization means valuing the already-said, or the historical data that drives data-driven insights and adaptive technologies. If we place importance on the already-said and the already-written, whilst positioned that “it’s impossible to say a thing exactly the way it was,” there are implications for education on a global scale as a result of digital twin technology that enables personalization.

This challenge has strong reverberations for education regarding governance and policy and comes at the risk of compromising the reality of schooling. Despite intense discussion about datafication, schools will never be able to quantify each teacher or student’s individual complexities in an educational Metaverse. However, the reality remains that we live as an assemblage within a datafied society and teachers’ “mirrored” existence is commercially profitable, particularly when teacher quality is seemingly able to be quantified.

Indeed, while technology-led personalization is a growing trend, if considered circumspectly, personalization in education will still be defined as a “promotional genre” (Bhatia, 2005). When compared to the in-class reality of personalized learning, digital twins of teachers and their classrooms modulating governance structures and developing policy. Therefore, delineating terms is significant to clarify part of a broad marketization discourse and ideology in educational settings

that is inchoate regarding the actual reality of schools. The prominence of Foucault's thinking in terms of a mirrored self, and its consideration in education (Ball, 1990; Peters and Besley, 2007), engages us in the understand that this discourse is primarily associated with power and power relations.

Foucault explored the power relations between language and the ramifications of lingual alterations (1988). Foucault acknowledged the power that language holds. The specific parameters of meaning that a word can classify a *thing* (Brown, 2001), enact sense of we truth in claims about power. Power is not the institution of education and is discussed as "a complex strategic situation in a particular society" (Foucault, 1988: 93). Power penetrates everything, not separate from knowledge and can unpack the ways educational settings are constituted by performativity and quantification. Performances that do not test results, NAPLAN scores, and PISA results are mundane and ignored.

The metadata, the location data, and the cumulative assemblage of digital twins are dangerous and invasive entanglements used to construct the self in digital and datafied landscapes. Dominant discourses render the less represented in the data illegitimate and those who are different or marginalized positioned as not present or unthinkable. These new materialisms make space.

In this space, literary constructs provide an opportunity to facilitate subjugated discourses to resurface as resistance as (im)possible things beyond the human teacher. Where the materialist doctrine forgets that the human student and teacher alter educational settings, we must educate the educator about the power of attempting to divide the classroom into two parts, one of which is superior to humans within the room.

A new materialist perspective challenges the reductively linguistic interpretations of personalization learning and personalization. Urging a legitimization of other ways of seeing technology in the classroom and engaging in a Foucauldian notion of power, this paper emphasizes that everything, both teacher and technology, is in constant entanglement in the classroom. This way of thinking requires an epistemological and ontological commitment (St Pierre, 2014) so that we can examine, understand, and unravel the ramifications of lingual alterations made in policy entanglements in K-12 education, in relation to digital twins and the terms personalized learning and personalization. A discussion of the similarities and differences between personalization and personalized learning guided by new materialist theory follows.

## Teachers-using-technology and technology-using-teachers

Digital Twins have power. Commercial power that ascends policy in educational entanglements can be considered through the notion that teachers are using technology contrasted with technology is using teachers. The *things* that evolve due to these entanglements connect with teachers, technology, pedagogy, and educational practice in the policy that governs educational systems. Understanding stories of personalized learning and personalization in K-12 settings emphasizes agency or lack thereof in a classroom with technology. Personalized learning and personalization may be considered terms in technical democracy, as the technology is not bestowed a priori expertise over the teachers' experience-based local knowledge (Thompson et al., 2020).

Alternatively, it may be considered subject-object relations at a particular time and place (Brown, 2001). With language and literature central to these democratic inquiries, these terms act as a privileged medium for revealing the power of inanimate forms of technology in the human experience of education. Here, we will consider Foucault's notion of productive power as evident yet untraceable. As such, power in digital twin technology that enables personalization compared to human centered personalized learning is intentional. Both being social, commercial, and political

action that always “leave[s] something out, [as] there are too many parts, sides, crosscurrents, nuances; too many gestures” (Atwood, 1998: 134). Both personalization and personalized learning through their complex agency and materiality have the evocative and affective capacity to enact behavioral change, but not explicitly tailored for all. However, the physical act of exclusion that may occur with personalized learning in a classroom has received extensive training, education and policy guidance. The policy, legislation, training, and guidance for exclusion from an algorithmically derived digital twin is relatively unregulated. As such, the terminology used in policy makes the power of personalization or personalized learning visible, actionable, and affective.

The productive estrangement of the terms reveals the representation of technological things in educational policy and, as such, an understanding of what meaning such representations hold. What follows is a brief delineation between the term “personalized learning” and “personalization,” to explain the concept of Digital Twins and the terminology of “personalization of personalized learning.”

### *Personalized learning*

Personalized learning has developed in the last decade, giving students a central and active voice in their education. It forms part of a generalized policy push to encourage self-regulation and responsibility, framed as the increased co-construction and choice within educational settings (Peters, 2009). Personalized learning sees the teacher as a human with agency (Biesta et al., 2015), whether online or in the classroom, working with each individual student with agency (Livingstone and Third, 2017). Agency is referred to as the “power of the individual to choose what happens next” (Lindgren and McDaniel 2012: 344). Developing quality teachers underpins the policy push for personalized learning (Ludecke et al., 2021), and teacher agency sits at the forefront of this consideration. As such, personalized learning may or may not use technology. Personalized learning is relational, with human-to-human contact, whether face to face or virtually, playing a significant role but does not necessitate technology. Democratic and supported technologically, personalized learning focuses on the pedagogical practices teachers assert in and around the classroom.

### *Personalization*

Personalization is a data-driven process. Personalization has its foundations in business intelligence and is aligned with the notion of customization (Piller, 2004). Personalization leverages technological advances within education, dependent on technology, collecting, and drawing on data to make predictions (Siemens, 2013).

Personalization necessitates digital twin technology and enables data flows beyond the local classroom context (Kant, 2020), thus feeding data into the perpetuation and growth of audit culture (Shore, 2008) and allowing servitization and commercialization to flourish (Arantes, 2020). Notably, this discourse does not concern itself with NAPLAN and PISA’s pervasive and invasive assessment regimes. Instead, it refers to the “Facebook-style” algorithmic personalization discussed in many contemporary critical accounts (Zuboff, 2019; O’Neil, 2016; Bucher, 2016). Although sharing similarities and arguably underlying values, they are fundamentally different in terms of commercial drivers, the profitability of data, and enumeration. Through personalization, erroneous insights and recommendations are embedded in educational practice without the student or teachers’ specific knowledge or understanding (Arantes, 2019). As Holton and Boyd (2021: 193) state, “What it does do is elaborate human–machine asymmetries, without privileging human consciousness and agency.” In this paper, an audit culture is considered in the context of educational settings and



acknowledges that it does not privilege teacher agency. Personalization refers to circumstances in and around the classroom where the means and methods of accountability have become central organizing principles for the purpose of digital data creation and collection (often commercial data) through digital twin technologies.

### *The “personalization” of “personalized learning.”*

So it happens that a global policy response occurs. In this interpretation, Foucault argues that power is integral to the relationships between subject and subjectification, sees teachers as governable subjects, and technology as having productive power manifested through personalization. Power and relations of power blur and conflate the terms to not speak of subjects and objects, or human led personalized learning and technology led personalization, but elements of these power relations become owned by commercial actors. Power is therefore, not solely oppressive but also productive and allows personalization to “piggyback” on the digital revolution.

Emerging technologies provide new infrastructures for student and teacher participation and collaboration (Siemens and Baker, 2012), and advocates of technology-mediated personalization claim that it can transform the notion of “one-size fits all” education (Cope, 2008). Examples in Australian developments can align with the growing investment and interest in learning analytics and educational data mining (Baker, 2019; Shibani et al., 2020; Gašević, 2021; Dawson et al., March, 2019). Claiming to be capable of overhauling and improving educational outcomes with adequate training and communication (McLoughlin and Lee, 2010), emergent technologies such as artificial intelligence are increasingly part of policy drivers in Australian education. There is an embodiment of the power–knowledge assemblage in policy, and particular versions of truth and knowledge become enacted in the classroom.

### **The “personalization” of “personalized learning”: a conflation of terms in policy**

A non-deterministic way of linking “wider economic and political arrangements is through national variations in dominant policies towards big data... as might be expected from generalized theories of corporate and state-based power” (Holton and Boyd, 2019: 187). On the one hand, educational policy is pushing for quality teaching and, on the other, increased automation and efficiencies. These two concurrent policy drivers conflate personalized learning and personalization, making it increasingly difficult to understand, enact, research, and apply the policy in local contexts.

The agency of technological objects and digital twins that provide personalization is revealed by decentering the human subject in their materialist states. These new materialisms are, to a lesser extent, confined to representational forms and use the ontology of Deleuze and Guattari. They propose a relative constellation of imbricated ideas. For this reason, we have to learn a new, relatively incompatible language within an ontological grid of intelligibility. There remains a lack of prescribed and shared terms between education, commercial drivers, and technological innovations. The conflation of terms has consequences yet of receiving sufficient scrutiny and debate.

To explain, I will draw on Graham’s (2019) examination of the Australian Gonski report that aims to provide guidance on improve educational systems. Graham (2019) states “The Gonski report links the ideal of personalized learning to a yet to be invented formative assessment technology ‘tool.’ This is in keeping with most proposals for personalised learning, which see the enabling “capacities of ICT as central to its delivery” (p. 7). Gonski et al. (2018) both support the increased datafication of education (Williamson, 2019) and the quantification of teachers

(Thompson and Cook, 2013) as well as the further development of quality teaching (Ludecke et al., 2021). Reid (2019: 12) further clarifies this claim, arguing that Gonski's vision of personalized learning will lead to a generation of automation. Stating:

Take the concept of 'personalized learning.' It can describe a flexible approach to learning, which starts with each student's individual strengths and capabilities and encourages a wide range of learning activities. Or it can be used to justify a program of rigid and scripted individual learning progressions.

It is not difficult to imagine why Reid (2019) has conflated the terms. We could arguably interpret Reid's (2019) discourse to suggest that personalized learning is a flexible approach drawing on students interacting with teachers as humans.

Personalization is a program of rigid and scripted progressions based on digital twin technology that tailors insights and recommendations to individual students. In "Through Growth to Achievement" (Gonski et al., 2018: 99), the term personalization is not mentioned at all. However, there is a conflation of the meaning of the terms in educational policy, privileging the data driven process of personalization over the human led act of personalized learning. For example, personalized learning is presented as a recommendation, made real via "new solutions, such as predictive analytics and big data." With growing concerns about personalization (Peters, 2009; Williamson, 2017; Selwyn, 2019), these differing conceptualizations in the discourse demand clarity, renewed debate, and dialogue.

Notably, this argument has received attention in learning sciences, engineering, and educational psychology—but not educational policy. Bernacki et al. (2021), in a systematic review of personalized learning, identified 376 unique studies in an attempt to define and describe the term personalized learning. They found that researchers lead research into personalized learning in education, computer science, and engineering. Stating that "policymakers have reached a consensus that students should receive a personalized learning experience, policies provide broad latitude to allow schools to define what personalization means and how to implement it" (Bernacki et al., 2021: 2).

This plasticity in terms of implementation flags the challenges facing policymakers, researchers, and teachers in trying to understand how personalized learning may relate to technology. These terms remain entangled as they are "defined differently in almost every context where [personalized learning] is employed." (Bernacki et al., 2021: 2). Personalized learning is an entirely different process than personalization via digital twin technology, and any conflation of terms has significant implications for discourse surrounding teacher quality.

What has ensured is an intertwining of political and commercial actors determining what "education is" (Selwyn, 2019). This leads to an urgent reason for turning to materialism, to consider how privileged terms in policy provide a medium for power enactment in the classroom. As Coole and Frost (2010: 5) state, "the emergence of pressing ethical and political concerns that accompany the scientific and technological advances predicated on new scientific models of matter and, in particular, of living matter" need to be critically engaged with.

For example, the same technologies that enable collaboration and participation also normalize remoteness, a lack of transparency in decision-making, and data-driven forms of governance (Williamson, 2015; Selwyn, 2016; Lingard, 2018). Largely paternalistic, personalization draws on policies of the neoliberal era that focus on privatization (Peters, 2009), and calls for advocacy concerning educational data are increasingly common (Arantes and Buchanan, 2022). There is an emphasis on commercialization and market-like arrangements (Lingard et al., 2017; Hogan et al., 2018a), referring to insights underpinned by business analytics, placing learning as a form of

performative measure (Manolev et al., 2019). As such, efficiency, performance, and ranking underpin the policy push and the various ways and means to enact such policy in the classroom. Quality teaching as a policy push is only pushed when it can be quantified, rendering personalized learning subjected to the impacts of servitization (Arantes, 2020), and mass customization (Kotler, 1989). It demonstrates how these technological *things* are speaking to policy and policy enactment, as they have political and socio-technical agency.

## Impact and implication: we need to untangle privileged terms in educational policy

In summoning new materialism in response to privileged language used in policy, we begin by recognizing that insight into the workings of power is characteristic of linguistic or discursive forms of power. New materialists demand a theoretical reconciliation with material realism. Congruent with ontological post-humanist reorientation towards technology exhibiting agency, a consideration of political and socio-technological issues concerning education and a critical engagement with political commercial relationships, we can unpack constituent parts by firstly understanding their productive contingencies.

Acknowledging that technology has an agency that behaves in seemingly non-predictable ways, we can see that it leverages the assemblages in and around the classroom into aggregates of power. Being able to interact and engage with other assemblages, personalization, and personalized learning is seen as shaping and molding educational policy. With an agency that plays out through complex agentic assemblages and materiality, the human-to-human contact between student and teacher decreases through technology-enhancing efficiencies and control measures. Notably, Duhn (2012: 8) argues that agency

*is no longer the expression of sovereignty and of an autonomous, knowing self but a seeking of encounters with vibrant matter that force continual invention to maintain the relation between movement and rest.*

Although personalization may be *things* such as automated role marking, assessment, or adaptive testing through personalized search, research, and automated language prompt—it is very different from personalized learning in terms of its productive contingencies. The new materialist way of seeing the constituent parts of personalization and personalized learning in practice is to bring to K-12 settings a nuanced way of thinking about the political, socio-technical, epistemological, and ontological nature of terminology related issues in policy.

What follows is a discussion of the “personalization” of “personalized learning” in relation to five impacts and implications for education that include Equity, Agency, Commercial actors, Quality, and Dehumanization.

### Equity

Knox (2019) argues that we need to “open up new ways of thinking about the digital and frame such discussions in the context of longstanding philosophical and theoretical questions and contemporary concerns” (p. 280). One such concern is that personalization instils a business model within education that establishes a profit-driven form of individual competition through data and analytics. It is challenging to question principles of equity when educational policy discussions are restricted to the framing of efficiency, predictability, and calculability (Thompson and Cook, 2013).

It is further complicated when talks about the process of instilling technology-led personalization are critiqued as value signaling, ideological, and self-serving (Moore et al., 2021). Concerns about how disadvantages may align with human-led personalized learning or technology-led personalization become silenced. Therefore, classrooms underpinned by personalization have been considered a working space “in which digital has become part of everyday use and has become integrated into everyday life, action and gestures” (Striano, 2019: 83). In such contexts, broader data infrastructures and policy aligning with an audit culture are prioritized over human interaction and engagement (Moore et al., 2021).

From this perspective, it is acknowledged that quality teaching and efficiencies are measured via institutional data, not the personalized way in which human teachers relate with students. Thus, there is a lack of technical democracy (Kitto et al., 2020) alongside teachers’ de-professionalization (Hogan et al., 2018b). As a result, platforms that offer personalization no longer depend solely on the innovation of education to ascend the marketplace (Tauqeer and Bang, 2018).

## Agency

Leite, Fernandes, and Figueiredo (2018: 436) state, “students benefit when the curriculum is developed in ways that consider their social backgrounds and cultures and local characteristics, in line with the notions of... personalized learning.” Personalized learning encourages the teacher to provide an eclectic offering that enables students to engage with learning activities based on their educational needs, personal interests, aptitudes, and abilities whilst retaining technology as a supplementary tool to be used as required.

Personalized learning describes a flexible approach educators take to build on the student’s individual strengths and capabilities (Dewey 1923) and is underpinned by student-centered theory. Notably, personalized learning does not necessitate technology. Undoubtedly, there are multiple instances where personalized learning involves technology. The critical point is that the teacher, in consultation with the student and their family, has agency and choice and control as to whether they use technology, which provides data flow to external stakeholders. Graham (2019: 6) suggests that “Many teachers... would argue that their prevailing pedagogy is already one of personalized learning, albeit within the constraints... of NAPLAN to judge schools and the quality of their teaching.”

Underpinned by the combination of policy drivers that aim to increase personalization (Williamson 2019) and presented as a paucity of teacher capability (Bonney and Williams 2009), the notion of teacher quality in terms of digital twin technology is arguably being pushed towards “the promise of self-directed, personalized and individually empowering activities” (Selwyn and Bulfin 2016: 274). Current policy conflates teachers who practice personalized learning without necessitating technology and teachers acting as “facilitators” and “problem-solvers to artificial intelligence platforms” (Savage 2019: 7).

Considered significant as the policy push for technology-led personalization perpetuates discourse that “getting ‘better people’ into teaching signals profound disrespect for and distrust of the current teaching workforce – effectively declaring incumbents not good enough” (Gore, 2021: 46). The policy that holds teachers to account for the quality of teaching is also encouraging or mandating forms of technology-mediated personalization enacted as a result of perceived deficiencies in incumbent teachers. By unpacking the terminology used, policy related to quality teaching and personalized learning can instead focus on the deficiencies increasingly evident with personalization (Barocas and Selbst, 2016).

## Commercial bias

New materialists discern generative power within technological systems while eschewing a division between human teachers and digital data and analytics. Ascribing agency to the algorithms that underpin personalization, new materialists purport powerful efficiencies that defy human teachers will and want. The dense networks of power that constitute subject objectivity and material reality can change conceptions of material causality, shifting the gaze towards the significance of technological corporeality in educational systems. We look for the way power is present to reopen the issue of how technology shaping K-12 educational systems society and circumscribing human behavior in and around the classroom according to commercial goals and drivers.

Let's consider the ways mass customization, a form of personalization, may impact education. We provide ourselves with a vehicle to consider the implications of personalization (vs personalized learning) within educational systems. With customization initially a strategy for involving customers in developing a product or service (Peters, 2009), we can consider that personalized learning morphed into personalization alongside the so-called "digital revolution" to increase efficiencies. Tseng et al. (2017) describe mass customization as the ability to "deliver goods and services that meet individual customers" needs with near mass production efficiency.'

Arguably mass customization and personalization seemingly provide a means to overcome the difficulties of "one size fits all" educational settings cost-effectively without getting "better people" into the teaching workforce. But aren't digital twins benchmarked averages—or more simply put, stereotypes of human complexities? Personalization, but not personalized learning, is more like leveraging servitization (Arantes, 2019) and mass customization to increase revenue rather than the relational, human elements of education. As Moore et al. (2021: 8) state:

Classrooms are graveyards to costly gadgets imposed on educators to answer problems they did not name; interactive whiteboards are the most ridiculous, underused, and wasteful in recent history.... financial investments reflect the belief that technology can raise standards, transform education, personalize learning [and] rather than drawing on the expertise of educators, their professionalism and effectiveness is called into question, and they are often blamed for each supposed crisis.

Although personalization offers the statistical data sets to provide "good teaching" through the creation of insights and recommendations, it is the logic of education policy as change based on conflated terms that do not make sense. Moreover, the quality of personalized learning, if conflated with personalization, is different. The logic of education policy as a process of reform, when the system is conflated between human-led personalization learning or technology-led personalization, remains predicated upon a desire to repeat practices for the masses—to which neither can with generalizable, accurate results.

We can see that services (teaching) and products (technology) have become entangled. This entanglement evokes notions of servitization (Drucker, 1987) that see technology as a product and that teaching service is inseparable. There remains a "glitch" with relatively binary, narrow, and calculative infrastructures determining what is measurable. In circumspect terms, if we consider the restrictive models that aim to quantify success and excellence, we need to consider the implication of increasing dependence on quantitative measures when they are more privileged than relational characteristics (Peters, 2009). Where regulations of services and products of education, we enable personalization to be a product that offers a "cost-effective" solution to personalized learning (Moore et al., 2021). However, these are short-term savings due to the "cost" of long-term impacts associated with defunding public education that serves Australia's most disadvantaged.

## Quality

To unpack how this is cost-saving is defunding public education, I draw your attention to the fact that the term “personalized learning” does not necessitate technology. It does not “piggyback” on the digital revolution. Rather personalized learning depends on the interpersonal power relations among and between teachers and students. Personalized learning engages the notion of the meaningful engagement teachers assert in their practice and aligns with a key policy target of securing the quality of education. Ludecke et al. (2021) note that developing the teaching workforce has long been the objective of achieving this target. Churchward and Willis (2019) discuss this policy driver and explain that it is justified through claims that lifting the quality of teachers will increase the performance in domestic and international student assessments.

Nevertheless, the concept of good teaching is poorly defined, and there is an increasing commercial footprint in justifying what quality looks like (Gore, 2021). I firmly believe that good teaching is not a commercial product. If we see personalized learning as a service detangled from digital twin, or the product (technology), we can reconsider quality teaching and how it is empowered in policy. What impact has efficiency, predictability, and resultant accessibility had on the quality of education? How does commercial data relate to educational disadvantages?

Arguing that features of the built environment provide the opportunity to engage in healthy and unhealthy behaviors, Thornton et al. (2016) demonstrate that fast food restaurants are more prominently located in socioeconomically disadvantaged areas. Teachers engaging in “free” personalization tools are akin to similar pressures. Secondly, fast-food restaurants are often located close to K-12 schools within Australia’s most significant underprivileged areas. Identifying that access to a high number of fast-food restaurants encourages the greater consumption of fast food products, Thornton et al. (2016) call for increased knowledge of the distribution of fast-food restaurants in Australia to assist policy mechanisms where they are most targeted needed.

By considering personalization to be the “fast-food” of education, we begin to understand that we need to audit any correlation between socio-economics and personalized learning across Australia when using digital twin technology to inform predictive outcomes. This is not possible without clarifying the difference between technology-led personalization and human-led personalized learning.

## Dehumanization

A multidimensional account of personalized learning argues that it is an entirely different process than personalization. Although, personalized learning may be institutionalized in those schools that can afford to keep the teacher in the classroom, more so than those that cannot. Foucault wanted to unmask power but also how power is exercised over the subject through disciplinary power. Personalization can classify and objectify the human teacher, producing things that also discipline and classify future insights and adaptive technologies. The paradoxical position of a productive classroom, that appears self-governable, conjures thinking around Foucault’s conceptualization of mechanistic control. Considered “a type of power, a modality for its exercise, comprising a whole set of instruments, techniques, procedures, levels of application, targets; it is a ‘physics’ or an ‘anatomy’ of power, a technology” (Foucault, 1979: 215), power penetrates the classroom and impacts teacher capacity for quality outcomes.

Personalized learning as a human interaction, does not necessitate technology. It is not a rational method to measure success and excellence via institutional data when it is the people or the humanistic factors (Hayes, 2019) that result in quality outcomes. Thus the concluding discourse is

positioned in the context that, firstly, there is a conflation of terms, allowing a policy to refer to human-led personalization and technology-led personalization as one in the same process. Secondly, that personalization which enables an audit culture is promoted in policy, due to greater efficiencies. When considering Foucault's thinking about power, we may trace notions related to the socio-technological, commercial and political frameworks that govern educational settings.

Just as fast-food restaurant McDonalds' has leveraged the location of their fast-food restaurants to be in areas with greater levels of disadvantage, there has been a shift in norms toward unhealthy choices amongst vulnerable populations (Thornton et al., 2016). We can understand the distributional patterns of personalization versus personalized learning for policymakers to target appropriate mechanisms in this metaphor. Budgeting for teachers over technology, where they are most needed, would provide healthier outcomes in K-12 educational systems.

## Concluding remarks

The increasing prevalence of technology led personalization dependent on digital twin technology is increasing alongside the evolution of the Metaverse. It is when digital twins are portrayed more favorably for profit, than human teachers that the term personalized learning in policy becomes of fundamental concern. While teachers are encouraged to understand their rights within their workplace and assert them as required (Bai and Wang, 2021), they are also working in schools that both mandate or expect them to engage with emerging technologies that offer or use personalization (Buchanan, 2020). Thus the classroom is being mandated or encouraged to perpetuate an audit culture that increases and perpetuates digital twin technologies, where quantified personal and school accountability is bestowed importance (Bai and Wang, 2021). As such, the audit culture and quantified reporting of quality teaching is arguably at the expense of acknowledgment of the relational, human engagement of a human teacher (Biesta et al., 2015). Further this is arguably due to the marketization of education systems.

In this context, the human relational characteristics of personalized learning are systematically silenced due to cost. The datasets provided by digital twins and personalization, but not personalized learning, justifies the perceived cost-saving measures of personalization in the classrooms. Let's consider personalization as the fast-food of education and personalized learning as the local restaurant. We can conclude that by unpacking how socioeconomic disadvantage aligns to the conflation of terms to identify that we may be walking toward increased disadvantage as a result of the conflation of terms in educational policy.

If personalization is fast food, personalized learning is the healthy alternative. Personalized learning provides an approach to teaching and learning that may include and consider various teaching strategies tailored to the individual student in a classroom. Personalized learning is essentially a student-centered pedagogy. It is a complex and multifaceted process that can refer to a sense of connectedness and place. It can be associated with creating built environments that talk to and respond to student needs via creating and constructing new learning spaces. Personalized learning can also be described as the curriculum, teaching, and learning activities tailored to individuals student needs and interests. It sees collaborative relationships between teachers, students, and parents in identifying, organizing, and applying approaches to learning, widely used across.

Personalized learning is relational. It may include a variety of eclectic strategies, from outdoor experiential learning with small groups to whole-class activities that involve hands-on practical components, technology, and individual one-on-one tutoring. A personalized approach to teaching and learning has also been related to sociocultural views of learning where the interaction between teacher and student. Whether providing feedback or engaging in activities, personalized learning

acknowledges the agency and individual complexities of the student within the context of the classroom, before the commercial goals and drivers of external stakeholders.

In conclusion, personalized learning should not be conflated with data-driven practices and personalization. We need a reconstruction of the terms, to make clear that human-led personalized learning is not a standardized and generalizable form of engagement, which can be quantified, metrified, and datafied. We must clarify that technology led personalization allows for the deification of quantification and forms of power that thrive on benchmarked averages, generalizability, and standardized testing. This is urgent, because the human teacher is no longer intelligible, particularly when the productive power of personalization enables *things* that welcome commercial actors into the classroom.

Whether servitization, marketization, or profitability of data collected from technology in K-12 educational settings, human-led personalized learning is not independent and self-contained. Instead, the human teacher cannot be separated into the “human subject” in new materialistic conceptualizations, and it is our responsibility to privilege the human over the assemblage. The human teacher, who is supported by technology already is more-than-human. This construct is always becoming and privileged terms in policy support the evolution towards an audited, deficit based narrative dominating discourse.

Through this paper, I have clarified the differences in the conceptualizations and why we must enact change in policy terminology as a result. With Gonksi promoting personalization and personalized learning, policymakers can use terminology discussed in this paper to challenge the foundational claims of personalization and promote a reality where human teachers are enacting human-to-human personalized learning.

As such, and acknowledging that the move to embrace personalization aligns with an underlying discourse that the improvement of education is predicated on the discourse that education cannot get better people (more efficient, offer greater opportunity), this paper calls for policy drivers to be analyzed in terms of whether they are trending towards non-human technology, albeit using inconsistent terminology. Although policymakers have agreed that a personalized learning experience is beneficial, we must continue to unpack privileged terms and power in educational policy associated with teacher quality.

Further research on how personalized learning is different from personalization and how personalization is or is not shifting education towards mass customization is urgently needed to explore how the ideal of personalized learning aligns with the enabling capacities of ICT as central to its delivery. Although the context of this paper is localized to Australia, a discussion on the generalizability of these arguments to other educational contexts on a global scale is crucial. For example, given the increasing adoption of emerging technologies in education and the interconnectivity of the online world, it is important to distinguish between the terms “personalization” and “personalized learning” beyond the English language. Further, how might these terms be considered from different cultural and social perspectives? As such, this paper calls for more research to understand the implications of conflating these terms on a global scale—in policy and legislation. It is assumed that these terms are crucial in having a shared understanding of their implications in policy in Australia and other English speaking country’ legislation. But to understand that this collective narrative is limited by language. It is by having a collective language across geographical boundaries and knowledge domains that we may ensure that technology is used in a way that supports, rather than detracts from, teachers’ rights, student learning, and educational well-being on a global scale. In sum, there is a significant need to encourage greater debate regarding the impact and implications of technology-led personalization and how greater clarity in terminology can assist effective policy enactment in the classroom.



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