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Data Science, Algorithms, and Curriculum Studies

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In the last half century, the interdisciplinary field of Curriculum Studies has defined itself in contrast to the administrative practice of curriculum development. Drawing productively and creatively from the humanities, including philosophy, history, theology, literary criticism, art criticism, poetry, and psychoanalysis (Taubman, et al. 2006), Curriculum Studies has also been deeply influenced by the “studies movement” more generally, taking on strategies from gender studies, cultural studies, Black studies, ethnic studies, queer studies, indigenous studies, and science studies. As editors of this special issue, we have written for decades about science (Weaver and Appelbaum) and mathematical matters (Appelbaum) within Curriculum Studies, but we have done so consistently with a humanities foundation. With this special issue, we aim to make science and mathematics more readily accessible and applicable for *JAAACS* readers. We do not mean to suggest that Curriculum Studies do an abrupt about-face and begin a new journey into the realm of quantitative, abstract mathematics, or empirical science. To undertake such a project would be misguided and ahistorical. Indeed, we believe such a perspective would be erroneous. Rather, the articles in this issue build on the growing body of humanities-based scholarship delving into the realm of data science and algorithms. This cutting-edge work should not be ignored by our field! Just as Curriculum Studies blossomed through interactions with 20th-Century humanities, 21st-Century engagements with data science and algorithms reveal new terrain and conceptual opportunity, elaborating science fields and associated, long standing sociological, historical, cultural, and economic concerns. New perspectives on racism, patriarchy, heteronormativity, settler colonialism, and ethnocentrism, for example, potentially bring fresh and vibrant directions. We invite Curriculum Studies scholars to catch up on the growing literature of critical data science, and to begin probing the many ways that data and algorithms shape educational experiences at all levels and in all educational contexts. We also believe that

Curriculum Studies can bring many insights to data science and algorithm studies, just as Educational Studies has pushed scholarship on any and all experiences to appreciate the role of power-knowledge relationships, designed environments, and institutions of education (family, religious communities, popular culture, public spaces, advertising, political truthiness, etc.). For us, the “issue” is not, “Should we join in the discourses around data, algorithms, and social justice matters?” but rather, “Why has it taken Curriculum Studies so long to explore this work, and to join the fray?”

The stark reality is that data and algorithms affect our lives not just within education but in all facets of experience. This is daunting and overwhelming. Data sociologist Geoffrey Bowker (2013, p.170) bluntly explains, “If you are not data, you don’t exist.” If you are not in a databank and there [are] no traces of your activity, then do you exist in the world? For governmental, economic, educational, and sociological purposes, the answer is an unequivocal no! Your data defines who you are, and if and how you are seen in the world. Your data allows you to move freely in the world (e.g., a visa or passport); to enter a hospital and leave alive (test results read by a medical professional and your online medical summary); to enter school and leave credentialed (your scholastic test scores, G.P.A., S.A.T., and of course your standardized test scores); to enter an on-line or physical store to shop (your credit card number); to enter a sporting event (your cell phone ticket app); indeed, to enter any other area of life, including the internet. If you wish to avoid this network of data collection, you would have to remove all traces of your existence and willfully deny yourself access to each institution that might matter to you in the world including your family. Even then, assuming you accomplish this challenging task, any governmental or cultural entity that wishes to locate you can -- and will, eventually. Nobody is free from the informational network, except for those who “do not exist.” And once we begin to entertain the concept of those who exist but do not exist, we begin to see why it is important to study the impact of data science and algorithms. Those who do not exist in data science and algorithms are those very people who do not count in society to begin with. Despite proclamations stating otherwise, the realm of data science and algorithms is not free of the very same racialized, gendered, colonialized, and classed assumptions perpetuated and amplified by other structures of social injustice. Long-standing scholarship on social reproduction is reframed by the invasive spread of data science and algorithms, since this proliferation reproduces the very societal conditions we routinely experience every day. Resistance to social and economic reproduction cannot be effective if we work from the presupposition that data science and algorithms are free of human prejudices and forms of discrimination. Data and algorithms are created from a racialized, gendered, colonialized, and classed society, and therefore bear the marks of this society. Indeed, even as they hide their own function as a tool of injustice, and even as they promise solutions to apparent problems, they effectively interweave

ideological, hegemonic, mystifying, and ignorance-inducing structures of coloniality, environmental devastation, anti-human practices, and neoliberal geopolitics. It is our role as scholars interested in matters of social justice, equity, and the sustainability of our shared planet, to interrogate how data and algorithms mimic and elaborate upon these discriminatory practices, and to understand better what impact these practices have on educational decisions. (For two recent examples of such a focus, see Perrotta & Williamson 2018 Liu & Huang 2017)

Since we proposed this special issue for *JAAACS*, discussions and prophecies about AI and the data upon which AI floats have proliferated in popular and professional discourse. Yet studies diving into the impact of data and algorithms have percolated for at least the last fifteen years. Nevertheless, as Jer Thorp (2021, p. 33) notes, “We live in data, but we have not, as of yet, figured out how to be citizens of it.” Thorp’s comment suggests a few important aspects of studying data and algorithms. First, people have not figured much out yet; so, although we as Curriculum Studies scholars might be late to the debates, we are not too late to make a meaningful impact on important decisions about how data is collected and how it is used. Second, he uses the word “citizen,” which historically implies living in a democracy. Data and algorithms are not inherently democratic or anti-democratic, but like most human realms it appears easier to assume everything done in the name of data collection and algorithmic action is for the good of humanity, despite many unintended consequences that undermine democratic movements --especially when they are controlled and constructed by multinational corporations. However, if we work from the assumption that data and algorithms are not neutral and very much inventions of human societies, then we can begin to ask probing questions: What is the history of data? What assumptions are behind specific instances of data collection, and of data collection in general? What human aspects do algorithms erase? What historical assumptions do data collection methods and algorithms concretize, and how can new approaches that specifically address traditional racialized, gendered, colonialized, and classed assumptions and categories change how data is collected and algorithms are created? Most of these questions reframe classic orientations to Curriculum Studies as a field, that is, which rephrases common Curriculum Studies methods. For example, they point us to the Schubert questions about what knowledge is of most worth in which circumstances, who is deciding this, and how the valuing of some forms of knowledge matters – and for whom does it matter in what ways? (Schubert 1985) The simultaneous data-ization and the invisibility of its ongoing actions apply those orientations to Curriculum Studies that focus on the interdisciplinary study of everyday experiences as the emerging curriculum (Pinar’s *currere*, Pinar 2004). The all-pervasive nature of data and algorithms provides on the one hand an important set of contexts for the application of public pedagogy methods, and on the other hand, for critical geography

in the consideration of where data impacts whom in space and time (Helfenbein 2021). The artifacts of data science and the technologies of algorithms can provide case studies of everyday life curriculum (Ng-a-Fook 2011). The instantiations of data and algorithms as potential transitional spaces yet also the pre-emptive figure of authority and constraints (Ellsworth 2004), the historical attempts to use data for democratization (Snyder 1993, Cline Cohen 1999, Tschaepe 2021), the study of education as forms of qualification (Foucault 1977, 1991) and the construction of ignorance (Sullivan & Tuana 2007, Malewski & Jaramillo 2011), and the globalization of data as an imperative of coloniality (Paraskeva 2020, Appelbaum 2019), are only a few of the opportunities that this special issue offers for the engagement of Curriculum Studies with data science and algorithm studies. The articles in this special issue begin the search for alternative means of collecting and interpreting data and for critically interrogating the historical assumptions embedded in algorithms, addressing for example, long-standing forms of discrimination and environmental destruction.

Liang Wang and Bernadette Baker note in their contribution to this issue that digital technology relies on non-semantic “representation” tied to probability, i.e., binary digits. They explore how the sliding signifier of “intelligence,” an indicator of Man once incarnated in terms of moral capacities and phenotype/genotype, has been and is being newly enfolded through the mutual formation of a “representation”-technology intertwinement. They elaborate on how education in general, and Curriculum Studies more specifically, continue to interact with embedded forms of discrimination once associated with semantic “representation”, despite the seeming promise that they would be eradicated through enfoldment-as-information the questions this leaves education in general and curriculum studies specifically with, when the seeming disembodiment occurring via binary digits does not lead to the eradication of discriminations once associated with semantic “representation.” This continues processes set in motion at least as far back as the 1920s and 1930s, in the United States, as Colin Koopman (2019) demonstrated in his study of original attempts to collect and manage data in various economic and governmental realms. Data collection and algorithmic processes embodied discriminatory assumptions in their inchoate forms, and such efforts continue to shape economic and government policies well into the civil rights era and beyond. Koopman encouraged us to...

... imagine an alternative history of the twentieth century in which connections between data and race had not been forged. No redlining, no credit inequity, no financial racism, and no prejudicial inequalities on any scale large enough to require statistical reasoning. In such an alternative history, racism would surely have sought and may indeed have found, other means of maintaining itself. But

alternatives would have produced a racism dramatically different from that which persists today. (Koopman, 2019, p. 113)

Koopman suggested that the very thing we refer to as systematic racism today has its roots in data collection and algorithms that embodied and circulated this racism. If those systematic roots embedded in the forms of data collection had been questioned from the start, racism as it has taken its many shapes would look very different than it does today. This is a major assertion by Koopman that warrants further exploration if we are serious about confronting matters surrounding systematic racism in the United States.

Eva Jablonka's article in this issue takes Koopman as a springboard for elaborating on specific formatting techniques of schooling that shape the "informational person." Her genealogies of human bookkeeping, the algorithmic personality, and segregating data demonstrate how processes of infopower such as blank forms, certifications, and grading systems take on formatting structures through a normative ambivalence to "student background" and other forms of "information." Jablonka's reading of Koopman suggests that "a focus on the productive function of formats in creating new realities, away from (mere) attending to what has been omitted in quantifications and mathematical models, opens new paths to be pursued." She proposes that school experiences might involve study of those performative functions of the educational person's informatics that bring into being the realities that they set out to describe. In so doing, they may provoke or assist escape from "the fastening of teachers and students to measures of achievement and to overcome the impediments of the "assessment stance" with its limited conception of equity."

Koopman is not alone in suggesting data science and algorithms are implicated in current sociological concerns of contemporary society. Ruha Benjamin (2019, p. 26), in her book *Race After Technology*, asserts that her book "explores not only how emerging technologies hide, speed up, or reinforce racism, but also how race itself is a kind of technology—one designed to separate, stratify, and sanctify the many forms of injustice experienced by members of racialized groups...." Richard Jean So (2021), critically discussed in Rob Helfenbein's contribution to this issue, takes Koopman and Benjamin's work further, proposing that we begin to use quantitative and data mining techniques to explore matters of race in society. So explores the realm of literature -- the stuff of our school curricula, as well as the publishing industry, to demonstrate the illusory nature of diversity in regard to "who gets published how." Quantitative approaches and data modeling allow us to see that from the 1960s to the early 2000s the literary world has remained overwhelmingly (90-95%) white. This stark quantitative reality covers the same period in which the culture wars raged and conservatives

complained that literary standards were declining because publishing houses were more interested in diversity than quality. So's work shows how conservative claims were groundless, and how progressive hopes for a broader range of authors were never achieved. As Rob Helfenbein describes So's work extends Benjamin's (2019) shift of purpose: "the point is not simply to help others who have been less fortunate but to question the very idea of "fortune": Who defines it, who distributes it, hoards it, and how was it obtained?" (Benjamin 2019, pp.193-194).

A critical focus on data science and algorithms is not just about racial matters. Wendy Hui Kyong Chun's (2021, p. 27) work "reveals how correlation and eugenic understandings of nature seek to close off the future by operationalizing probabilities; how homophily naturalizes segregation; and how authenticity and recognition foster deviation in order to create agitated clusters of comforting rage." In the early days of the emergence of new technologies, the 1990s, the literature within humanities-based fields covering technology were filled with utopic proclamations of hope that these new technologies would naturally promote new forms of diversity and acceptance of diverging perspectives. The hope was that a sort of technological nirvana would emerge, in which people with divergent backgrounds and opinions would come together and discuss their differences. The opposite happened, as Chun shows. Technologically constructed "neighborhoods" have developed, in which *The Stepford Wives* and *Handmaid's Tale* meet the Proud Boys and the Oathkeepers. Together, they form a white supremacist self-help group to reestablish a settler colonial, patriarchal, and heteronormative society ignorant of climate change and other global crises.

Catherine D'Ignazio and Lauren Klein (2020) have entered the discussion too, to point out that how and what data is collected matters, yet who collects the data and constructs the algorithms matters more. They point out that when it comes to questioning patriarchy and dealing with matters that affect women the most, the standards and practices shift. D'Ignazio and Klein (2020) demonstrate moreover that proof is often required to stress the importance of an issue to garner public attention in regards to women's issues: Data is often dismissed as "not 'big' enough, not 'clean' enough, or not 'newsworthy enough to justify a meaningful response from institutions that have a vested interest in maintaining the status quo" (D'Ignazio & Klein, p. 58) Indeed, when data is collected and utilized, it is used to reduce women's experiences to "'violence or reproductive health'" (D'Ignazio and Klein, 2020, p. 59). When we ignore questions of who is able to collect data relevant to women's issues, and if we leave unexplored why and how such data are ignored, we lose the opportunity to examine the impact of these practices. Concerns are in this way governed by the patriarchy status quo and end up not helping women but instead reasserting their subordinate position in a society that limits their possibilities rather than opening them up. It is no

wonder then that current U.S. politics is engaged with a strategic effort to undermine trust in the voting system, despite no concrete evidence that this form of data collection is in any real danger of corruption.

Expanding upon the work of Chun, D'Ignazio and Klein, Nicholas Mitchell's contribution analyzes information selected for policy-making and legislative public curriculum within the United States mandating intramural and interscholastic sports participation according to sex. Through a feminist post-structural policy analysis of documents from five U.S. states, Mitchell describes drafters of these policies as framing a public problem in need of remedy, along with a gendered narrative of danger and protection. Absence of information is as important as its presence in this study, leading to a veneer of impartial policy that masks implicit ideological criminalization and violations of privacy promulgated by the limitations of the available information categories.

Boni Wozolek, in their contribution, interrogates the intra-actions of the hidden and enacted curricula as they are enmeshed with the broader curriculum of metrics through an analysis of a data-driven tenure and promotion process at a large state institution. Also, a critical feminist study, Wozolek employs an autobiographical narrative in dialogue with the always already complex nature of curriculum as it is imbricated with local and less local sociopolitical and cultural norms and values. Questions of agency and cooptation are interwoven with personal obligations to use the "moments" to unravel the curriculum from within its fibers of data and techniques of counting.

John Weaver's contribution to this issue focuses on the work of Bernard Stiegler (2016), whom he identifies as one of the first philosophers to systematically explore the implications of the algorithmic world. Stiegler (2016, p. 104) uses the phrase "algorithmic governmentality" to describe what is emerging in the world.

Algorithmic governmentality is based on 'ubiquitous', territorial and environmental spatial technologies, through which the programs of 'smart cities' are today being designed, based on 'autonomic computing' and 'ambient computing', on technologies whose visibility just makes them all the more active and efficient, as Mark Weiser states: 'The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.'"

Weaver calls for a new science to be invented. This new science would serve as a foundation for thinking with care, and carefully, about of how the digital epoch can free

organological humans from the suicidal tendencies of the Anthropocene and the lifelessness of automation that requires nothing from humans except constant data production. Weaver sketches the poetic nature of this science, its potential for changing science itself, and associated pedagogies that would grow from this science while also nurturing its potential.

A commonsense perspective on algorithms is that they can (and even *should*) chart our every move and quantify every aspect of our lives so that we can adapt the environment around us according to those perceived needs, and vice versa. If this is indeed the goal of algorithms, then how are we to challenge that which shapes our reality? How can we distinguish what we experience firsthand from the data we generate mostly willingly, and how can we challenge the construction of this data when it is directly involved in constructing an unequal society? In our current world, most people's data is not equal to and not as valuable as the data generated by wealthy people, powerful nations, and most importantly the multinational corporations whose well-being is defined by the very act of creating "discriminating data." Stiegler, as a philosopher of the algorithmic, seeks an alternative approach to data science and algorithms. We ask Curriculum Studies to join in his efforts in the name of social justice, equality, and a democracy in crisis.

Toward such ends, the contribution of Patrick Phillips and Nicholas Ng-a-Fook explores AI and NLPs (natural language models) as artifacts of the curriculum of our everyday lives. They describe AI as a complex curriculum of power reflective and continuing to reframe our capacity to dream possibilities in a post-colonial world. They note that "empiric-or imperial-constraint of our futurities did not originate with computer programs, but rather informs their coding and potential self-learning." Historic injustices and power imbalances of colonialism and settler colonialism endemic to our algorithms might turn machine learning into machine *unlearning* so that dreaming can be a political act. Similarly, Peter Appelbaum's extension of Ruha Benjamin takes a warning from L. M. Hampton (2021) seriously: inclusion of diverse voices is not enough. Reading Gulson Sellar and Webb's (2022) *Algorithms of Education* through the lenses of speculative fiction and Afro-Futurist arts-based practices, he highlights dislocations of synthetic governance and associated synthetic politics that might bring natural language systems and algorithmic decision-making in dialogue with Afrofuturism and narratives of alternative futures.

With this special issue, we urge Curriculum Scholarship to forge a new subfield within our field. In the spirit of JAAACS and AAACS, we hope we have provoked

further conversations to come. What new sorts of pedagogy, old forms of blended curriculum studies strategies, international dialogues, and multi-vocal responses will emerge are those sorts of futures and dreams so far inconceivable or as yet unmade.

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