Teaching Machines: The History of Personalized Learning. Audrey Watters. MIT Press, 2021. 323 pages.

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Is a writing assignment technology? We could say it's a kind of "device"—you put it in place and certain practices become possible and necessary as a result. And you can think about what you'd like to make possible and necessary for students, how and why, and, so, set yourself to making your writing assignments more precise and targeted towards the production of work of which you can then say, "yes, this is what I wanted the students to be able to do" (or, "no, this isn't it"). And, presumably, what you want them to be able to do as a result of the assignment is something they will need to do (or at least benefit from doing) on other occasions and something they wouldn't be able to do without having complied with the terms of this assignment. In that case, not only is the assignment technological, but the student is made a bit more technological and better suited to "interoperate" with other technologies and forms of organization (and technologies are forms of organization and forms of organization are technologies). The alternative, I suppose, is just telling students to write and allowing them to figure out what looks like "just writing" to you.

Audrey Watters spends quite a bit of her *Teaching Machines: The History of Personalized Learning* narrating B. F. Skinner's years-long, frustrating and ultimately unsuccessful attempts to build and market a teaching machine. She frames Skinner's attempts within a broader history of like initiatives, but I was wondering why so much time was devoted to Skinner's efforts, especially since nothing came of them, and as Watters points out, his model was in many ways less sophisticated and interesting than those of some of his competitors. She doesn't speak all that much of what Skinner or his competitors meant by "learning," except to make the very interesting observation that the models for teaching machines from the 1930s through the 1980s converged with the emergence of standardized (and standardized style, e.g., multiple-choice) testing in the American public school system. The machines all worked, it seems, by having students answer questions that the machine would then tell them was right or wrong, along with, perhaps, a reference to a textbook or some other source that would take students through the steps of arriving at the right answer. Unsurprisingly, most of the machines focused on math and very elementary reading and writing skills.

The reason for the focus on Skinner, I think, is so that Watters can make the case that even though Skinner, on the face of it, failed to get his teaching machines made and sold and had his whole mode of experimental psychology discredited, his "dehumanizing" approach to teaching and learning has nevertheless triumphed. The attempt to control individuals by systematically rewarding some behaviors while punishing others has moved well beyond the classroom to structure our relations to the market, the workplace, social media and the state. Watters reminds us of Noam Chomsky's devastating critique of Skinner's behaviorism as well as the broader repudiation of his stimulus-response model of conditioning-as-

learning by the humanistic critiques of '60s thinkers like Paul Goodman. Watters clearly identifies with these critiques, as they provide her with a fulcrum for decrying the implicitly behaviorist premises and ends of what, borrowing from Shoshana Zuboff, she refers to as "surveillance capitalism."

But the lesson of Skinner's failure is also that the attempt to "engineer" the human can be resisted. After citing a series of critics of technology, such as Theodore Roszak and Jacques Ellul, Watters concludes her book as follows:

> From the history of refusal, we can see when students and teachers and communities protested attempts to engineer them, into either enlightenment or submission. From the alternatives they imagined and built—most notably, perhaps, the Freedom Schools, we can glean ways to construct and share knowledge that depend on humans rather than machines, liberating us from the efficient control of the "Skinner box." These practices privilege the much messier forms of teaching and learning, forms that are necessarily grounded in freedom and dignity. (p. 263)

The Freedom Schools, "a network of alternative education centers that offered the kind of teaching and learning that the public school system of Mississippi had refused to provide its black population," worked with a pedagogy akin to Paolo Freire's critical pedagogy, which resists "programmed instruction" (p. 226) in the name of "the education of a free people" (p. 227). Other than resisting the Skinnerian effort to move "beyond freedom and dignity," though, Watters gives no indication of what students learned in the Freedom Schools or how. Indeed, to use Freirean jargon, she doesn't even pose the problem: why should a pedagogy aiming at treating students directly as social and political actors within a predetermined project enable them to become producers of the kinds of knowledge that will empower them within what is after all a technological social order? Might not such a pedagogy have its own unintended effects? Is it not, perhaps, resting upon some uninterrogated assumptions regarding the "human"? In particular, does it not rely upon the very old, and some might say debilitating, assumption that education is really a matter of becoming the (free) being you already are by removing the encrusted layers of oppression imposed by the social and technology?

So, what is learning? The behaviorists at least provided an answer, whatever its limitations. The "humanists" do not, gesturing vaguely toward liberatory pedagogies. Chomsky certainly doesn't provide an answer—he doesn't even think humans learn language! And in the absence of a clear answer, it is easy to believe one has done something by defending the human against the technological while identifying the latter with any kind of constraint on or directing of human activity, thereby placing oneself within an honored tradition of rebels who, by definition, haven't done anything and can't do anything—because it's impossible to say that one has "done something" without thinking technologically, in terms of some means applied to some set of practices towards some end that can be measured, however expansively we might want to understand "means," "practices," "ends" and "measure." But what if, for example, we have students work with an online grammar checker and provide them with guidelines for examining the "choices" made by the machine in "correcting" a particular "error," and then we ask them to revise their writing so as to defend a different choice, one implicitly "rejected" by the machine? There might be

something interesting in such an assignment, some of us might imagine. Or what if we have students work with translation software that can be set to different "styles" (as will surely become possible a few years down the road) so that they can see various forms a piece of writing, including their own, might take? Not only could linguistic and cognitive choices be made more transparent and nameable to students in these ways, but they might also learn something about the choices the designers of software make in shaping our environment. Even more, the linguistic experiments of the avant-garde would become pedagogical resources in previously unconsidered ways—indeed, in thinking of a kind of translation software that would work across styles rather than across languages, I have in mind Raymond Queneau's *Exercises in Style*, a novel that tells the same very brief story dozens of different ways according to different styles. I'm thinking primarily in terms of the college-level composition courses I teach, but there's no reason such methods, which involve diversifying a particular model so that students can see what can be done with the model and further diversify it themselves, couldn't be designed for much younger students. Trying to design a teaching machine for a particular task, and for the purposes of individualized instruction (the goal, Watters points out, of these, on one level, homogenizing techniques), is always going to be awkward and probably immediately obsolete, but maybe the teaching machines are already here, in our environment—maybe the very machines designed to turn us into data extraction sites will be the teaching machines, if we set ourselves to training the algorithms rather than imagining we can dodge them.

What do we mean when we say that a student has "understood" (or "not understood") a particular text? Even more, what do we *do* when we tell the student that? The problem with behaviorism is that it models human learning on animal learning—what is different about human learning is that humans always learn from models, those we emulate, admire, or perhaps resent. To think technologically about teaching is to think in terms of the various ways of "downloading" models. One has "understood" a model when one can participate in a practice recognizable in terms of that model and, even more, as one that model might be revised in response to. Since mimesis never perfectly replicates the model, our focus with students can shift from assessing their degree of deviation from the model of disciplinary reading and writing we more or less explicitly provide for them to having them use their own efforts as samples of imitative, participatory attempts to take up a model under inevitably different conditions. In this way, we make explicit the "steps" and "stages" of the disciplinary literacy we really want to teach them. We can break down practices of disciplinary literacy, as minutely as learning to notice a particular word in addressing a particular interpretive problem, or scale them up so as to follow several intersecting chains of references across a text (perhaps using the search box in the PDF file). Either way, we're thinking and teaching "technologically," in terms of manipulable parts and revisable wholes, and could readily imagine various technologies serving various purposes along the way. Again, the only alternative would be to say something like "engage the subject matter like a fully embodied, imaginative, sensuous, free, conscious human being (like, say, me)," which is the most disingenuous pedagogy imaginable. It is disingenuous because such a humanist pedagogy conceals from students all that the teacher knows about the arduous course, often frustrating and even humiliating, of learning from authoritative (and even authoritarian) models, of constructing and discarding one reading and writing self after another while still, if we're being honest, needing to test (and revise) the one we've ended up with against other available models. We can't exclude the possibility, though, that the teacher has forgotten

quite a bit about all that—for many (most? all?) there is much we wouldn't mind forgetting. But, then, the pedagogy I'm proposing here—let's call it a technics of learning—is doubly learner-centered because it turns the teacher into a learner once again (as the Freedom School itself insisted upon), with all the trials and exposure that return entails. ⧗