Mertala, P. (2021). Those magnificent men with their teaching machines: Watters, Audrey: Teaching Machines: The History of Personalized Learning. *Learning, Media and Technology* https://doi.org/10.1080/17439884.2021.2019055

Teaching Machines: The History of Personalized Learning is Audrey Watters' sixth book and provides an insightful and compelling review of the history of automated and mechanized personalized teaching and learning. The book focuses especially to the era of mechanical teaching machines between 1920's and 1960's. The historical perspective is a refreshing and welcomed exception to the mainstream discourses of the educational technology (edtech) debate, which can be described as future-oriented: it highlights the uniqueness of each new technology and its revolutionary impact on teaching and learning.

Watters constructs her book largely around the psychologist and behaviorist Burrhus F. Skinner (1904–1990) –"arguably one of the best-known scientists of the twentieth century" (p. 18). However, *Teaching Machines* does not tell about Skinner per se. Instead, Watters uses Skinner as a central figure through whom she opens up to the reader the social, political, cultural, scientific, and economic entanglement of automated education. The solution is successful, as the person-driven presentation enables a vivid and humane way of narration. Although Skinner is often referred to as the "father" of teaching machines, psychologist Sidney L. Pressey (1988–1979) had developed the first teaching machine already in the 1920s, 30 years before Skinner's attempts. At first, Skinner ignored Pressey's pioneering work and e mphasizing the uniqueness and novelty of one's own invention has likely been a strategic move because of patent rights and in terms of marketing.

Partly due to commercial productization, the history of personalized learning and educational technology is dominantly history of machines. According to Watters, this perspective is one-sided. A teaching machine, be it a mechanical device or modern digital technology, also requires an instructional program that the student follows by using the machine. To provide a more balanced account, Watters has dedicated one full chapter to familiarize the reader with the theory and practice of (early stages of) programmed instruction

One reason for machine-driven historiography is that learning machine pioneers primarily collaborated with technology companies such as Intelligent Business Machines (IBM), which had a specific interest in developing machines, not programs. IBM and others had the tools, material, and knowledge to build machines but failed short when it came to creating programs. Watters also provides the reader with plenty of examples of situations where companies themselves have slowed down or even stopped developing and manufacturing teaching machines because the anticipated income did not seem high enough. In other words, the "dominant narrative" in which the slowness of the technological reformation of education is explained primarily with teachers' resistance and the rigidity of the education system is not supported by history.

As can be deduced from the names mentioned in the previous paragraphs, the history of teaching machines is also primarily the history of men. A representative example is that after abandoning the development of teaching machines, IBM transferred the rights to the instructional programs to Skinner, not to Susan Meyer (1928–2008), who had developed the programs. Although Meyer progressed in her career as a professor of psychology and director of a research program in programmed instruction, she suffered from sexism throughout her career (and was belittled even in Skinner's autobiography). Meyer is one name among an unfortunate large number of overshadowed female technology scholars. For example, the pioneering work of the mathematician Ada Lovelace (1815–1852) in the development of computers and computer science was considered the merits of her colleague Charles Babbage (1791–1871) for more than a hundred years.

Back to the future

As mentioned at the beginning of the review, *Teaching Machines* is a high quality overview of the history of teaching machines. However, the value of the book is raised to new potency due the explicit and implicit references to the current state of the field of edtech. Watters points out that many of the technologies used in schools today base on behavioristic theories, which are, metaphorically speaking, smoke screened by using concepts that do not carry the undesired behaviorist legacy: instead of conditioning, we are just talking about guidance and nudging. In addtion, the arguments about the school as a stagnant institution and the innovative and equalizing potential of technology are repeated in virtually identical form from one decade to the next.

The most interesting juxtaposion, however, is found from Chapter 7 in which Watters cites long excerpts from Simon Ramo's (1913–2016) vision of a mechanical school written in late 1950's. In mechanical school, each student is given their own specially stamped small plate", which identifies both the, the student and the program the student is registered to. According to Ramo's idea, the plate serves as a key with which an individual student can be connected almost entirely to the massive data material produced in teaching on teaching machines. If we replace mechanical technology with digital, Ramo's ideas share notable resemblance with visions of data-driven schools of 2020s.

I have not come across Ramo's name in contemporary discussions of data driven education. I understand that it is impossible to track down and address all possible historical traces. Nevertheless, incomplete, selective, or shortsighted historiography seems to be commonplace in 21st century pro-edtech debate. In the opening chapter of her book, Watters provides a delicious example of the former by going through Sal Khan's popular YouTube videos in which Khan –the founder of learning platform Khan Academy– presents his interpretation of the history of education. To quote Watters in her own words: "There's at least one problem with the way Khan tells it [the history of education]: the history is all wrong" (2021, p. 10). Luckily, now we have *Teaching Machines* to put the record straight.