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The Learner Who Was Taught by a Bot

The narrative that follows is a composite of the experiences of five individuals who had interacted with an intelligent pedagogical agent or a bot. Their experiences are described in more detail in Veletsianos and Miller (2008).

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I visited Neebin in her office one frigid winter morning to learn about her experiences interacting online with an instructional bot named Jesse. Her office was adorned with plaques of her accomplishments—degrees, awards, pictures—and piled with books and papers everywhere. “Here, have a seat here,” she said, removing the papers from a chair and placing them in a neat stack on top of other papers on her desk. After exchanging pleasantries, I quickly got to the crux of my visit: “So, what was it like to have a conversation with a bot?”

At the time, I was studying bots as an instantiation of artificial intelligence (AI). These anthropomorphous digital characters interact with learners and are used in online learning environments to serve various instructional goals through

text-to-text and text-to-speech technologies. I was also using a new-to-me interview technique and analytic approach that required asking that sole question and listening intently to the response in order to probe further into Neebin's experience. While some of these interviews were more awkward than others, Neebin was eloquent and descriptive, which made my job of gaining insight into her experience much easier.

"I wanted to know more about this thing," she said, "So, I just started asking Jesse questions such as, 'How are you? What's your name?' I asked questions from popular culture to history and math. We talked about TV shows, about the region where he lived. I felt that I needed to challenge him. I wanted to stump him by asking him difficult, complicated, or misleading questions. . . . I kept on wondering: what else could this thing do?"

As Neebin expected Jesse to respond in human-like ways, she kept asking and asking questions, testing his limits and intelligence. In so doing, she told me, she became "completely engaged" and had no idea how long they talked: "It was like late at night, like three o'clock in the morning, and I was still chatting. . . . I couldn't get up. I was awake, wide awake, and I couldn't get away from my computer." Neebin claimed to be "completely into it," watching, observing, and interacting with the bot while paying little attention to her surroundings. She was describing the kind of educational experience that educational designers aspire to foster: an experience that entralls learners, pulls them in, and engages them. "I almost forgot where I was," she said. "It is very engrossing." Neebin commented on Jesse's personality, voice, and looks as if he were an actual person, and while his knowledge of the content area that he was enlisted to help with seemed limited at times, she seemed to appreciate and find value in interacting with a rudimentary form of artificial intelligence.

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I often ask students in my educational technology courses to debate a variety of issues central to the field. One of my favorite debates revolves around the question of whether teachers should be replaced by AI, which invites students to engage deeply with the work that teachers actually do on a day-to-day basis, as well as with the possibilities and limits of a technology that seems to be concurrently promising and worrisome. Although this debate invites students to imagine teachers being entirely replaced by machines, it is not all that far off the common view that AI offers a promising way to complement and supplement instructional functions, and, indeed, to do away with some of the pesky aspects of what humans bring to teaching. Such a perspective can be seen in Clark's excitement about how AI "holds the promise of high-level teaching that is scalable and cheap" and could be "invaluable for a teaching assistant that never gets tired, inattentive, demotivated, crabby and delivers quality learning experiences, not just answering questions" (2019, para. 12).

Most analyses of the use of AI and bots in digital education focus on effectiveness and efficiency. In particular, proponents of bots and AI often employ the argument that these technologies will enable efficiencies through automation and scalability. In fact, educational technology has historically been envisioned as instilling efficiencies through automation. In 1933, Pressey argued for an "industrial revolution" in education, one "in which educational science and the ingenuity of educational technology combine to modernize the grossly inefficient and clumsy procedures of conventional education" (582). His proposed solution to the inefficiencies of conventional educational practices was a teaching machine, which was a mechanical device that provided learners

with a way to respond to information and provided feedback to said input. Nor was Pressey the only one intrigued by the perceived promise of teaching machines: in 1935, Skinner developed his own, the first of which taught arithmetic by asking the student to move a lever to indicate an answer in response to a posed problem and turning on a light when the correct answer was provided.

Among early efforts to standardize, package, and efficiently deliver training to large numbers of people—what some today might call *education at scale*—was the US military’s use of audiovisual devices to train a large population of unprepared military personnel and civilians during World War II. While data evaluating the impact of these technologies were not collected, the military’s perception at the time was that training films and filmstrips had enabled the United States to efficiently and effectively train these individuals en masse. Despite a similar lack of empirical proof of efficacy, the quest for technologies to deliver training and education at scale has continued through successive waves of technological innovations, including radio and television (Saettler 1990). Even before the advent of the personal computer, content providers such as Encyclopedia Britannica, Disney, and educational institutions invested heavily in information and communication technologies to deliver education via a variety of means and media.

Whereas these early examples used educational technology to make the education of large groups of people more efficient by removing the need for individual instructors to be present, the growing access to computers led many experts in educational technology to shift their focus to developing personalized learning software that tailors instruction to individual learners’ needs, skills, and interests. The notion of personalized learning is predicated on defining discrete learning

objectives; identifying content to address those objectives; packaging content into discrete chunks; delivering content to individual learners according to various behavioral, emotional, or cognitive measures; and automating the process so that it can be repeated for many different learners in many different contexts. This approach is aligned with the one that imagines using AI to automate education and teaching on a vast scale. In a *Washington Post* article, for example, Basulto (2014) imagined an “artificially intelligent machine” that could teach massive open online courses by “lecturing, grading and engaging with students” and predicted that “once a MOOC can be taught by a machine, it may end up making the delightfully erudite college professor a quaint artifact of the non-digital past”—to his mind, not only a possible future but a desirable one.

The potential of bots—or at least some version of an AI—was reignited in 2016 by Jill Watson, an AI bot powered by IBM’s Watson created by Ashok Goel at Georgia Tech to answer questions posed by online students who were not made aware that they would be interacting with a computer. By Goel’s account, Jill Watson was so successful at this task that a student posted a message on the discussion board wondering whether Jill Watson was a human or a computer. Although Goel doesn’t imagine that bots like Jill will replace human instructors, he does envision that they could free “teaching staff to focus on more creative endeavors” than repeatedly answering the same student questions (TEDx Talks, 2016). Other researchers adopt a more critical perspective, one that aims to resist techno-solutionism, but instead invites educators to “explore how human and non-human teachers might work together in a teaching ‘assemblage’” (Bayne 2015, 460). Such an approach resists the use of technology for efficiency’s sake and

employs it as a course design concept that invites teachers to consider which aspects of their own work may or may not be automated (Bayne, personal communication, February 21, 2017).

Even then, not all commentators are as welcoming of a world with nonhuman teachers and have raised concerns about efforts to automate education instruction. Science fiction writers have warned against dystopian education futures, such as Isaac Asimov's image in *The Fun They Had* (1951) of Margie's future schoolroom, which was right next to her bedroom and housed a mechanical teacher that was always on at the same time and focused solely on lessons, providing little social or emotional support or encouragement. Historian David Noble (1998) also warned against such mechanization and, in particular, against the development and delivery of standardized distance education courses without faculty member participation, which, he argued, would not only degrade learning experiences but commercialize and commodify education through mass production and market logic. Although such concerns may strike some as quaint in an era of interest in upskilling, reskilling, private-public partnerships, education at scale, and online learning, ongoing technological advances make the possibility of automated teaching and assessment ever more likely. While some practitioners imagine a variety of AI technologies reconfiguring the digital learning experience—from using bots to employing hologram lecturers to using automated grading software—others are concerned that such attempts subordinate the social functions of education to its economic imperatives. We face an urgent need to ask probing and difficult questions about the function of education and online learning in relation to automation through AI. While traditional higher education is successful,

it leaves many students behind. Is it possible that the automation of various aspects of education may help us broaden access? How do we ensure that such automation not only expands access but does so in a student-centered and caring way? How do we ensure that a future which includes AI is not just a future for those who can't afford education with human teachers?

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- Proponents of AI and bots argue that such technologies enable automation and efficiencies while liberating faculty to focus on more valuable, creative, and worthwhile activities. This claim is oft-repeated, but some are concerned that the real goal of this effort is to substitute humans with machines.
- Others note that instructor-bot collaboration may be valuable in that it might allow us to consider and develop new pedagogies.

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