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Robot teachers: government's nightmare

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My experience as a young programmer, voracious reader and computer science student leads me to research by experts of the near future. Artificial intelligence, self-driving cars, and robots for dangerous jobs will be fully integrated with life as soon as this decade. So as technology can outsource all the functions of a teacher, should governments replace them with robots? No, robotic teachers raise ethical implications such as loss of human contact, responsibility, safety, and privacy issues, ergo they cannot replace roles of teachers, yet can be advantageous as companions to help teachers. To cement this point (1) the roles of a teacher are defined, (2) the ethical problems with robot teachers are given, and (3) the advantages of robot companions are outlined.

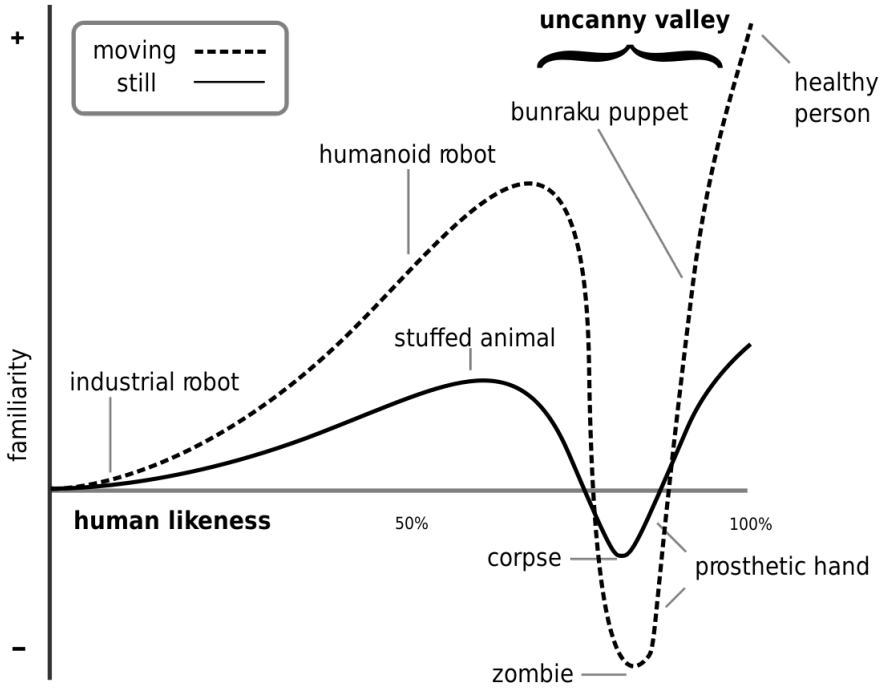
Teachers play critical roles in the development of a student into a good human which makes a quality teacher-student relationship vital and leads researchers to believe that robots cannot step into teachers' shoes. According to Sharkey A. Sharkey (2015), "there are requirements for being a good teacher that a robot is unlikely to fulfil". Broadly speaking, a teacher is the person who has the expertise to assist his or her students to acquire knowledge of a certain subject. (Aichinger 2017). Learning means more than acquiring knowledge in a subject; it includes acquiring new behaviors, skills and values; therefore, the teacher must provide the best possibility for an effective learning environment. This leads us to the teachers' main functions: source of expertise, manager of children, source of advice and, at the very top, facilitator of learning (ibid.). This proves that teachers have duties on an emotional level, which leads Sharkey (2015) to conclude, "the idea that a robot could identify what a pupil needs to know seems [...] challenging". As teachers spend much time with their students, they are necessary for physical, emotional, and intellectual support and should "help to socialize their pupils, acting as attachment figures and as role models, and inspiring an empathic view of fellow humans" (Sharkey 2015). In sum, it is a teacher's duty to teach moral virtues and character to students, so they become

morally responsible individuals. Without this connection between teacher and child it is possible that exclusive or near exclusive care by a robot could result in cognitive and linguistic impairments (N. Sharkey and A. Sharkey 2010). The argument must then be that teacher-students' relationships are important.

Good student-teacher relationships lead to better academic and social outcomes for students, consequently many researchers have stated that this relationship plays an essential role in the classroom (Kesner 2000; Heacox 2005; Gurland and Evangelista 2015; Baker 2006). According to Gurland and Evangelista (2015) "closeness, conflict, and other dimensions of teacher-student quality predict various academic outcomes, including achievement [...] as well as indices of social adjustment, such as aggression, antisocial behavior, and peer acceptance". Baker (2006) argues that the relationship to the teacher not only "shapes children's engagement in social discourse [but also] affects children's social behavior and their readiness to learn". For a positive relationship there needs to be a rather low degree of dependency and a rather high degree of closeness, which requires empathy. Empathy is seen as "one of the critical ingredients in constructing a [beneficial] relationship" (Freedberg and Gallese 2007). If, as pointed out by the researchers, the relationship between a student and teacher is of major importance for the child's psychological as well as academic development can it be ethical to replace this significant figure by a machine?

The problems associated with introducing robot teachers into schools are (1) deception, loss of human contact, (2) responsibility and control, and (3) privacy. Children are already deceived by toys, which is largely accepted as ethical. N. Sharkey and A. Sharkey (2010)

put toys in the "let's pretend – category," but a robot, on the other hand, does not remain in the let's pretend category. As the deceptive behavior and appearance of robots become more akin to social entities it could lead children to be tricked into thinking that robots are "capable of or worthy of attachment" (A. J. Sharkey 2016). However, as this attachment is not reciprocal but deceptive it must be considered unethical (Aichinger 2017). Lasota, Fong, Shah, et al. (2017) points out that psychological harm and stress can have its roots in "a robot's appearance, embodiment, gaze, speech, posture, and other attributes." This is also known as "Uncanny Valley", where our emotional response to robots increase as they resemble humans more, until they reach a point at which their resemblance is close to perfect but eerily dissimilar enough such that we no longer trust them (Lin, Abney, and Bekey 2012). Ultimately,



given the fact that the robot is responsive, seems sentient and pays attention to the subjects, it cannot be denied that such characteristics are arguably forms of deception (Aichinger 2017). Robots are designed to "evoke a social bonding and fulfill the need for social interaction" (Serholt and Barendregt 2016); consequently, children might prefer the robot interaction above human relationships which will lead to a social impediment. Considering the importance of teacher-student relationship, it must be regarded as contra-productive. The teacher's role to support students emotionally and academically must be maintained. Otherwise, there is a clear risk that students could fail in both these fields.

For robots to make decisions and take responsibility, they must be able to adapt pre-programmed plans to children's needs, make ethical decisions on how to control students and take responsibility for the student's safety and wellness. If robots become teachers, it means putting them "in charge of human beings" (Sharkey 2016) which means making "ethical decisions; decisions for instance about when to praise or castigate children for their behavior" (Sharkey 2016). Or deciding to take an alternative path when realizing the prepared lessons plan does not work as predicted. Sharkey (2016) points out that robots need to recognize children's intentions behind their actions to analyze its behavior. Because robots are preprogrammed this becomes painfully obvious how difficult it will be: a quite child could be studying, or sullenly refusing to participate. A vociferous child might be actively contributing to the class discussion or interfering with it (Sharkey 2016). Robots might think a student raising their voice is disturbing the lesson; when, it could just be excited and motivated to participate. In order to make right decisions one needs a sense of morality; robots could not decide whether a behavior is good or bad. Even with the best pre-programmed rules, right decisions are situational dependent. It seems rather inappropriate to put them in charge of students and young children (Aichinger 2017). Teachers must make sure that students are safe and well. This leads to the problem of re-

sponsibility and determining who is accountable if something would happen. N. Sharkey and A. Sharkey (2010) clam (with regard to robot nannies) that it "would be ridiculous" to hold the robot responsible as "that would be like holding a knife responsible for a murder". This comparison regards robots more as tools.

Robots need to store data of individual students to create personal profiles, but because it then could record a student's entire life hackers can get access to information that would otherwise never have left the school and puts student privacy at risk. (To quote Aicinger 2017) Authors like Sharkey (2016), Serholt et al. (2016), Kenda et al. (2007) have uttered concerns about "whether this type of data collection has the potential to infringe on people's privacy" while claiming that such social robots could turn into "a surveillance system where others may access the data" (Serhold et al 2016). Technology makes it possible to monitor individuals and store information. They can "sense, process and record the world around them" (Calo 2020). Kanda et al. (2007) describes "how the robot they used kept record of which children had interacted with it, and even of friendship groups amongst the children" (quoted in Sharkey 2016). Clearly, if this is the case one must admit that students' privacy is severely affected. It will impede the teacher-student relationship when children "perceive [the] robot to threaten their privacy" (Serholt el al. 2016). Robot teachers would make it possible to record a child's entire life (Shakey and Sharkey 2010). Student will be observed constantly, even when they think might be alone; unfortunately, that is exactly the opposite of what a student need. Students need someone apart from their parents to confide their fears, talk about their problems, and to share all kinds of concerns. In other words, they need an attachment figure they could trust. Despite the psychological concerns, hacker attacks is also a possibility. Such hackers' attacks do not only infringe people's privacy by accessing private information, but they could also "turn into dangerous tools capable of wreaking havoc and causing substantive harm to their sur-

roundings and the humans they're designed to serve" (Cerrudo and Apa 2017). Cerrudo and Apa (ibid.) hacked a robot, Alpha 2 - "a humanoid robot that can teach, be a personal assistant, or provide entertainment" (Burgess 2017), to continuously stab a tomato with a screwdriver. If such robots are to take on the role of a teacher, it must be made sure that students can still share information and secrets without their privacy being violated.

Robots may not yet be capable of replacing teachers, but researchers argue that robots can help provide (quality) education to everyone, increase engagement, and save money and time. It is thus inferred that robots can ultimately help to improve education. Today, not every child can receive high-quality education since "family income is one of the best predictors of success in school [and] has created a huge inequality in the world" (Zhou 2016, TEDx Talks). Robots can be deployed (almost) anywhere and thus making it possible to provide teachers to children which would otherwise not have access to education. Amongst those who do have education Zhou (2016) mentions chronic disengagement towards learning (40%-60%). Chang et al. (2010) and Weinberg, Yu, et al. (2003) identify the "unique learning experience" that is created using technology in the classroom. It is classified less by "instuctionalism" and more by "constructionism" (Papers 1993). Engineering classes, for example, are more engaging as students learn from "designing and assembling their own robots" (Chang et al. 2010). Another benefit identified by Zhou (2016) is personalization. There is no double that a personal (human) tutor would be able to give the best teaching possible, but "society does not have the resources on the human capital or the financial [means] to really achieve this" (Zhou 2016). Robots could thus make personalized learning possible. Here, however, Zhou does not speak of replacing teachers but rather empowering them with technology that could help save time and offer various advantages. Robots could be responsible for carrying out the tasks that require no human-like interaction. Thus "allowing teachers to really focus on what matters, [namely]

the students and the relationship [with] them" (Aichinger 2017).

This essay recommends that governments should not introduce robot teachers as it is not an ethical means to improve education, but rather introduce robots that could automate functions that do not require human intervention such that it empowers teachers. This is encouraged by the evidence laid out that teachers have much more complex roles than current robots could possibly replace; that a good teacher-student relationship is the main predictor of social and academic success; that robots raise ethical concerns by being deceptive, unmoral, and dangerous; and that robots serve humans much better when used in conjunction (especially in the classroom). Student's emotional, psychological, and physical well-being, as well as privacy, are put at risk by replacing teachers. On the other hand, many children do not receive much, if any, education, suffer from disengagement, and do not receive personalized teaching. In these areas it is recommended that governments invest considerably as robots could help solve these problems.

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