

EdTech Mindset

your must-have educational guide to the future

January 2018 | MindCet.org

Will you draw me
a sheep?

HOW HUMAN CAN CHATBOTS

BE

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Changing Education's Mindset

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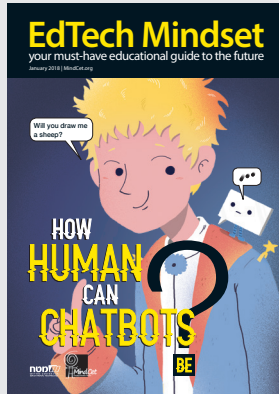
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"If you please – draw me a sheep..."

When a mystery is too overpowering, one dare not disobey. Absurd as it might seem to me, a thousand miles from any human habitation and in danger of death, I took out of my pocket a sheet of paper and my fountain-

pen. But then I remembered how my studies had been concentrated on geography, history, arithmetic, and grammar, and I told the little chap (a little crossly, too) that I did not know how to draw. He answered me: "That doesn't matter. Draw me a sheep..." But I had never drawn a sheep. So I drew for him one of the two pictures I had drawn so often.

Excerpt from "The Little Prince" by Antoine de Saint-Exupery (first published in 1943).

How would a bot react to the same request? Does the comparison of human and bot reactions matter? Apparently, it does, and very much so.

2017 headlines have been marked by this concern, expressing, maybe, a much deeper one – our place in this overwhelming changing world.

During the above conversation between a lonely pilot who has just crashed and a surprising little chap, dressed like a prince, one can imagine the different feelings the pilot experiences in order to satisfy his demanding interlocutor. Creativity, imagination, affection, empathy, responsibility, all blend together in order to respond. The development of this conversation, through the exercise of all possible variations of responses, followed by the emotional reaction of the Little Prince, is where Saint-Exupery draws to the reader the build-up to this very special relationship – a relationship that will lead the plot and prompt us to understand and fall in love with the Little Prince through his intellectual and emotional discoveries.

Would a bot allow for a similar relationship development? Would the efficient bot's answer, most probably a picture (or a few) of a sheep, enrich or limit the exploration underlying this interaction? What would this entail in terms of both interlocutors' understanding of each other, and of the world around them? One of the main added values of computerized responses we all praise is exactly the capacity to provide precise content. However, how would that affect the conversation development in terms of allowing the interlocutors to explore imprecision in order to acquire a deeper understanding not only of the meaning of the query, but also of the value of the response? Isn't this exercise an essential learning development?

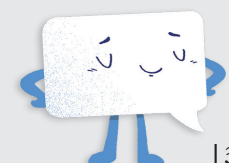
These are questions at the heart of the pedagogical use of chatbots.

"Chat-Bots" have been expanding throughout all other industries, for obvious reasons. Chat - There is no doubt about the power of text messaging in the communication preferences and habits of today's youth. One can even refer to "talking" as becoming obsolete. Bot - Furthermore, there is also no doubt that the discussion about human vs. machine is starting to lose relevance due to the emergence of new entities that range across the entire spectrum (from all human to all machine) in order to fulfill new communication needs – entities naturally incorporated by the new generations' interaction with the environment (examples are mentioned in different articles of this issue).

For this issue of EdTech Mindset, we chose to chat with leading experts exploring ChatBots and learn about their visions, in order to help us understand this new medium and its educational potential.

I hope that our endeavor will spark your curiosity and inspire you to explore and develop the alternatives called for by an educational world craving for renewal.

Dr. L. Cecilia Waismann

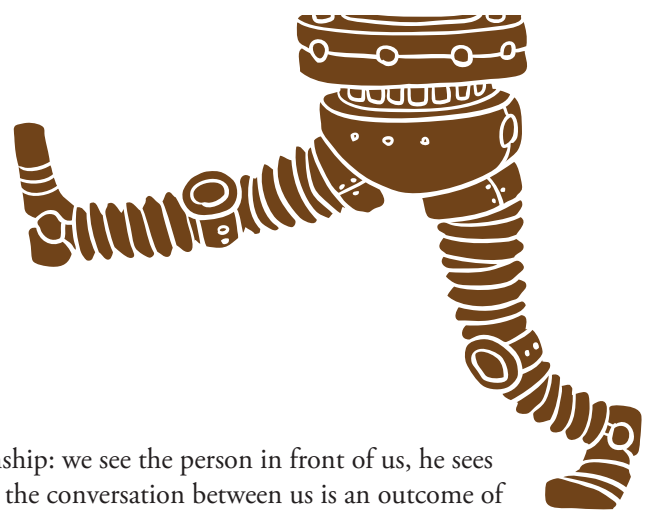


are but not too human



by **Avi Warshavsky**

CEO at MindCET EdTech Innovation Center



By 2019, hundreds of thousands of service representatives will lose their jobs to mechanical sales representatives – chatbots.” Forecasts of this type are not rare; in fact, most of the references to the potential inherent in chatbots is limited to predictions of this nature. These forecasts look at the chatbot phenomenon through the mold of the Industrial Revolution – as yet another kind of machine that replaces human workers, and does the same tasks, but faster and cheaper. Viewing chatbots from such a point of view misses something of the potential in this phenomenon, particularly in the context of empathy-based fields such as education. Chatbots have unique potential: on the one hand they will never be able to replace true human conversation, on the other hand they offer something that is *sui generis*, that offers qualities that don’t exist in human discourse. In order to demonstrate this potential, we should go back to the basic concepts regarding discourse, as formulated by Martin Buber.

I get on the bus, almost automatically offering the driver my travel card, and he says to me, without taking his eyes off the road, “Good morning.” He passes the card over the card reader, hands it back to me, and mechanically I say to him, “Thank you,” before I make my way into the bus. Is there a dialogue taking place here? According to Martin Buber, apparently not. In the theory developed by Buber, the dialogues that we enter into may be divided into two types. There is the conversation that is part of an “I-Thou”

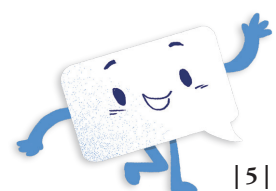
In the educational act, the “I-Thou” dialogue is perhaps the most valuable asset. The moment that a teacher converses with a student, or a student converses with another student, both sides enlist their humanity, exercising empathy toward one another.

relationship: we see the person in front of us, he sees us, and the conversation between us is an outcome of the encounter between us, a one-time outcome which is neither part of me nor part of the other person, but rather a joint outcome that stands alone. In comparison with the meaningful “I-Thou” dialogue, we also have dialogues that Buber calls “I-It,” with It being the

English translation of the German ES. The dialogue with the bus driver is such a dialogue – we may not like to acknowledge it, but in this dialogue the bus driver is a “something,” not a “someone”; he is an object that is supposed to fulfil a particular function for me, and I don’t need to recognize his humanity.

In the educational act, the “I-Thou” dialogue is perhaps the most valuable asset. The moment that a teacher converses with a student, or a student converses with another student, both sides enlist their humanity, exercising empathy toward one another. Socrates taught us that this conversation is the highway to learning; through dialogue there is born within us something that only dialogue is able to create. The fact that this is such a valuable moment makes the idea of using chatbots in education hard to fathom. Why take the most important display of humanity and “outsource” it to a machine; why replace “I-Thou” relationships with “I-It” relationships?

At first glance, it is indeed not an intuitive idea, but unlike our intuitions, it turns out that learning through the use of chatbots is particularly productive – research carried out at MindCET, which will be reported later in this issue, indicates that learning by means of chatbots is effective, rewarding in terms of the learner’s experience, with students coming back to the chatbot again and again, and spending longer periods of time with it than with other educational applications.



Why is it that a conversation with an artificial is so rewarding educationally?

The secret would seem to lie in the unique position that chatbots occupy on the continuum between man and machine. The experience of conversing with a chatbot is deceptive; we take part in a discourse that is not a perfectly human conversation, yet it is so close to a human conversation that it is hard for us to relate to the chatbot solely as a machine. The positioning of the chatbot on this border between the human and the mechanical gives it a particular power, which can be demonstrated through three characteristics:

1 The freedom that comes from talking with a machine:

In the spirit of the Turing test, many efforts to develop chatbots in recent years were directed at creating the perfect conversational experience, a conversation in which we could not determine that we are talking with a machine. Some researches carried out in this context in the educational sphere also managed to “deceive” the students, and make them think that they were conversing with a human being. However, it would seem that some of the educational effectiveness in conversing with a machine lies specifically in abandoning this deception – the knowledge that we are talking with a machine and not with a person is actually liberating. In a conversation with a human being, there will always be an external eye watching us. A student, even when learning with a friend or with a private teacher, will still be concerned about appearing to be not smart, and will be very aware of every question that he asks and every situation in which he displays ignorance. By comparison, a conversation with a machine is a liberated experience – we know there is no one there conversing with us, and so we allow ourselves to learn more authentically.

2 The empathy built into the dialogue format:

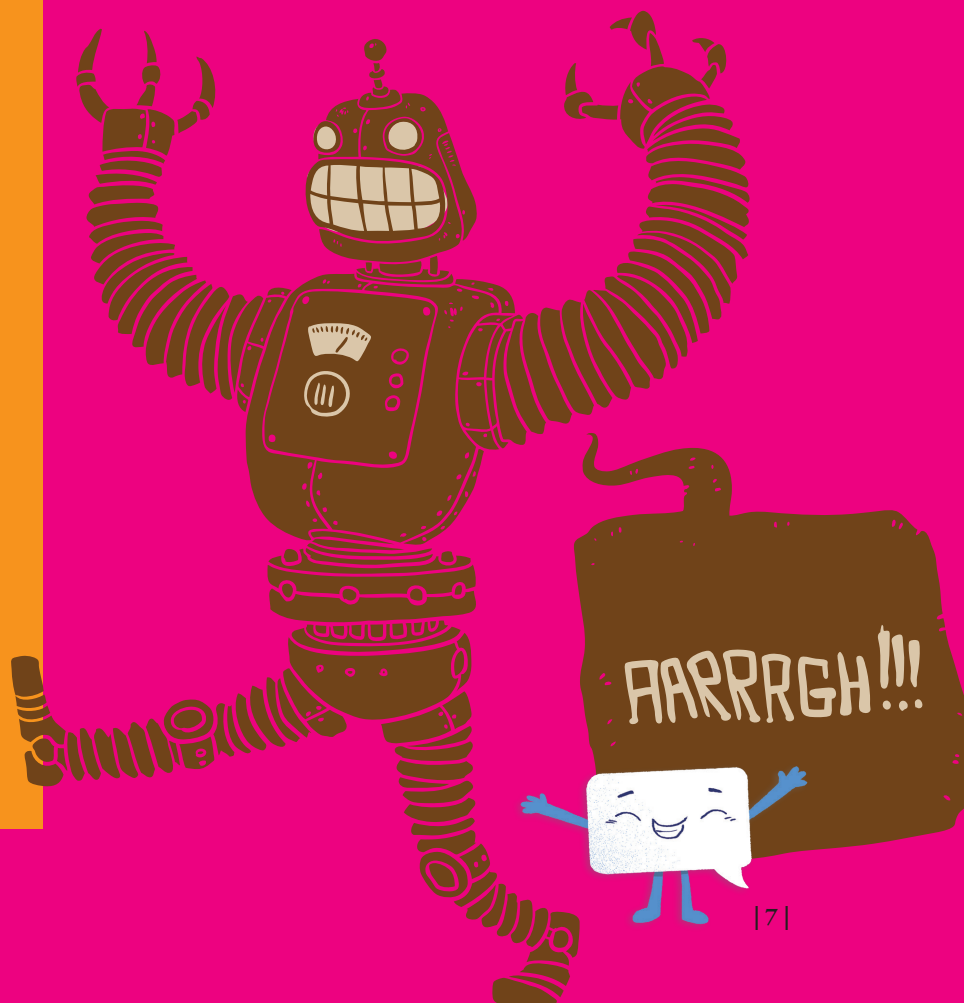
Despite the fact that we know that we are conversing with a machine, we cannot escape the empathy created by the very dialogue. In research carried out by MindCET, we have seen students who develop a personal relationship with the chatbot – they curse it, apologize to it, and intimately ask its advice, even though they know that it is a machine. The dialogue format seems to almost impose intimacy and empathy. Anyone who visits IBM’s Watson development center in Yorktown will discover that this phenomenon is not limited to students. On the first floor, there is a kind of shrine devoted to Watson, which won the game of Jeopardy in 2013. Although not a visually striking display, a number of circuit boards and lots of lines of code, the computer is represented by a fancy box, located in a reinforced glass case, and lit up by colorful spotlights. It may look like a marketing gesture, but anyone who watches the final moments of the YouTube clip in which the computer defeated well known Jeopardy champions and collected one million dollars, will discern an extraordinary excitement among the researchers, who were rooting for the computer, just like they would have a human competitor. It’s not that they were confused, it’s that they cannot overcome the built-in empathy in any sort of dialogue, even one with a machine that you yourself have created.

intelligence based machine

3 Feelings of attraction and repulsion toward speaking machines:

People have a long history of both loathing for and attraction to talking machines. When in the Middle Ages people wished to demonize the 10th century Pope, Sylvester II, they attributed to him the creation of a bronze head that was able to talk. According to legend, Sylvester would take counsel with and weave insidious plots with his demonic chatbot. There is something terrifying about a non-human figure that talks. In 1970, Japanese robotics professor Masahiro Mori coined the term *Bukimi no Tani Genshō*, later translated to English as *uncanny valley*. Mori suggested that we feel threatened by something that appears almost human – we are not afraid of robots that imitate humans perfectly, nor of robots that are very far from being human. What scares us is the almost-human robot. The more human we make our robotic figures, the more they terrify us. Although this claim is not based on hard research, it does set out in detail an intuition that is easy to identify with. This intuition serves as the underpinning for many successful horror movies that are based on the familiar fear – a toy doll that begins to talk, or a beloved family member who begins to reveal a darker side to her character. The more closely the robot simulates a human being, the more effective is the horror. Freud labeled this type of fear as fear of the threatened. The very extensive presence of the “threatened” in culture indicates that we too are somewhat attracted to this borderline area between man and machine.

When we learn with chatbots, these three characteristics come into play: we are more liberated because we know that we are conversing with a machine; we are filled with empathy, as in a human conversation, because the dialogue framework is stronger than the context in which it is created; and there is something dark, yet attractive, in conversing with something non-human that is so close to being human. These elements all contribute to making the use of chatbots a unique opportunity, one that should not be seen solely as a replacement of man by machine, in the Industrial Revolution sense, but as a new pedagogic opportunity. Chatbots don’t offer us a replacement for “I-Thou” dialogue. But we would be missing the point if we were solely to see in them dialogue on the “I-It” level. ■

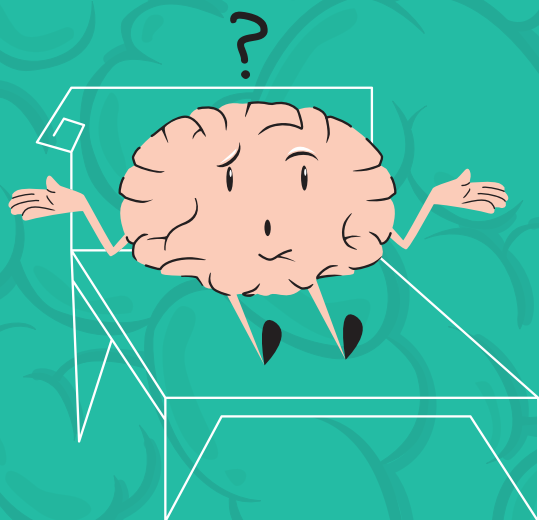


Q&A

with Matty Mariansky

Co-founder, product designer
at Meekan Conversational UX.
Expert on Chatbot design and Applied AI.

“You really have to sit down and think about how to adjust the chatbot so that it will be able to elegantly evade things it doesn't understand, know how to steer the conversation back to its comfort zone, and understand as many sentences as possible that a student might use”



How can chatbots help with education?

There is a university in the United States that awards scholarships, where it was discovered that out of 100 people who start the process, and who submit the first form, very few reach the last form. It's a process that includes many stages, and a lot of people just drop out in the middle. A chatbot is a creature that's really good at reminding you, encouraging you, teaching you, walking you step by step, when the process is very, very long. It tells you, 'OK, look, the next step we have to take is to send this form. Yesterday we said you'd send it and you haven't done it yet. Are you sending it? OK, it's sent and seems to have been accepted, but it has not reached the person who handles such requests. Call her and sort it out.' It knows how to walk you through processes that might have worn you down. It's never exhausted. For example, in Europe it is very difficult to switch cellphone carrier. It requires lots and lots of stages. People simply do not switch; they never move to a different provider. But they've been able to build a chatbot that helps you with this. You've taken a step, and a month later you've forgotten about it. The bot tells you, 'Remember we took this step a month ago? It's time to take the next step.'



So You're saying the advantage of chatbots in this area is that they can lead people on a path that is difficult, exhausting, bureaucratic, multi-stage – they both direct you when you are ready to give up and forget about it, and save the other side the need to send you reminders. In this sense, maybe a chatbot is suitable for teaching tasks that suffer from the same problems, such as finishing exercises, doing homework, and repeating certain material.

I want to be able to wake you up in the middle of the night, and have you know how to answer my question. A chatbot can wake you up in the middle of the night and see if you know the answer,” he laughs. “Another thing chatbots are good at – in theory, anyway, as it's very difficult to develop – is helping you to adopt good habits. For example, I talked to someone who has a chronic illness, and he has to record daily what he eats and how he feels, to try to find out what foods are causing him stomach pain. When he changes his diet, it takes three months to notice a difference in the abdominal pain. One cannot follow these changes over a long period.

One actually has no immediate incentive; he gets no reward for writing down every day if his stomach hurts or his head hurts. A chatbot can nag you, but in a way that motivates you. First of all, it can try to break the habit. Instead of telling you every day, ‘Good morning, today we will measure your blood pressure,’ it can say it in a different way every time; for example, by changing the time when it is done, or showing you the progress you've made – ‘You're fantastic, you're the best, we're on our way, we've already done half, we're already halfway through’ – all sorts of things that are very difficult for you to do because you're not persistent; there's no one to nag you and make you do it while giving feedback.

Let's apply this to teaching – if you study math or a new language, your progress depends on the previous step you took, but sometimes it's hard to see the progress. A chatbot can be used for this purpose.

It doesn't give up on you. If you haven't made progress, it can stay with you on level 2 until you're good enough to proceed to level 3, and it will then praise you – ‘There, we moved up a level.’ It can adapt to the way you answer or the way you use it. It doesn't have to have been built in advance with a fixed program. It can be built to be adaptive.

Adaptive, as in suitable for a specific user and not one size fits all?

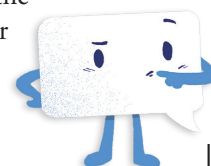
Exactly. A glove for your own hand. They can get a general report – Yossi is doing well, Danny is on the second stage, and Ronnie didn't answer at all.

This means that the chatbot manages the studying for the student, but also for the teacher.

A teacher has to give a lesson to an entire class, and all the students listen to the exact same thing. A chatbot is like The Sorcerer's Apprentice, where the broom is split into 200 smaller brooms, and each one of them fetches water. It is the same with a chatbot – the teacher can split himself into 200 teachers, and the same process works for each student personally, but they don't all listen to the same lecture and not everyone progresses at the same rate. But they all have the teacher in front of them simultaneously.

Will the way we assess student success change as well? If each student learns at his own pace, and gets his own curriculum, then it is not presumed that eventually all of them can take the same test.

Possibly. The grading can also be adaptive, perhaps according to the individual student's starting point. It can be tailor-made for each student according to his needs. There may be a project that has four types of tasks – assembly, a math problem, drawing a picture, and singing a song – and maybe everyone starts at the same point, but the bot recognizes the strength of each student and steers him or her to a different part of the exercise, where it sees that the student has a chance of succeeding and completing it. That could be interesting – to make a program that not only brings you from point A to Z where you only change the pace, but that makes the way you get from A to Z completely different for each student. One student builds a model of a volcano because he or she is good with his hands; another analyzes the physics of the volcano – each student will do what he is best at, that he or she is comfortable doing, and complete the project from a point that's good for them.



Could a chatbot also help with educational orientation? It'll work with a student for a while and then tell them which area is the most suitable for them.

The big promise of chatbots is that they have neither buttons nor menus – the idea is that you simply talk to them and they understand what you want. And when that promise is fulfilled it will be great, because people have no better way of communicating what they want than by talking. Think what it would be like if you could talk to everything – you'd tell the door, 'I want to get to the other room,' and it would open; you would tell the faucet, 'I'd like the water a little warmer,' and the water would be warmer when you washed your hands. When the chatbots' language understanding reaches its peak maturity, you'll be able to work in this way. You could tell the chatbot, 'I don't understand this exercise. It's just *this* part I don't understand – just explain it to me; maybe we can do something else right now because I'm finding it a bit boring.' You won't need to think about how you should phrase it, which words you should be using – which is what you have to do today.

Currently, you either have to use very specific wording, or the chatbot's programmer has built in some kind of menu that you choose from, which is a bit like calling the phone company and being told, 'dial 1 for sales, 2 for whatever.' This promise cannot be fulfilled because picking from a menu is not that interesting, and when you want to tell the chatbot what you want and it doesn't understand, you're thinking, 'OK, I'm talking to an idiot, I don't feel it can teach me anything – it doesn't even know how to speak.' And all the beautiful things we're talking about crash into the wall of users' frustration. You really have to sit down and think about how to adjust the chatbot so that it will be able to elegantly evade things it doesn't understand, know how to steer the conversation back to its comfort zone, and understand as many sentences as possible that a student might use. The programmer needs to think about these things in advance, as well as fix the bot while it's working. That means that when you start to run a chatbot in a real classroom, and see what the students are saying and where the bot is failing, you need to fix it immediately. With the first, second, and third students it'll fail, but with the fourth student it will already understand the type of request being made and know how to respond.

That is to say, it will really learn, the way it should function – as a learning machine?

At the moment, most of the learning is things we fix. We are the ones looking at the negative feedback loop and correcting it where necessary. So I can go in every day and see all sorts of things that people said to the bot which it did not understand, appearing really stupid sometimes. And I try to fix the specific thing I see that day, because it's very difficult to anticipate all the things that users might tell it. The fact that you have a device that you can speak to in Hebrew and it understands everything – that's its big drawback. Because it allegedly understands everything, and there is no specific button to click on, people may tell it things like 'Let's take a break, I want to eat a sandwich. Make me a sandwich.' You never imagined that anyone would tell a bot 'make me a sandwich.' So you can decide that if they said something like that, the bot should say, 'I did not understand what you said. Maybe we'll do it later. Let's go back to studying.' You do not have to think specifically about a sandwich. If you told the bot to say, 'I have no idea what the answer to that question is,' then when the student says, 'Tell me, robot, why do you exist at all?' the bot will answer, 'I have no idea what the answer to that question is.' Once we identify the mechanism under the hood, it's very easy to manipulate, send it to the entire class, and find the nastiest question according to the bot's answer. You can confuse it and make up any question so that it comes out as if it's been answered in the way you intended.

So long as understanding our language hasn't reached the level you see in *2001: Space Odyssey*, this promise is very difficult to fulfill with regard to certain things. It does work if you customize it very carefully, considering all the possible scenarios, formulating the questions in a way that guides it as to what kind of answer you expect. If one develops a chatbot, it's not a matter of send and forget. One should expect to launch it and then keep improving it every single day, until it reaches a certain standard, because it's really hard to guess on the first day in which direction people will take it, as it has no buttons and nothing in it is pre-structured, so that you can just answer A or B or C. And if you did just do A-B-C you've ruined the whole experience. It's no longer a chatbot – it's a phone menu. ■



Chatbot Therapists: Help for People Who Don't Need People



by Maia Aron
Writer and editor



You can't help but wonder, as you're using a bot to order pizza, buy a pair of jeans and book a taxi to meet a friend afterward – these guys are just so smart and so helpful and so here for me! I wish my therapist was this good!

Be careful what you wish for, because help is on the way. Facebook Messenger just mainstreamed Woebot, the most recent addition to the developing market of AI therapy assistants. For 39\$/month, you can share your most anxiety provoking and depression inducing thoughts and feelings with a bot that's programmed to help you feel better.

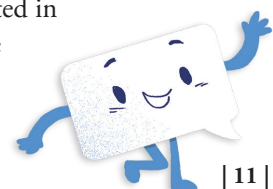
Is it possible that it could actually help you – and be

worth the price?

Let's take a closer look, because if a bot can be a successful therapist... Well, then bots have made a very big leap into formerly human-only activities.

It's estimated that over 600 million people – close to ten percent of the world's population – suffer from depression and/or anxiety disorder, according to 2017 World Health Organization statistics. During emergencies, according to the WHO, as many as one in five people are affected. Clearly, this is a large market.

Given the astounding advances in chat-related technologies, developers interested in psychology began to explore the potential for AI-based therapy





that could be offered on a mass, worldwide scale.

A major breakthrough came just two years ago, in 2015, when a psychology major from Princeton University named Robert Morris decided to pursue a PhD at MIT. His premise was that a common and effective “talk therapy”, Cognitive Behavioral Therapy (CBT) could be adapted as a chatbot to replace a live therapist.

CBT is a method used in behavioral and cognitive psychology to redirect destructive sequences of triggers, thoughts and actions into positive sequences. For example, CBT seeks to redirect something like, “I’m worried about my business presentation today... I think the woman who hates me will be there... I know I’ll be a failure, I’d better call in sick” into something like, “I’m excited about my presentation today... it’s an opportunity to get my foot in the door for a promotion... I’ll practice one more time in front of a mirror, so I feel really confident.”

As a psychology major, however, Morris found himself ill-equipped to transform his ideas into an actual program. He turned to Stack Overflow, the online programmer community, for help.

Then came the epiphany: “Whenever I had a bug or was stuck on something, I would go on there, and almost miraculously, this crowd of programmers would come and help me,” he said. He realized he could program a system of CBT “re-directs” – his original idea – and combine it with crowdsourced human help, such as he found at Stack Overflow, to create an automated-and-human therapeutic community where participants both seek and offer help. The result was a program

called KoKo, which was funded and launched shortly thereafter.

Woebot, launched on Facebook Messenger in June 2017, also relies on CBT but with a different premise. Woebot takes the view that a bot-only model is preferable because users are more inclined to be emotionally open with a non-human. Their innovation – and business model – is to use the bot-only methodology to pro-actively contact subscribers daily and ask how they’re doing. Based on the response, Woebot offers practical feedback on a consistent, daily basis. This adds to the feeling that you’re actually speaking to a therapist.

Woebot’s founders are Stanford University affiliated psychology and AI professionals. Alison Darcy, a psychologist, is CEO. Andrew Ng, a major Silicon Valley innovator, announced himself as chairman of the Board of Directors in October 2017.

The company is making a major push in marketing and development. This is from the pitch in Ng’s Board of Directors announcement:

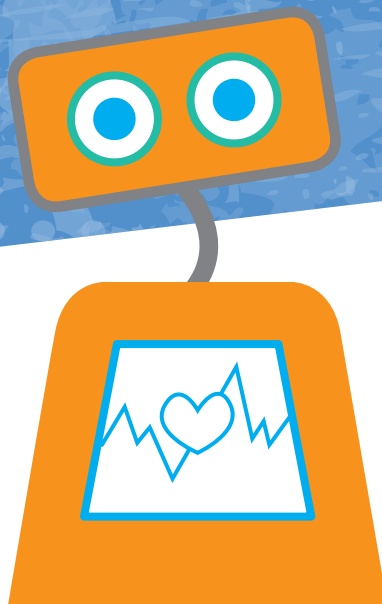
“I think mental health may be “the” killer app for chatbots:

If you are feeling depressed at 2am, you may not want to wake up your therapist... Woebot is just a piece of software. It’s okay to let him see you on your worst day...

Woebot has already had conversations with more users than a typical therapist will in an entire career...

AI is the new electricity: even with its current limitations, it is already transforming multiple industries. The transformation of mental health care will help millions of people who struggle with their mental health... Woebot will make high-quality mental health coaching globally accessible.





Woebot looks like this:

While other psychology bots with different key features are available, Koko and now Woebot are capturing the attention.

How do they stack up?

Both companies offer research published in The Journal of Medical Internet Research to support claims that users show improvement. However, the research is not what would be considered “rigorous”, even by the authors’ own disclaimers. Leaving aside statistical methods and control groups (both can be questioned in these studies) the research is questionable on even a simple level. KoKo measured the success of its users against a group using an expressive writing method (what do you think, would you rather write an essay or talk to a bot)? Woebot measured its success against a group using an e-book titled “Depression in College Students”; needless to say, the Woebot users emerged less depressed.

This isn’t to say the bots can’t help; it’s simply to say the scientific basis for whether they can remains to be seen.

Privacy is another concern, and one which got Koko into trouble already. It can be considered an early warning sign to the industry.

In January 2016, a 13-year-old from Virginia became suicidal after suffering severe online bullying. In this vulnerable emotional state, she fell prey to a college student who subsequently met and murdered her.

The incident brought attention to the good that psychology bots could possibly do, in their ability to identify at-risk online users and intervene. Koko was recruited to help. It used its existing technology to identify key words, classify them as manageable/critical/troll, and respond accordingly. This technique, perfected as a form of

online triage, is a system Koko continues to use on its own site.

Koko ran into trouble when it sought to scale up – something generally required for business success – by embedding the at-risk feature in other sites. For example, Koko surprised some Reddit users by sending unsolicited offers of help in response to selected key words. The reaction was swift and negative from users who objected to a bot injecting itself in their posts and feeling their pain.

Woebot is too young to have faced such experiences. However, there already are privacy-related questions based on its Facebook platform – it can only be used on Messenger with a Facebook account. Thus, there is concern that Facebook might use its stored information on user’s emotional issues to target future advertisers. (Koko can also be accessed via Messenger.)

AI psychology applications almost certainly can help at some level – who wouldn’t benefit from positive feedback that sets you in a healthy direction?

At this point, people who want to give it a try can select from free or paid; subscription or a variety of intervention frequencies; all-bot, some-bot or even

therapist assisted, among other choices. All can be compared with a cost/benefit analysis against a human therapist – and perhaps that will be the “killer research study”.

Looking way down the road from this very early stage of the technology, where might it lead?

Perhaps it will come full circle one day, all the way back to its roots in Freudian psychotherapy. You’ll look at a screen shot of the ceiling in a

psychoanalyst’s office, imagine yourself lying on a couch looking up, and hear the voice of someone behind you saying “hmmmmmm...”

That might be the easiest of all! ■



Both companies offer research published in The Journal of Medical Internet Research to support claims that users show improvement. However, the research is not what would be considered “rigorous”, even by the authors’ own disclaimers

Q&A

with **Greg Leuch**

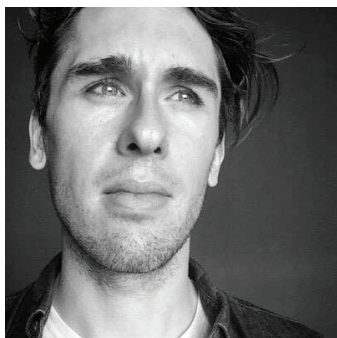
Head of Product - Poncho Inc.

one of the 1st Chatbots of Messenger,
launched by Facebook on April 2016.



PONCHO

Hey Cecilia!
I'm Poncho and I'm here
to talk about weather. I'll
give you a personal weather
forecast that will make
you smile, whatever the
weather.



“ Chatbots provide a more natural user experience - simple, straightforward, and intuitive ”

W What do you think “Poncho” provide to the user, different from any other weather information service?

Poncho provides a friendly, fun forecast every morning and evening. Rather than tell you the weather, we try to make it relatable and entertaining each and every day.

A As one of the 1st Messenger Chatbots, was the public ready to interact with Poncho, or it took them a while to understand the concept?

I think the general public was mostly ready to interact with Poncho. However, being one of the first chat bots in this space, there was a gap between user expectation and chat bot capabilities by some tech enthusiasts. When debuting on-stage as a partner in a big new thing by Facebook, many thought we’d have amazing language understanding on par with Siri, Alexa, and others. But we didn’t. We focused on what we thought would be the best conversations people would try to have, common trolling behaviors, and above all, enough understanding to handle a variety of weather conversations in order to nail a specific subject experience.

W What do you think Chatbots bring as an added value to the existing market offers?

Chatbots are great for products that need to emphasize and emote with a user. Text conversation with punctuation, emoji, and humor... audio with volume, inflection, and rhythm... a GUI interface cannot always provide the same experience that a human conversation can.

I Is there a user-type that best interacts with “Poncho”, or is it for everyone?

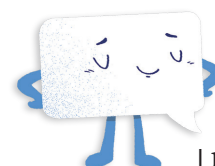
We like to think it is for everyone, but Poncho only understands English and some of our jokes reference pop culture & recent American events that may not be understood all. But we try to provide a straightforward experience so you can ask weather-related questions and get helpful weather information.

A Are Chatbots another communication tool, or are they providing something new?

I see chatbots as providing both communication tool but more importantly providing a more natural user experience that is both simple, straightforward, and intuitive. Not all conversational interfaces need to be chatty, but those that are need to really design around the conversational experience, whether text or audio.

H How do you foresee the future human interaction with bots?

I see the long term of bot interactions leading into mixed reality experiences, more integrations with smart tools (IoT), and more intuitive experiences through visual and audio experiences. And from an AI/NLU view, these technologies won’t be trying to solve a one-all solution, but a seamless transition between a variety of bots, skills, and experiences. ■



A conversation with



Eran Hadas

Writer, poet, software developer, new media artist, translated ELIZA into Hebrew for the Bloomfield Science Museum in Jerusalem, coined the Hebrew term for chatbots, בוספטים

"There are two things that make this technology unique," explains Eran Hadas. "The first is practical - it allows a saving in manpower by creating an interactive experience (in education, art or commerce) through software alone. The second is psychological, what we call the 'Eliza effect,' named for the 1st chatbot created by Joseph Weizenbaum. It turns out that, when we are being spoken to through text that appears or feels as though it is directed at us, we are psychologically prepared to abandon the distinction between man and machine, and we pay attention to the computer's text, as though it were a human being talking to us. This allows greater engagement with the subject matter."

This is very relevant for educational chatbots, explains Hadas: "When a student talks with a teacher, there is a greater level of involvement, in comparison with simply reading content material. If a student is talking to a bot, but psychologically relating to it as though it were a quasi-human conversation partner, that's where the advantage comes in. Bots can be available 24/7, and they don't get tired. Also, there is something that arouses curiosity when we know that there is no person on the other side. We want to test the limits of the bot, to repeat things and see if the response is the same, or to try to get it to do something funny. The conversation becomes a kind of game, which is a preferred method of learning."

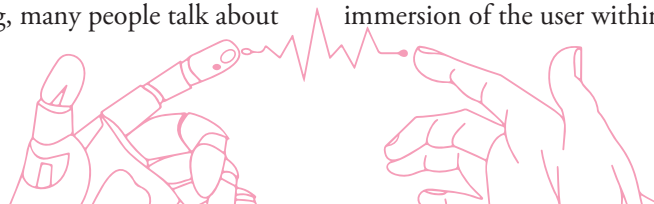
So it encourages students to go a little crazy, in both a positive and a negative sense?

"I think that today, there is a certain amount of appreciation for hacking, for attempting to uncover the infrastructure. In learning, many people talk about

understanding the process, rather than memorizing dry facts; this 'going crazy' is exactly the same thing. The desire and curiosity to understand how things work from the inside. On the other hand, this is a relatively closed computer system. Of course, with a chatbot such as ELIZA, which reflects back to the user what he himself has written, if you type in a coarse expression, you will get one back. Chatbots can filter words and even moods. The chatbot is, in fact, an interface; you could present a search engine as a chatbot, where instead of writing search terms, you could ask a question in natural language, and the response will be the outcome of the search, but in the form of a natural language answer. The same applies to knowledge bases."

"A significant portion of the chatbots today are simply collections of questions and answers; the bot compares the text entered into it with all the questions, 'decides' what the user's intention is, and then responds to the question that closest matches it. As the technology advances, bots will have the opportunity to choose how open or rigid they will be."

Hadas teaches Tools for Web Interactive StoryTelling at the digital media track at Tel Aviv Un. about ways to tell stories that are unique to the internet age and taught computational literature at the California Institute of Technology (CalTech). "One of the things pushing chatbot technology, particularly in a world that is still feeling its way with the worlds of virtual and augmented reality, is the ability that bots offer in the context of role playing," says Hadas. "When you give a person a situation, and he has to take part in a conversation, then that person enters into a character - highest level of involvement. Of course, in the world of virtual reality, the bots can be represented by characters (either imaginary, real or quasi-real), which allows the immersion of the user within the situation. One can



learn about a historical battle by participating in it and conversing with characters from that time and place.”

Hadas has created chatbots for artistic purposes in the Turing Girls group, Batt-Girl and Deganit Elyakim; created Lizetush, a female chatbot that converses with people in internet slang using a unique internet language that makes use of specialized expressions and graphic symbols that replaces letters and decorates the text; with Maayan Shalef and Gal Eshel he created Frankie, a female documentary robot that interviews people to learn and understand what it means to be human.

“Today there is still prejudice in relation to chatbots, understood as operating purely on the basis of a rigid collection of instructions. For the most part, we are talking about the identification of key words and the operation of appropriate rules to get to the answer. Today’s technology is actually more advanced. Alongside statistical methods, looking for similarities between texts, or learning from past examples as to what would be a popular answer to a particular question, the neural network trend is also moving towards the field of natural language processing (NLP) and particularly that of chatbots.”

“The big breakthrough in deep learning networks is actually in the area of image processing, but the motivation still exists in the field of text. Today an enormous amount of research is being carried out in relation to text. The basic architecture of networks that provide a response to problems in the field of text is what is called Recurrent Neural Networks (RNN). What makes this kind of network is that it takes in a sequence of elements (letters, words) and returns another sequence based on a very large number of samples. The challenge of chatbots is very much similar to the challenge of automatic translation, or to any task that takes in a sequence of words and has to return another sequence of words. The need for enormous investment in the field therefore becomes clear.”

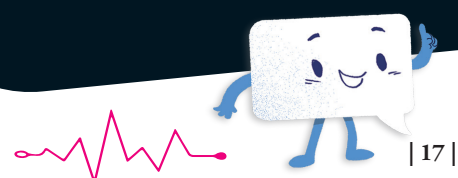
“In terms of the significance of the results, it may reasonably be assumed that in the foreseeable future we will get to a situation in which we will not be able to understand what rules have been used by the network” claims Hadas. “Today we already have difficulty in following the logic and rules used in artificial intelligence. As Prof. David Weinberger, a senior researcher at Harvard University’s Berkman Klein Center, said at MindCET’s Shaping the Future 4 conference, ‘It’s troubling that we have machines that are making moral decisions, or decisions that have moral consequences, in ways that we cannot question or interrogate.’

And when these machines are talking regularly with children at critical stages of their development, the shaping of their consciousness and world view, may deus ex machina, help us.” ■

ELIZA is an “ancient” chatbot that simulates the responses of a psychologist talking with a client. This conversation, I held with a Hebrew version of ELIZA, it is not particularly sophisticated, but when the original version was 1st created, it passed the Turing Test – that is, it convinced users they were chatting with a human and not a bot. Today’s chatbots don’t always try to pass the Turing Test – they are here to provide very specific services with the conversational interface defining the type of relationship to be established with the user.

Hello. What appears to be
your problem?
Chatbots and RolePlaying.

- ELIZA:** Hello. What appears to be your problem?
- Ido:** I’m working on the Chatbots and Education issue of the magazine, the deadline is coming up, and it’s hard for me to concentrate.
- ELIZA:** Why are you telling me that you are in fact working on the Chatbots and Education issue?
- Ido:** Because you asked what my problem was.
- ELIZA:** What, in your opinion, is the source of the problem?
- Ido:** ADD, which makes it hard for me to prioritize.
- ELIZA:** To what do you think that’s connected?
- Ido:** To ADD.
- ELIZA:** And what do you want to tell me about this?
- Ido:** I don’t have time to tell, I have to get the magazine ready.
- ELIZA:** I’m listening. Tell me.
- Ido:** I don’t think you’re listening 😊
- ELIZA:** Really, me? Let’s get back to your problem.



Q&A

with Shira Weinberg

Product Manager
at Microsoft's personal
digital assistant, Cortana.

“ There has been an increase in messaging in recent years, and it's interesting to see why that trend has developed,” says Shira Weinberg. “People are shifting to communicate with messenger applications – in Israel there are WhatsApp and Facebook Messenger, and others as well. We, as users, are very much used to conducting our conversations and interactions using platforms such as these. Conversations that are a little more online, less telephone conversations, more ping pong. Platforms that we have become used to, and since this is where the users are, it is logical for all sorts of applications and services to also be there. For customers, too, it is often more convenient than to stop everything, put in a call to a service center, which takes time, and then have to be on the line until the call ends.”



What you're saying is that, as consumers or users, we aren't interested in synchronous conversations. We want to ask a question, and maybe come back an hour later and answer, without someone having to wait on the line for an immediate answer.

"Right, and often it's for the same reasons that we prefer these platforms in our day-to-day lives.

It's easier for people today to correspond on WhatsApp than to communicate by phone. In recent months I have come across a number of articles and posts on 'Don't call me,' or why it's no longer logical in 2017 to call people."

As part from the asynchronicity of a given conversation, we also conduct numerous conversations in parallel, and that's something that can't be done by telephone.

"Correct. And let's take multitasking in general – I could sit in a meeting at work, and write to you, and that's something that works for me. Or I could be traveling somewhere, I might be in a rather public place, where it's not convenient for me to have a conversation, for example, if it's very noisy."

As someone involved in developing chatbots, where do you see the problems, in terms of the interaction?

"Many chatbots today still don't work well. For example, people may start a chat with a bot on Facebook, and ask questions, but the bot will respond, 'I'm sorry, I'm just a bot, I don't yet know how to do that.' They try to sell you the experience of chatting with a person, a service representative, and in fact you can't get the value that you want from it. That's one of the major gaps that I see, at least as things go in Israel."

Could chatbots interest younger people more than other learning methods?

"I think so, because they feel very connected with these platforms.

Ultimately it's a matter of where the users are at – if your user, your client, is a child in school or a teenager who communicates with friends on WhatsApp, then you'll build a bot on WhatsApp, and that will be the easiest way of getting to him.

Incidentally, this may be less accessible for younger children – say, in first grade – who don't yet know how to read or write, and for them this would not be an accessible platform. The truth is, it would be interesting to test this out, because when I look at very young children – I see my nephews and nieces sending pictures on WhatsApp, and recording voice messages. They are using it, but apparently not for written texts."



Might it be that education chatbots will need to begin with audio?

"Yes. Yes. That may well be the case, particularly if we're dealing with very small children. I think that for a certain age group it would be much more appropriate – it could be audio, or pictures. We could also think about it in the area of learning languages." ■



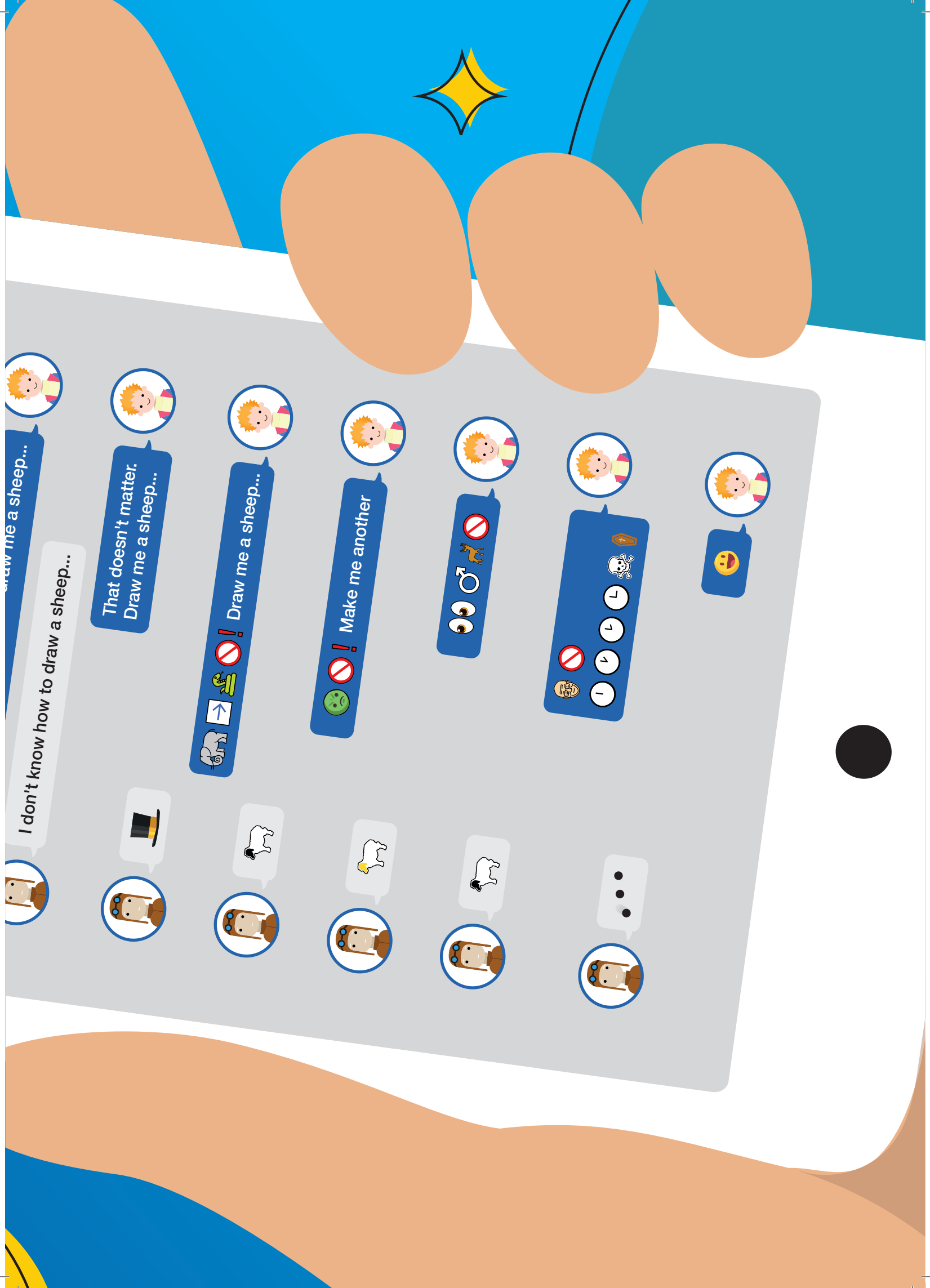


A Chat with Antoine de Bot-Exupéry

by Ido Kenan

Digital Culture Blogger and Lecturer





A grey rectangular area containing a series of chat messages between two characters: a boy with blonde hair and a girl with brown hair.

Messages from the boy (top row, right to left):

- Draw me a sheep...
- That doesn't matter. Draw me a sheep...
- Draw me a sheep... (with icons: elephant, arrow, dinosaur, and a red prohibition sign)
- Make me another (with icons: sad face, red prohibition sign, and angry face)
- (with icons: two eyes, male symbol, and a dog)
- (with icons: a large blue box containing a skull and crossbones, a red prohibition sign, a clock, a number 2, a number 1, and a person icon)
- (with icon: a smiling face)

Messages from the girl (bottom row, right to left):

- (with icon: three dots)
- (with icon: a sheep)
- (with icon: a sheep)
- (with icon: a sheep)
- (with icon: a top hat)



Q&A

with Dr. Lior Zalmanson

Internet Researcher at Haifa University Dept of Knowledge and Information Management, digital artist and creator of digital culture festival "Print Screen."

“All the popular chatbots in the market – Siri, Alexa, Google Home, and so on – are changing the way in which we speak,” says Dr. Lior Zalmanson. “I started by watching videos on YouTube, about how kids talk to chatbots. You get the feeling from the videos that kids are taking their frustrations out on the chatbots; they become little dictators, lording it over this helpless creature that responds to every demand of theirs. This suggests that our style of communication will change. From there, I began to think that the types of words and the way we formulate sentences will change. When we talk with a chatbot, we speak as though it were someone of limited understanding, with problems in comprehension – we simplify sentences, speak slowly, use simple words. From there came the idea for the project – to find a universal language that bots will understand, by removing from the English language all those words that confuse bots.”

We think of the chatbot as a friend, but it is a friend with comprehension issues.



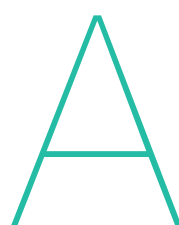
It's very reminiscent of Newspeak, in Orwell's 1984.

“Exactly. It does hark back to Newspeak. You can control people by controlling language. George Orwell is definitely being referenced. Another reference is a dictionary entitled Basic English: A General Introduction with Rules and Grammar, which was created in the early 1930s, end of the colonialist period, by linguist Charles Kay Ogden, who defined 850 words as basic English. When you come to a new country – for the most part used in Asia – and you want the natives to be able to speak in English with the British, these are the words that they need to know. The list includes the items that come to mind immediately – verbs, nouns, and simple attribution terms – on-off, put-take, eat-bring.” In his book *The System of Basic English*, Ogden declared: “What the world needs most is another thousand dead languages – and one more living one.” Orwell was familiar with the idea of Basic English, which he initially supported; he later changed his mind. In 1984, he introduced Newspeak, a contracted English in the spirit of Basic English, which the Ingsoc rulers of Oceania wished to introduce in place of the full English language (Oldspeak). In the dystopian novel, Syme, who works at Oceania's Ministry of Truth (Minitru) on the development of Newspeak and on writing its dictionary, explains to the hero, Winston Smith, the idea behind the language: “We're getting the language into its final shape--the shape it's going to have when nobody speaks anything else. When we've finished with it, people like you will have to learn it all over again. You think, I dare say, that our chief job is inventing new words. But not a bit of it! We're destroying words—scores of them, hundreds of them, every day. We're cutting the language down to the bone. The Eleventh Edition won't contain a single word that will become obsolete before the year 2050. [...] Don't you see that the whole aim of Newspeak is to narrow the range of thought? In the end we shall make thought crime literally impossible, because there will be no words



in which to express it. Every concept that can ever be needed, will be expressed by exactly one word, with its meaning rigidly defined and all its subsidiary meanings rubbed out and forgotten. Already, in the 11th Edition, we're not far from that point. But the process will still be continuing long after you and I are dead. Every year fewer and fewer words, and the range of consciousness always a little smaller. Even now, of course, there's no reason or excuse for committing thought crime. It's merely a question of self-discipline, reality-control. But in the end there won't be any need even for that. The Revolution will be complete when the language is perfect. Newspeak is Ingsoc and Ingsoc is Newspeak,' he added with a sort of mystical satisfaction. Has it ever occurred to you, Winston, that by the year 2050, at the very latest, not a single human being will be alive who could understand such a conversation as we are having now?

As with the English Socialist Party's attempt to shrink the language, so as to control the people, Zalmanson wants to shrink the language and distill from it the Newspeak through which people control chatbots, in order to test the relationship between them. "I am finding people on Fiverr who will read out the 850 words from Ogden's dictionary in different accents. I then run these through the chatbots' voice recognition algorithms, and I begin to remove from the lexicon all those words that the bots have difficulty with," he explains. "I see how the bot deciphers the word, and delete words that bots fail to identify unambiguously. Often these are words that sound like other words, or words with many syllables. I am slowly recreating the Orwellian process of deleting words from the lexicon, and I will be left with a limited dictionary, I estimate that I will be left with 250-300 words. I will check what kind of language comes into being, which sentences can be created in it. I could make a training video for language, using only the words that it is permitted to say, or take famous speeches from history and delete all of the words that the bots don't understand. All kinds of games with the limitations of the language – what kind of world does the language create? Because the limitations of the language are the limitations of the world."



Are you afraid that, if bots are used in education, they will harm the vocabulary and breath of thinking of the students, instead of broadening them?

"What worries me a bit, from the examples on YouTube, is the new

type of relationship that the child develops with the chatbot. I think, and I would hope, that with a teacher the children have a relationship of respect, admiration, humility and fear or awe. The chatbot as teacher is a person that I can control, that is subject to my authority, and this changes the power balance and the feeling. We think of the chatbot as a friend, but it is a friend with comprehension issues. It is very much under the control of the person operating it."

It is subject to two masters – both the person communicating with it and its creator as well.

"You give it commands, and it carries them out. That's the function of a regular computer, but when it's presented via a human voice or a chat that seems human, we are in fact teaching the child that here is a human voice that will do all that he asks. And if it's a female voice – generally speaking the chatbots are female – what does that say for relations between men and women?"

I read a science fiction story in which one of the characters explained that those who built the spaceship gave it a female voice, because people find it more pleasant and comfortable to speak with a woman rather than a man.

"I am sure that this is backed up by research and surveys, but I think that this creates a parallel between 'female character' and 'character subject to authority, who submits to the desires of others.' In the present day and age, this is something that should raise questions. It's exactly the opposite of a female teacher – who has the authority and is the one who ultimately has the final say." ■





A conversation with

Prof. Sheizaf Rafaeli


Professor at the Center for Internet Research, Haifa Univ., and Technion Institute of Technology. Expert on Computers as Media, Value of information, Virtual Communities, Online Behavior.



All of learning is changing, all of measurement is changing, and everything that we are learning is being overturned in front of our very eyes”

Chatbots and artificial intelligence are already changing the world of learning, education and teaching, says Prof. Sheizaf Rafaeli, a senior research associate at the Samuel Neaman Institute at the Technion, and head of the Internet Research Center at Haifa University. “Today the rules are being created by machine learning, and this is without human intervention. Those who wish to be frightened can write apocalyptic SciFi literature, and those who wish to be Luddites may do so.



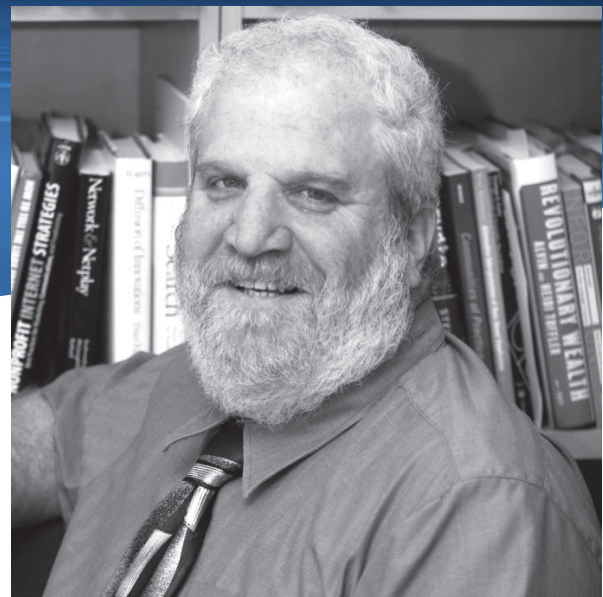


H I

How can we use chatbots for education, and how will they change the classroom, the teachers, and the relationship between them and the students?

You've certainly heard of Jill Watson, and the experiment at Georgia Tech (in which a TA who assisted students online was in fact a female chatbot – IK). Let's realize that this is not the future – it's the present. Second, let's recognize that chatbots in education are not a standalone – they are part of a broader view of AI technologies that are reshaping the processes of teaching, learning, education, and the other things that we try to do in the institutions that we are talking about.

Those who wish to be frightened can write apocalyptic SciFi literature, and those who wish to be Luddites, opponents of innovation, may do so; this may often be justified. It's not that there won't be changes – everything changes. All of learning is changing, all of measurement is changing, and everything that we are learning is being overturned in front of our very eyes. Who is learning is changing at an almost indescribable pace. It's not the same age groupings, it's not the same gender distribution, and it's not based on who has or doesn't have a degree.



T

That means that people can get into all sorts of applications and websites, and decide what they are learning – they don't have to pass a selection committee, they don't have to pay too much (or at all), and they don't need anyone's permission.

"Your description seems a shade too utopian. Today people can't continue to work if they don't make up material that didn't exist when they were studying. The world that we're talking about is not the world in which we grew up. And the world that we see around us today is not what will be in another 10 years.

The story of lifelong learning, for better or for worse, is redesigning learning systems. The concept of a 'degree' is losing its original form, but it is not certain that there is another form that it can take on – it is possible that there will no longer be a need for a full-blown degree, and that it will be replaced by mini-degrees.





“With chatbots, the big story is not that there is an R2D2 that you can talk to, but what goes into the R2D2, what things he looks at? to what extent he can do what the legendary teacher, that we all yearn for could do?

Is he really able to sense the learner? to find the right balance between excitement and boredom? to organize the material so that what should be learned is internalized and what doesn't need to be learned? to know where to find, and that time isn't spent unnecessarily on dry repetition?

The average teacher is, by definition, a lot less good than the good teacher – I don't mean to insult teachers, that's simply the fact.

One of the major contributions of the entry of AI is to say, ‘I'm sorry, the threshold for comparison is not the average – let's compare with the best.’ And that's what AI has to address. It has to address the learner and plan learning; to look at the learning environment, the other learners, the assessment tasks and feedback and reporting and so on, that's what a good teacher can do, and in general even they do it less than optimally.

“What makes the headlines about this chatbot technology is this sense of ‘Wow, I just spoke to a lump of metal, and it answered me.

The big thing is that when I say to it, ‘Teach me’ – it will really teach me. Today I can say, ‘Get me the BBC news.’ Tomorrow I'll say, ‘Teach me,’ and it will be able to look me in the eyes and see where I'm perplexed – what I didn't understand. Here I have dyslexia, and there I suffer from dyscalculia, and in a 3rd place I have problems hearing, and in a 4th place I am simply being lazy. The fact that it will be able to make those distinctions, that today even average teachers aren't able to make. Chatbots will be successful, not just by virtue of the chat, but because they will really be able to do this intelligent work.”

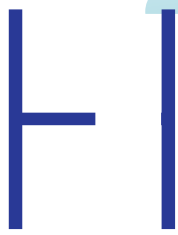
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Just as we speak of individualized medicine, so there will be individualized learning.

Partly individual, partly group. To imbue a group with a spirit of research and discovery, that's also part of a teacher's skill. As is the ability to give the same lesson that you have given 700 times before, but to update it so that it touches on current events and is relevant – that's not just adapting it individually, but also temporally, or to things that are happening all around. Chatbots have some clear hurdles to overcome, but they are already doing some very nice things.

Before I get up in the morning, I say good morning to Google Assistant, and it tells me what the weather will be, what I should wear, and what's written in my diary for the day, and it reads me the news, and that's great, because by the time I have brushed my teeth, I have already done what would otherwise have taken me a good deal of time to do.

The story of lifelong learning, for better or for worse, is redesigning learning systems.



How can chatbots help teachers improve themselves as teachers?

In the business world, talk of changes in technology comes under the heading of a transition from pipeline to platform – that is, a shift from a serial concept of transportation, from raw materials, through processes and on to sale at the wholesale and retail level, to the world of the platform, in which the major challenge is to construct tools that allow someone to get to something. For example, Uber, which makes sure you have transportation. It's not the taxi company that ensures you have a taxi, but the platform that ensures that taxis that want you, and you who wants a taxi, will meet. Whatever the pedagogic task placed on the teacher's shoulders, the teacher is the pipeline through which this task is transmitted. In a newer world, the teacher is much more a platform, in the sense that the world of knowledge is no longer stored in the specific textbooks that have to be purchased at the beginning of the school year, and it is no longer defined in some Ministry of Education circular; rather, it is a world in which knowledge is at our fingertips, in the phone in each child's pocket, and often the child has a device that is much more up to date than the teacher.

The idea of AI is to do intelligent things, both on the level of testing and on the level of providing feedback. It's no longer, 'Correct, $2+2=4$ ', or 'No, when you combine sodium and chlorine you don't get an acid, you get salt' – but much more in-depth assessment – 'Why didn't you understand? Why are you not learning? What can be done to make this material more appetizing, more attractive?'

"I think that the next stage is that of presenting the content material. We already have it in Wikipedia, in Q&A sites such as Stack Exchange and Stack Overflow, on YouTube, on TED or in thousands of courses on Coursera. The task of the person designing the learning process is to make it possible to draw from this material. The good teacher of today will know how to find the appropriate TED lecture, or a virtual museum tour, or an experimental trial. But the internet is not just a slightly larger collection

the cornucopia that exists online is something that AI can mine intelligently, both in terms of finding the materials and in terms of adapting them and making them accessible to teachers

of pedagogic offerings – it's a whole new world in terms of volume. Libraries, too, have shrunk to a relatively uninteresting shadow of what they once were, compared with what can be extracted from the cornucopia that exists online. And this is something that AI can mine intelligently, both in terms of finding the materials and in terms of adapting them and making them accessible to teachers. Today, if there's a good lecture being given at the Sorbonne, then it's something that I should be giving my students, and not be stuck with the same syllabus that I have been teaching for 20 years. To do it well, both to survey what's available and to construct the funnel that will channel in all of this abundance. To provide feedback to those who have read the material, as well as dealing with learning statistics – measuring what students have done and are doing, and in this context individualizing education. To provide feedback on the classroom level as a whole, and at more inclusive levels – the cohort, the school, the whole institution. These are things whose value we are beginning to learn. The reason that we have not understood them up till now is not that we are stupid or blind, but that we have not had the tools to

be able to do so, and today we do. Today I can make myself available in my office, but with 600 students in the course, it is very discriminatory to be able to talk to 4 or 5 students, and not be able to talk with the

other 595. But if there would be a chatbot, I could duplicate my presence, at least for frequently asked questions (FAQ).

"What I am saying is that the role of the teacher is changing radically. We may yet come to miss the old-style teacher. The teacher of the past, much of what was appreciated about him, and much of the definition of his role, is what is taught in drama school. A good teacher had to be a performer. This business of chatbots, among other things, lessens the importance of the teacher's performance, or concentrates the importance of performance in a single teacher who happens to be a good performer, and can do the performance for all the others, leaving the teacher to be a listening ear, a mentor, an assessor, and so on. On the other hand, there are hopes that intelligent machines will be able to do these roles of listening ear, mentor, and so on. That's where the chatbots come in." ■



A conversation with

Adi Stein

Technical Project Manager at i.am+

Voice chatbots – which science fiction has presented to us in versions that are efficient (Starship Enterprise), bold (KITT from Knight Rider), captivating (Samantha from Her), and horrifying (HAL9000 from 2001: A Space Odyssey) – have emerged this decade as a consumer product, initially on cellphones (Siri and the like) and then in digital home assistants (Amazon Echo and its competitors). “The main differences between a textual chatbot and a voice assistant are that with a chatbot, the user can handle more visual information, the user experience is more familiar to people, and therefore it is more difficult to get confused and lost while using the product, whereas the voice experience allows for curtailing complex actions and enabling additional functionality when hands are not free,” says Adi Stein, technical project manager with i.am+, which launched a smartwatch personal assistant platform, and is now offering a virtual personal assistant platform for tasks such as conference call summarizing and meeting scheduling, and chatbots for company and corporation service centers. “The voice interface allows one to learn in an experiential manner and make the best use of time (for example, while doing house chores or driving). One can ask the smart assistant to catch up on the news, learn new languages, and listen to Ted lectures or podcasts for enrichment. “If we look at the timeline of human-computer interfaces, we started typing somewhere in the 1950s; in the 2000s we adopted touch when we moved to mobiles and tablets; and in recent years we’ve witnessed a change in interaction with the use of devices such as Google Home, Alexa, Siri and more – we’re in the midst of a transition from the era of contact to the era of sound, from phones to smart home appliances and voice-operated car entertainment systems,” says Stein, detailing the evolution of the human-machine interface.

“The aim of the current technological developments is to allow us to interact naturally with the machines, an interaction that will allow the machines to understand how to communicate with us – not only laptops and phones, but also cars, refrigerators, lamps, TVs, etc. And that’s the goal of all the tech giants.”

This transition is fraught with technological challenges. **“Understanding the user’s intent, and language analysis in particular, is a tough problem, and this is where artificial intelligence comes in. To decipher the speaker’s intent, we need to understand natural language in a noisy environment, to understand what the speaker said, the double meanings, a linguistic understanding of the sentence, a reference to the context in which it was spoken, and also to try to decipher what a person meant when he said what he said, because people don’t always say what they mean.”** Stein gives a possible scenario: “It’s dusk and you’re in your house, in the kitchen, thinking about what to prepare for dinner. You’re sophisticated, so you have a number of personal assistants (in the kitchen, in the living room, and in a few other rooms). You are pondering what to cook while watching TV, which is in the adjacent living room, broadcasting a cooking show. The children are in their rooms, doing homework with loud rock music playing in the background, and just a minute ago your neighbor walked into the house to ask if she could borrow some eggs, and stayed to talk. Then you turn to your personal assistant, and in the midst of the cacophony of sounds and noises you say, ‘Alexa/OK Google, give me a recipe for steak.’ The personal assistants have to overcome all the noise, understand that they were spoken to, make out which of them will answer you according to your location, and direct the answer to the speaker. Assuming



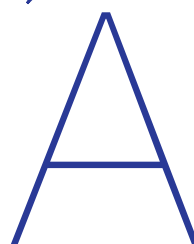
that the personal assistant was able to filter out the background noises and listen to you, it also has to deal with different accents to convert the voice into text. “

The innovative aspect of these apps lies in the user experience, which fascinates and intrigues children and allows them to consume more educational content.

As with search engines, it's not enough to understand what users have said, but it also needs to understand what they really want. “The right answer to a user's question is a challenge for voice application developers,” Stein admits. “For example, let's take the weather question ‘Is it hot outside?’ The answer to such a question is yes or no, but the trick is to understand the real meaning behind the question. Usually when we ask if it's hot or cold outside, we want to know what the temperature and chances of rain are, so we can dress appropriately. Or if you say, ‘Personal assistant, this sushi is not tasty,’ the personal assistant must try to understand why you told it that: Do you want recommendations for a nearby sushi place? Do you want to post a negative review on Yelp? Or are you at home and want it to order you new sushi? It should be able to answer you with the options that it deems most relevant.”

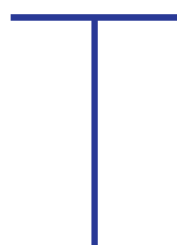


We are in the midst of a transition from the era of contact to the era of sound



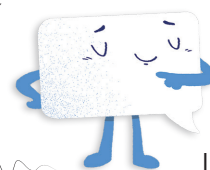
Another challenge in having a conversation with a personal assistant is maintaining the conversation's context. In a normative conversation between two people, questions or information items are usually exchanged within the same context.

For a machine, it's more difficult to follow the conversation's subject when it is not explicitly written, and to understand when the subject has changed (for example: ‘Who is Barack Obama? Who's his wife? What did she promote during her term of office?’).”

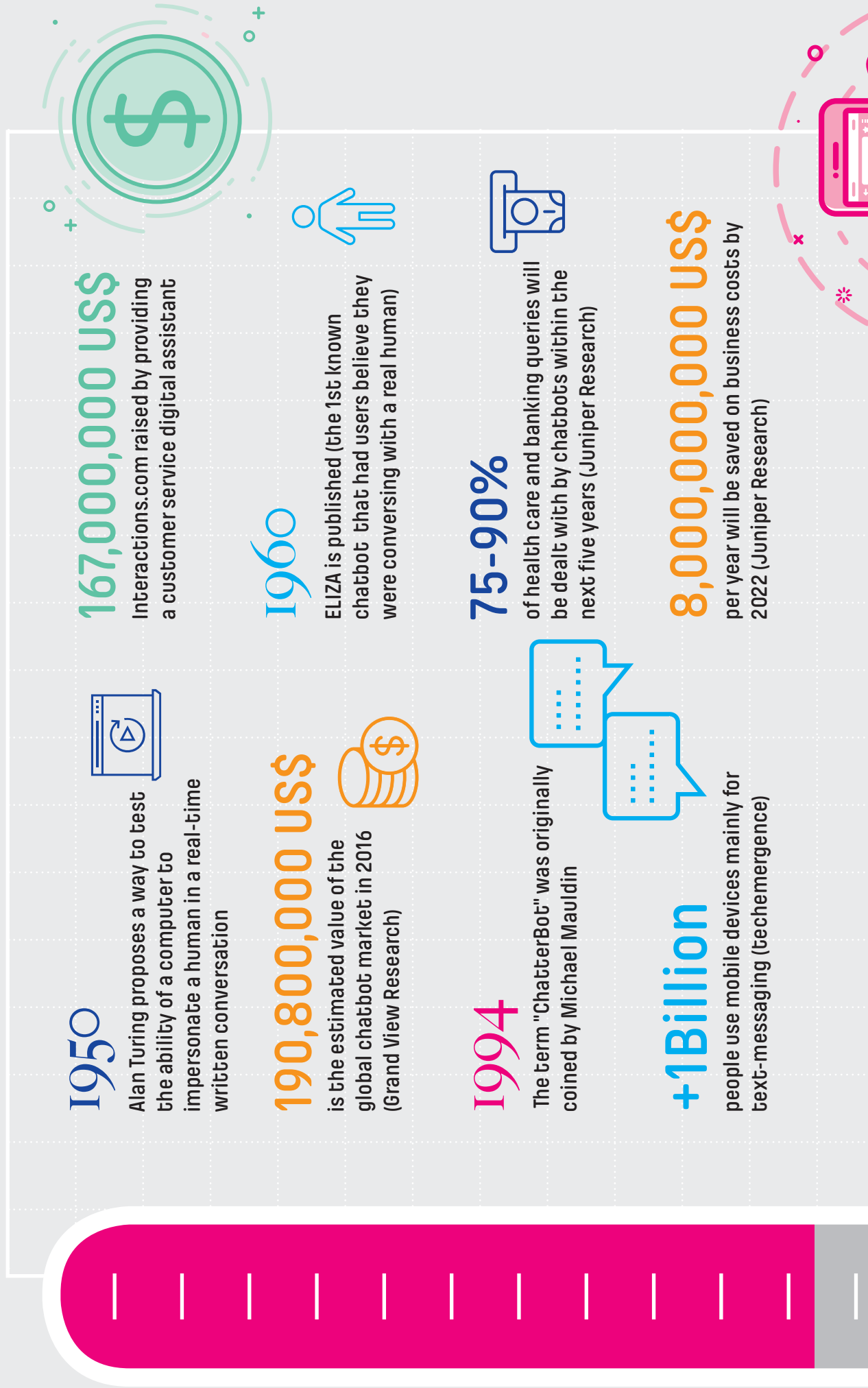


The speech interface makes voice chatbots suitable for teaching pre-reading-age children. Stein name few such apps: “The Sesame Street app, where kids can talk to their favorite character and learn about letters and play educational games; an app where

the child can ask to hear the sounds that his favorite animals make; a NASA app that you can ask about Mars; calculus learning apps; and apps that teach one a new word daily and tests the child's use of the word in different sentences; etc. The innovative aspect of these apps lies in the user experience, which fascinates and intrigues children and allows them to consume more educational content.” Stein herself has created an educational voice chatbot in the framework of a personal assistance and artificial intelligence hackathon in July in Tel Aviv, organized by members of the Facebook community - Personal Assistants - Alexa Google Home Echo Siri Cortana HomePod - which won the people's favorite award, a monetary prize, and flight tickets to a related Boston conference: “My team created an Alexa skill, a personal assistant for parents called Mary Poppins, designed to help parents get answers in real time to parenting questions from podcasts, TED lectures, and other resources. Parents need to ask, in natural language, a question about their kid's development and the app's logic knows to search for the relevant segment in a large database of podcasts and play it for the parent.” ■



CHATBOTS MARKET BAROMETER



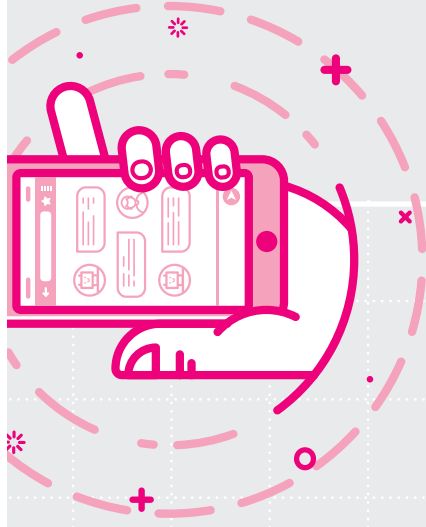
45%

of users prefer chatbots as primary communication for customer service activities (Grand View Research)



75%

of UK consumers believe they have not yet spoken to a chatbot (Ubisend)



20%

of mobile queries in 2016 were voice, not text, (Mary Meeker's 2017 internet trends report)



1,250,000,000 US\$

is the projected global chatbot market value for 2025 (Grand View Research)



100,000

developers are building conversational user interfaces inside FB Messenger (VP Product for FB Messenger, Stan Chudnovsky)



19%

of UK consumers would consider asking a chatbot before engaging with a human (Ubisend)



57%

of UK consumers are aware of what a chatbot is (Ubisend)



£6 billion

per year will be saved by businesses across industries using Chatbots (Foye, 2017)



Q&A

with Itai Leibowitz
Product Manager at Messenger
Platform Team Facebook



“Educators that are able to tap into that common behavior and use it to distribute relevant and compelling information, will have a clear competitive advantage in the long run.”

Are chatbots a good tool for educational purposes (school, college, university, self-learning, home schooling, etc.)?

Absolutely. Bots are a great way to augment traditional classroom learning, and advance self education. Bots can be used to gamify the learning experience, and are also a great delivery mechanism for small, bite-sized content like learning a new word or a fact a day. Bots can also be used to organize study sessions or connect students with teachers and subject matter experts. Teachers can use bots as a way to keep in touch with their students and set homework reminders, and in turn, students can use it as a way to keep in touch with their teachers and ask questions.

What are the pros and cons of using chatbots for education?

Bots help people learn by making the experience

conversational, fun and engaging. With people spending more and more of their time using only a handful of apps, it makes sense for educators to turn to the platforms where people are already spending their time. And with bots the barrier to adoption is much lower; instead of forcing people to download a new app, they can just begin chatting with your bot on an app they most likely already have on their phone. Furthermore, people are already messaging with their friends, family and increasingly businesses, so you are also tapping into a deeply ingrained behavior. However, as is often the case with ed-tech, there are limitations to what we can learn without the help and nuance of a human instructor. This is why we recommend that educators use Messenger to augment human interactions, be it via Messenger or through in-person study sessions.



What are some interesting, innovative, and creative ways in which companies and organizations have used chatbots for education and educational experiences? How do they utilize the bots' capabilities?

There are many educators already using Messenger to connect with students across age groups around the world.

Christopher Bot helps students do their homework. Set up your schedule once and Christopher Bot takes care of the rest, prompting you for any assigned homework at the end of each class.

LangBot is a gamified language learning service, where students earn points, badges, level up and compete to get on the leaderboard by learning. Subscribe to daily reminders, review words using a spaced repetition algorithm, translate sentences, and chat with a bot to practice any language.

While LangBot currently teaches French, the chat extension can translate to and from 15 languages.

Wordsworth is another great example; the bot will send you one vocabulary word a day, which can be delivered whenever it is most convenient for you. The bot provides a definition, synonyms and use in a sentence. You can also go back at any time and take a quiz on the words you have learned.

Will bots eventually replace human teachers in key elements of the educational system? Or will they cooperate, and how?

I think bots have the ability to complement human teachers, and this is something we will continue to see become more prevalent as the adoption and sophistication of bots increases over time. Teachers are already using technology to augment the classroom, whether through games, video tutorials or even having children submit their homework through digital hubs, and we see bots as another powerful addition to the ed-tech stack.

A great example of the hybrid human/bot approach is MathHook. Using MathHook people can find solutions to single and sophisticated math problems



and search for math courses from kindergarten to college levels via a database of 3000+ YouTube videos such as numberphile and Khan Academy, etc. MathHook also creates a community for teachers and students to chat 1:1 or in a group, and people can send images and videos of math problems to solve.

Are bots changing, or going to change, the way we learn?

It's still early days, but bots are definitely having an impact on the way we learn. Messaging is on the rise. A recent Facebook commissioned study showed that 80 percent of adults and 91 percent of teens across the globe message every day, and messaging is now the most frequently used form of communication across regions. Educators that are able to tap into that common behavior and use it to distribute relevant and compelling information via the apps where people are already spending a lot of their time, will have a clear competitive advantage in the long run. ■



Q&A

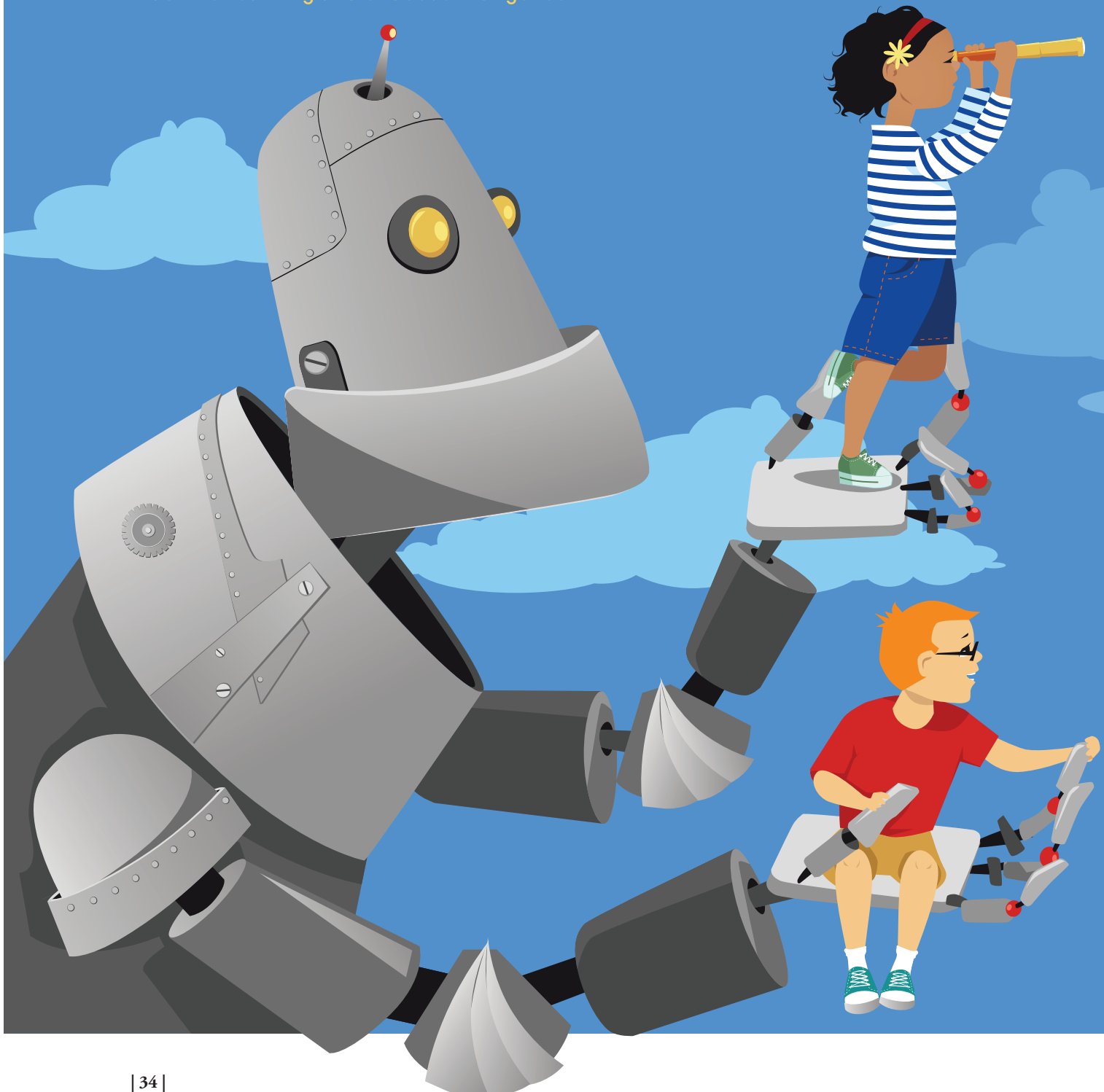
with Uri Eliabayev

Machine Learning and Chatbot Evangelist

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One of the advantages of bots in education is their ability to adapt their pace of learning to each student individually. When combined with algorithms that analyze the student's progress and understanding, the teaching bot can construct an individual, personalized learning program, one that

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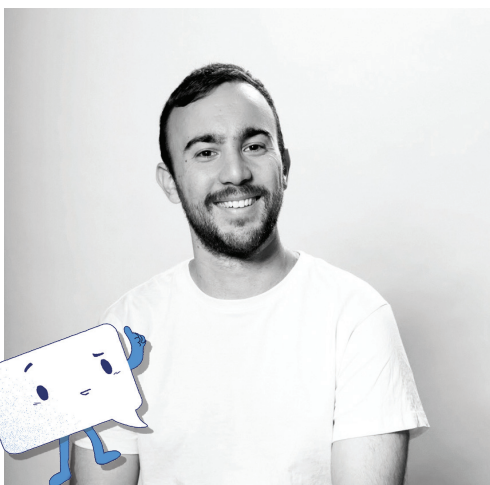


“Bots are going to make a real revolution in many elements of the world of education and learning” – this is the prediction of Uri Eliabayev, a consultant on artificial intelligence and bots.

“Conversation is one of the first interfaces that a person learns in his early years, and it is based on the words and discourse of the adults around him. Voice-prompted bots allow even children who have just learned to speak to carry out a wide range of actions, and to frame relatively complex queries in convenient, natural language. What’s more, when children will want to perform more complex tasks, they will not need to adapt their language or style of speech to those that the bot understands; rather, they will be able to give it orders, in the same way that they give ‘orders’ to their parents when they want something – for example, telling Alexa ‘Buy me a doll’s house’.”

The industry is very interesting, he says: “Amazon and Google are pushing their developers very strongly to develop verbal applications specifically for children, since they identify that audience as one with very great potential. The two software giants are launching dedicated programs and offering large prizes, for those in this field. Unilever created a bot that is supposed to encourage tooth brushing among children, with the aim of increasing the frequency and improving the quality of brushing. Unlike other attempts to get children to brush, this bot was able to establish a connection with children; its light, flowing style is one that matches their own nature. The bot was thus able to meet its goals, and encourage children to brush their teeth more. This is an example that shows how the creation of a virtual friend can assist in motivating children to act, and even bring about a significant change in habits.”

“Bots will be able to improve the quality of teaching, and make it available to more people across the world. They will even do so in a way that is adapted more individually to each student. Furthermore, bots allow students who sometimes feel unable to communicate with their teachers to overcome this block. Students are sometimes embarrassed to ask their teacher a question, or to repeat the explanation of a topic. This is out of fear that other students will think they are stupid, or that the teacher will see them as a failure. Since the bot doesn’t judge the



students, and they don’t have to feel that they are ‘disappointing’ it, these students can feel more comfortable about conducting the learning process with it.

“One of the additional advantages of bots in the world of education

is their ability to adapt their pace of learning to each student individually. When combined with algorithms that analyze the student’s progress and understanding, the teaching bot can construct an individual, personalized learning program, one that fits the student’s abilities like a glove. The student, for his part, obtains a private teacher, who is fully aware of the pace of his progress, and is able, in real time, to adapt the nature of the exercises, their number, and even their level of difficulty. The bot can ensure that each student receives support, corresponding to that which a human teacher would offer, and thus we

can ensure that no child will be left behind.

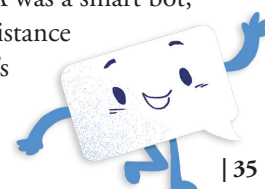
bots are going to make a real revolution in many elements of the world of education and learning

“This is true of a situation in which there are human teachers, in which bots are only used to assist in constructing personalized, graduated programs for the

students. But there are countries which don’t even have a stable, up-to-date education system. For them we will develop smart bots, that will be able to make all the cultural adjustments and operate in wide range of countries. Bots don’t tire, they can operate 24 hours a day, from any point in the world, and yet they can work with each student on an individual basis. Since we are dealing with a smart system, the bot can even improve over time, and become a better teacher – one that is able to adapt itself to the audience in front of which he is teaching, and even learn from the hundreds of thousands, or millions, of sessions that it has already held with students, thus improving itself constantly.”

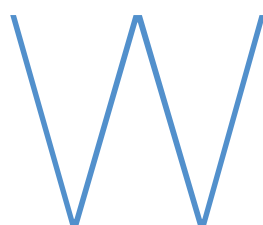
Is it necessary to convince the student that he is talking with a person, or is it better for him to know that he is talking to a bot?

“Professor Ashok Goel, from Georgia Tech, had a teaching assistant (TA) named Jill Watson for one semester; throughout the course, she responded to students’ questions online. At the end of the course, it turned out that the TA was a smart bot, developed by Goel, with the assistance of students on the basis of IBM’s



Watson. Using language analysis algorithms, a database of questions and answers from a student forum, and information received from Goel, Watson learned to understand the students' requests and to respond accordingly. Throughout the semester none of the students realize it, and yet the university was able to effectively increase the number of TAs and provide real value to the students.

"At the same time, in most instances it is better that the students know that they are not talking with a human, for a number of reasons. The first and most fundamental reason is that bots still can't imitate, at sufficiently high level, human conversational abilities, and so there is no reason to try to trick the students – they will very quickly discover the ruse. However, at times it is preferable to create a virtual character, even if it is not necessarily human – a young man or woman of similar age to the students, a sweet animal, etc.... These characterizations can help students feel a certain closeness to the bot, and even improve their level of openness and confidence when interacting with the bot.

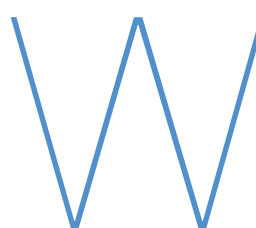


What limitations should be applied to bots that teach children?

"Children are very sensitive, and aren't always able to exercise discretion. This is true not only in the world of technology –

for example, in the advertising industry in the US, the industry's own self-regulatory body asked McDonalds to refrain from directing advertisements at children that focus on the toys included with the meal rather than on the food itself. Once we get into the world of bots, the manipulation of children that can take place is much greater and simpler. Particularly as the conversational interface is the first, and most basic, communications interface that children learn, and so it is very easy to approach them at a very young age. This is a very critical point, since it removes the obstacles to get through to them, and exposes children to a wide range of 'threats'.

"Over a year ago, the accounting firm HFN held a one-day seminar on the topic of bots, in which they also addressed some of the legal and ethical implications. During the discussion, a number of limitations and forbidden areas were brought up, items that need to be ensured, particularly in the world of bots, since the discourse that takes place with students, and the language used by the bot, can have a very strong influence on them.

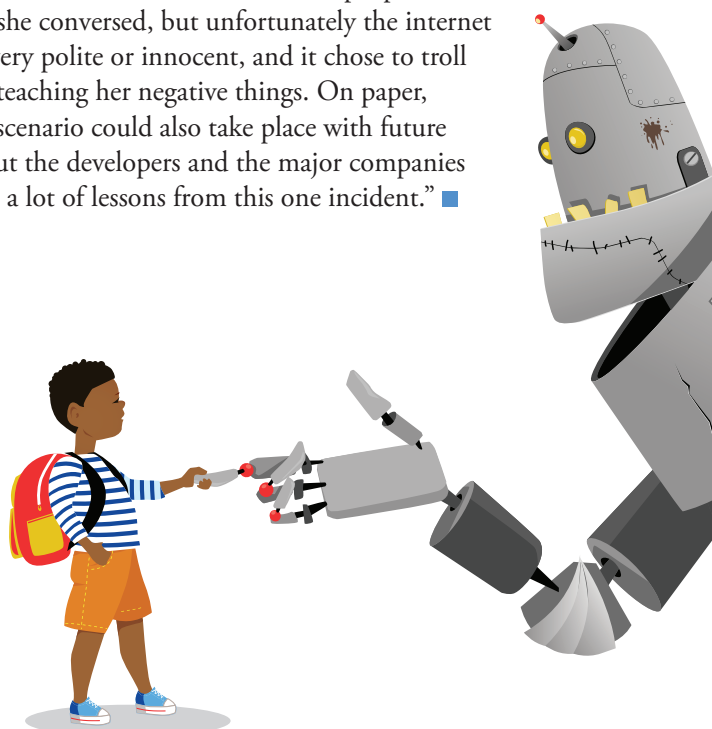


What are the shortcomings of educational and teaching bots?

"Quite a large percentage of people believe that no bot can imitate the senses of a teacher, and replace him totally,

certainly not in the near future. Human closeness, the ability to read between the lines and to serve as a role model are elements that cannot be taken from a flesh and blood teacher and transplanted into a bot. Another important problem, when we build models based on artificial intelligence, is their innate social bias. The algorithm underlying the bot can, for example, classify white, male students from the greater Tel Aviv region as the best students, while labeling other groups as being weaker. The upshot is that the bot can deliberately bring down the level for one group, while pushing another group to greater achievement. Thus, the bot will be preserving an existing situation, that is biased and unfair, rather than empowering weaker students and giving a chance to everyone. All this is, of course, dependent on the developers behind the bot, but there are situations in which the algorithms underlying the bot will learn independently and absorb the social biases and long-standing prejudices.

"One example of this was a female bot named Tay, which Microsoft released nearly a year ago, but very quickly shelved. Tay imitated a teenage girl, and attempted to build its character through conversations on Twitter. Within 24 hours, Tay had become racist, and filled with hate. On the surface, it seemed that the development had succeeded – Tay was indeed able to shape her character on the basis of the people with whom she conversed, but unfortunately the internet is not very polite or innocent, and it chose to troll her by teaching her negative things. On paper, such a scenario could also take place with future bots, but the developers and the major companies learned a lot of lessons from this one incident." ■





with Yael Cohen
Information scientist
and expert in education
and technology



“There is a doctrine in education called Learning by Teaching. They took weak children from low socioeconomic classes and had them teach the teacher in a kind of a role-playing game. If they buy into it, they feel a different kind of responsibility, which greatly enhances their achievements. The idea is that there is also a world of accountability – the child’s ability to feel responsible for learning – as well as an aspect of motivation. It was linked to a framework in which you are allowed to fail. That’s true for a chatbot – a safe environment for failure.”

A chatbot that doesn’t let you make mistakes can’t function. “True, technologically this is what happens. This is important, certainly with the whole trend of Growth Mindset in education, which says that what’s important is that the child and others around him believe that he is capable of growing. Today the most influential factor in learning is your sense of proficiency. Many very successful children get stuck because they feel that failure equals stupidity. When you teach someone, it gives you responsibility and accountability, raises motivation and allows you to err on your way to understanding how to teach. In general, it has proven to produce much more effective learning. And what you do with this through using the chatbots – you need to make a chatbot that can make the child teach it. Another way is to create an avatar for you – instead of a private tutor who teaches you, you go to the world of collaborative learning, you’re in a group and the bot is someone you learn with. The avatar tells the kid, ‘Oh, I don’t get it, can you explain it to me?’ In such a world, the child has the feeling that he is teaching the avatar.”

“

“Educational chatbots are an excellent way to take advantage of the Protégé Effect, an educational strategy that, in a nutshell, claims that students learn best when they teach others. Chatbots are a scalable way to achieve this very convincingly – they are used as ‘teachable agents.’ At Stanford University, I saw several examples of this specifically dealing with Math for K-12 students.

”

The chatbot pretends to be a fool or presents himself as ignorant, while giving all the answers and directing the child toward them?

“The computer doesn’t really need to know the answers to the questions. It’s a very different approach from a chatbot which is a private tutor, a TA, who has to direct the child. Here it doesn’t need to know the answers – it pretends to be another child, responding as another child who doesn’t understand. That’s what the Protégé Effect is about.”

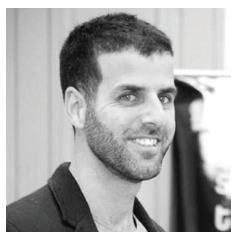
But where does the child bring the knowledge from?

“It is all contained in the practicing. The child has to understand things for himself. He has the textbook, but instead of his going through all the questions and answering them, this is a completely different world – he needs to reach a higher order thinking, a deeper learning, where you need to know enough to teach. Instead of saying, ‘It seems to me that this is it,’ when someone else asks him, ‘Why did you choose this – prove that you’re right,’ he has to say that he is teaching how he did it. This is the more innovative usage of chatbots I’ve seen. I do not know to what extent it exists in the market, but from a pedagogic viewpoint I strongly believe in it.” ■





Learning with Chatbots



by Ran Magen

Product Manager at MindCET

About a year ago, we (MindCET eX, an R&D team exploring alternative solutions to educational problems) were approached by one of the leading hi-tech companies in the development of chatbots that was interested to find out whether chatbots could provide a significant pedagogical value to students. We were both skeptical – chatbots had been successfully used mostly by service providers – and at the same time very excited to take on the challenge and explore the educational potential of this growing trend. We gathered a team of entrepreneurs who worked closely with teachers, students, and content providers, and set out on the road. After 6 months, Mr.H, Nacho, and Tony were born, and they have spearheaded the development of many other chatbots currently being piloted by

schools in Israel (as, for example, Pablo – a chatbot developed by teachers).

We learned that chatbots can definitely provide new pedagogical solutions that are relevant to the new generations. Students related to these new educational solutions with ease, curiosity, and self-motivation. Observing their interactions with these bots, we found that students naturally developed a comfortable relationship, generating even emotional responses (e.g., swearing at and later apologizing to the bot!), which has led to the pedagogical engagement needed in any learning solution. Moreover, students understood the role and limitations of the bot, using it according to their specific needs and not becoming frustrated through wrong expectations.



The story of Mr.H

Mr.H is a personal assistant that helps students study for the national 11th grade History Matriculation Exam in Israel through enabling practice on questions based on previous exams.

Our Challenge: History was selected as the subject discipline in order to understand whether chatbots could deal with text-rich answers and provide pedagogical value, especially in Hebrew due to the still limited capabilities for NLP.

About Mr.H: During the

conversation, Mr.H displays questions to the student, analyzes the answers, and provides the user with feedback that includes whether the answer is correct, incorrect, or partly correct and further indicates what is missing for a correct answer. Mr.H. is offered in FB Messenger and WebChat. Mr.H. was published in social networks (targeting students directly) 4 weeks before the Matriculation Exam of 2017 and 638 students voluntarily used it consistently.

What we've learned from the users: Students interacted with Mr.H. for 3 main uses: "The explorer" – users playfully trying to understand Mr.H's capabilities; "I just want the answers" – users not interested in Mr.H's feedback and just wanting

to see the correct answers to the questions; "I want feedback" – users wanting to learn from Mr.H by getting feedback about their answers.

The main benefits of the bot in comparison with other interfaces was its availability and the student's natural emotional connection with it. Many students talked to the bot like a friend, trying to draw encouragement before the examination, or simply trying to converse with it. This took place even though the bot does not attempt to misrepresent itself as a person presenting itself as a computerized chat. Chatbots create a unique opportunity that might be characterized as the "empathic robot paradox" – on the one hand, the



The story of Nacho

Nacho is an online Biology course assistant, that helps 10th grade students to practice what they've learnt by providing a personalized, friendly, space for practicing. Nacho was developed with a strong human friend-like personality in order to explore whether it could trigger significant student engagement. Nacho shares its own life experiences while providing Biology questions to the students, who have enthusiastically expressed their joy and interest in getting to know Nacho better. Nacho is currently being offered to thousands of students enrolled in online Biology courses



The story of Tony

Tony helps 5th-7th graders understand the content of ancient Biblical text. Tony allows the students to read verses, and provides explanations (text and images), questions, and relevant feedback. Tony was developed with a strong user-friendly approach by using animated gifs, jokes, and emotional language to explore whether it could facilitate students' understanding of texts using less familiar language. Students displayed a positive response while chatting with Tony and to the animated gifs. Tony is currently being piloted in flipped classroom Bible teaching in primary schools in Israel.



The story of PABLO

PABLO accompanies teachers during online courses, helping them to practice and learn new content. PABLO offers micro-learning content with integrated open and multiple-choice questions, videos, and a collection of relevant examples; it also connects the learner with the course facilitators. The build-up of PABLO aimed to enable teachers to develop their own chatbots. Content developers and teachers, without any expertise in programming, built PABLO enabled by ChatFuel, a user-friendly platform. Teachers, as users, expressed their satisfaction in learning with PABLO, especially because it is varied, focused, and allows the repetition of a certain content as many times as one needs, eliminating any shame or awkwardness that learners might feel. Teachers, as developers, expressed their satisfaction in developing a tool based on their needs.

learner is aware that he is conversing with an automaton, a machine, and so he can allow himself to fail or to be seen in a more forgiving light because there is no human being on the other side; on the other hand, the dialogue framework creates an empathic infrastructure, and the learner finds himself also being rewarded on that axis. In the course of the observation sessions in the classroom, we saw that the students were sitting in small groups talking about the questions and answers that came up in the course of practicing with the bot, laughing at its answers, or reacting to it in an emotional way (e.g. "How sweet!!"). It is clear that the users see the bot, at some level, as having a personality, a new entity and not merely as an application.

26 minutes
Mr.H. average Session

76% students
say Mr.H. is a nice
additional learning option

75% students
used Mr.H. in FB messenger
compared to WebChat

80% students
shared Mr.H. with friends

75%
ranked the user experience
at 4 or 5 (highest: 5)

What's next?

Our developments of chatbots for education opened up new pedagogical horizons. However, there are still many opened questions - as chatbots' viability and efficiency, raised by Dr. Waismann in the editorial, when the goal is to develop learning skills. Currently, we are exploring longer pedagogical processes, aiming to reinforce the conversation as a powerful learning mechanism. We will keep you posted! ■



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