Donald Clark (00:00):

The future of AI is not going to be little robot teachers. It's not going to be robot teachers, full stop. It's such a great fallacy, this. It's going to be more like Google. It's going to be online. It's going to be from Starlink. It's going to be on whatever devices we carry around with us, coming into our glasses, AR, whatever. It's going to be online stuff. Incredibly smart because of the hidden force of AI behind the scenes. It will be invisible, and that's the point.

Jeff Cobb (00:24):

I'm Jeff Cobb.

Celisa Steele (00:28):

I'm Celisa Steele, and this is the Leading Learning Podcast.

Jeff Cobb (00:36):

Welcome to episode 266 of the Leading Learning Podcast. This is the second episode in our seven-part series on the frontiers of learning technology, and it features a conversation with Donald Clark. Donald Clark is a learntech entrepreneur, CEO, professor, researcher, blogger, speaker, and author. His book *Artificial Intelligence for Learning* was published at the end of 2020, and it encapsulates much of his thinking on AI for learning. We recommend it for a better understanding of the uses of AI for learning, and, if you're interested in the book, listen to the end of the episode where we extend a special offer to Leading Learning Podcast listeners. Donald regularly blogs on learning technology, and he has a series of posts on 100 learning theorists who have shaped the world of learning. Donald brings almost 40 years' experience in online learning, games, simulations, adaptive learning, chatbots, mobile learning, virtual reality, AI projects, and more to the discussion. And he's an evangelist for the use of technology in learning. In this conversation, his knowledge, his passion, and his optimism about learntech and its possibilities come across loud and clear. Celisa spoke with Donald in March 2021.

Donald Clark (02:04):

My name is Donald Clark. And, as you can probably tell if you're familiar, if you have an ear for accents, I'm originally from Scotland although I am doing this podcast from England, a place called Brighton on the South Coast, just south of London. I spent all my adult life in technology and learning, bringing those two things together. About 37 years I think I've been in this business, before the Internet, as it were, the very first computers, and so on. But jumping to today, just the thumbnail sketch of who I am. I'm the chief exec of an AI learning company that's using AI to create online learning content. I'm a director and investor in several other online learning companies that have reach both in Europe and the US. I'm a professor in an English university, and I've taught in American universities, in Harvard, Stanford, and so on. I'm the author of a book called *AI for Learning*, which is the thing I've focused on for the last four or five years, and then a blogger and a speaker. I give these conference talks, podcasts all

over the world. I've been doing that for many years. So, unlike a lot of people my age, it's a portfolio of things really. And so that's who I am.

Celisa Steele (03:18):

When you think of that phrase "frontiers of learning technology," what comes to mind?

Donald Clark (03:23):

You know what, I suppose, the frontier, it's a bit like the *Star Trek* phrase, isn't it? "To boldly go where no man has gone before," which commits two crimes, I suppose. One, it's sexist, and it has a split infinitive. I suppose for me—because I've tended to always to work right on that leading, breaking edge of technology—for me, now, speaking today, it means two things: artificial intelligence and data, really. That's the new paradigm in technology. It's really everything we do online is mediated by AI and data. And I don't mean just social media. Facebook, TikTok, Instagram, Twitter—that's all mediated by AI. But, if you're watching Netflix, mediated by AI. Buy something on Amazon, mediated by AI. Use Google Scholar, Google AI. So the whole online world is supported and mediated by AI—except in learning. This is the peculiar thing. And so for the last four or five years, I've focused very much on that.

Donald Clark (04:22):

Not only building and investing in companies that do that, I've written a book called *AI for Learning* that lays out the landscape of how this really radical shift in technology—we've had several big shifts in technology. I mean the big one is writing, really. That was bigger than anything. It really shaped, created the culture of our species. The alphabet, of course, and then printing—another explosion in terms of shaping culture. These are all learning technologies. The multipliers of culture. And then we come to the computer in the 1970s and then the Internet itself—another event, some would argue, as big as writing. But now, the big paradigm shift is into AI and data, and I think that's because it starts to mimic teaching and learning in a much more sophisticated way. So that's my focus. When you said frontier of learning technology, that's what I would call the new frontier.

Celisa Steele (05:15):

Well, that's very helpful. Thank you. I'm thinking if we begin to get into some of the specifics, like you did with mentioning AI and data, calling those out specifically, but when you think about the trend or trends that are out there, I'm going to ask first about those that you might think are kind of over-hyped or maybe dead ends. Are there any things that come to mind that kind of fall in that camp, as sort of distracting us from technology that might actually help with learning?

Donald Clark (05:43):

Well, I think there are certainly some things that are more niche than universal or general. I like to look at the consumer technology that influences learning technology universally, and AI and data is one of those things. Writing is clearly that. The computer is clearly that. Social media is that. There are some very niche things that people claim to be universal and are not really. They're truly niche. Google Glass was a good example. I think that still has some way to go, and you'll see Apple and others develop those devices because it makes sense to have one and not carry something in your hands. And VR—VR I think it's not a dead end, but it's a niche product, but still has some way to go. We don't quite know where that's going to end up. But it's certain we're not all learning inside VR headsets, as some would imagine.

Donald Clark (06:29):

I think AR, augmented reality, is over-hyped. I think a lot of this is just Pepper's-ghost-type stuff. So what? I can see a globe floating in front of me, but I can see a globe on a 2D screen anyway. So I think some of those things, their efficacy in learning, is somewhat exaggerated. I think another one, which I think is exaggerated is gamification, especially that really primitive Pavlovian, you-chase-rubies, random-maze-type stuff. I'm just too old for it. It is what it is. I think it could be useful, but only in a Pavlovian badging type sense. I think badges is another one—a lot of hype, not much action, really.

Celisa Steele (07:08):

What are those trends that really do have significant potential for learning?

Donald Clark (07:13):

I like to think about that issue in the following way, which is, what are the technologies that really reflect good learning theories, how we really learn? That's why we come up with technologies. Some of them fit learning; some of them don't. The ones that really fit—and this is why I think AI and data is so important—are the ones that shape the interfaces, make learning easier, avoid cognitive overload, and so on. So coming back to those two letters, AI, I do this a lot obviously, look at the way AI has shaped the interface. I mean, I have in this room I'm sitting in an A-L-E-X-A. I'm not going to pronounce the name because it springs her into action, but the voice interface AI has given us text-to-speech, speech-to-text that's making these interfaces almost frictionless.

Donald Clark (08:00):

You don't have to learn. I mean, we didn't really learn how to speak or understand what people were saying. It came effortlessly. We've evolved. The brain has evolved to do that. We did have to learn how to read and write. However, these big meat fingers that we type in or peck away at touch screens on is a rather poor bandwidth way of interfacing with anything. I think AI is fitting learning because it makes learning smoother, easier. The interface isn't a problem. We want to get to the learning, not worry about the interface.

Donald Clark (08:30):

And then, secondly, certainly the algorithmic side of AI, along being fueled by data, is allowing us to personalize learning. And this is terribly important. This is the big shift in pedagogy that I think is afforded by AI. The idea that we're not stuck and batched through like sheep in a pen getting sheared, but some sensitivity arises around what we're finding difficult at that exact moment, and we need help on that, and we vector through learning differently. We're all in a different learning journey, even when you're sitting in a classroom with 30 people. You're all sort of going at different speeds, different things going on in your head, different types of difficulties. So this personalization of learning is terribly important.

Celisa Steele (09:14):

And do you feel like that use of AI for personalization of learning, I mean, where do you feel like we are in the application of that? At the beginning of it? Do you know of great examples of where it actually is being used successfully to support, whether that's large-scale or smaller-scale learning interactions?

Donald Clark (09:34):

I'll give you some examples. Of course, we tend to think about this as present and future tense, but it's already been around for a couple of decades. I mean, we all use Google, and Google is pure AI. And, of course, what it does is gives us whatever we're interested at that exact moment of need. We type something in, and we get it. And I don't mean just Google Search. I mean the searchability of the content. A lot of learning management systems or VLE have search that just search for the titles of the meta tag data. That doesn't hack it, really. You really have to search it and interrogate the documents, PowerPoints, videos internally. But, of course, we've had Google for a couple of decades, Google Search. Nobody doing a PhD research would ever in their right mind want to just wander down shelves, looking for bits of paper in journals again.

Donald Clark (10:17):

So I think AI has already massively accelerated that. That's a real example that's universal, almost global. Let's cut to the quick, though, with more formal and informal types of learning, I think AI is already hitting the deck with, well, first of all, there's adaptive learning, so that's increasingly being adopted. Interestingly, it's like pools of adoption. A very good example would be Arizona State University but also in China. And I think the big take-up will be there for various reasons, but there it's a bit like a sat nav or GPS in your car. If you're driving from Boston to New York, you take the wrong turn, and it gets you back on course again, literally on course. And the same with adaptive learning .The AI tutor is what gets you back on course if you're studying statistics, maths, biology, American history. All those courses I've been involved in building, using adaptive learning systems.

Donald Clark (11:10):

But, of course, there's also the recommendation engine type stuff, which is always looking at you as a student and trying to work out what you need next on your learning journey or giving you learning support through chatbots or whatever. You've lots of that stuff going on, all enabled by AI. There's anti-plagiarism. There's even the creation of online learning content using AI. So I think we're at this embryonic stage where the sophistication of AI is bringing sophistication to technology-based learning to get us out of a, really, what was a necessary stage, which was almost multimedia production. Lots of videos, thinly punctuated by multiple-choice questions. That's a lot of what you're learning, isn't it? Graphics, text, videos, some multiple-choice questions, some scenario-based stuff, maybe some more sophisticated sims, but it's stuck in that rut, the use of media. What it needs to do is become more like a teacher. Be more sensitive to you as a learner, be more adaptive, more responsive, to be able to tackle your needs at exactly that moment. And you can only do that by using data. This is terribly important. I need to know about you as an individual, where you are exactly, how you got there, the context you're in, but I also need aggregated data from all the other learners that are taking this course so that I can bring that to bear, right at that moment of need.

Celisa Steele (12:40):

In the near future, I'm thinking maybe three years out, how would you characterize learntech? Are we going to have breakthroughs? Is it going to be disruptive innovation? More incremental innovation? Something else? How would you describe what you think is going to come in the next three years or so?

Donald Clark (12:57):

Well, in the next three years, you'll have a sort of hybrid phase here, as you move from one paradigm to another. It's a bit like Netflix gives you AI-mediated, tiled, personalized menu. We all know the Netflix interface; that's why it's being used in learning now. Nobody has to learn the Netflix menu. It scrolls to the right across a topic and in-depth for new topics—so almost

effortless interface. But Netflix exists alongside broadcast television. Those guys are not disappearing anytime soon, although they will start to diminish as the new streaming services come into mode. We can see that happening now. How much time do we spend watching HBO, Netflix, Disney, as opposed to broadcast television now? A hell of a lot. So I see both systems existing. The best contrast might be between traditional VLEs or LMSes, learning management systems, which will continue for some time because they manage, store stuff rather crudely with the SCORM standard, but they are certainly going to be replaced to a very large degree, I think, and quite quickly by learning experience platforms, that are really AI- and data-driven learning journeys built within them, are much more sophisticated, respond to you as a learner, and deliver personalized learning.

Celisa Steele (14:11):

So that was a question about the near future for learntech. I mean, if you want to pick up and you can take whatever horizon in the distance you want in terms of how many ever years out, but in the more distant future, what do you see as the direction for learntech?

Donald Clark (14:26):

Yeah, I think the shift is taking place as I speak, having been involved commercially in this stuff. You're getting $3 million deals on LXPs now. That's brand-new. That didn't happen three, four years ago, but it's now happening with the larger global companies. That's something starting to happen here. Looking further out is always dangerous—the further you go out the probability drops off dramatically of you being correct—but I think the AI- and data-driven thing is irreversible. It's not going away. That is the technology of the age. The idea that we'll go back to sort of a client-server model or something is plainly ridiculous. But there are some really interesting things for me that I think that don't get enough billing, five years, ten years out. First one is maybe even within the three-year horizon, which hasn't got a lot of publicity, and that's Starlink. The underlying technology for online delivery, especially AI and data, is bandwidth, the Internet itself.

Donald Clark (15:24):

Suddenly at this unique moment in our species—and I can buy this in England or in America right now for about, I think, it's $89 a month or something, $400 to start up—I can get 5G from a satellite. Now, the promise here within a year or two, so that's within the three-year horizon, is that high bandwidth 5G will be available anywhere on planet Earth at a reasonable price because the prices will fall with volume. This is an absolutely fascinating thing. Having spent a lot of time, year on year, in Africa, looking at the terrible problems in the developing world because they don't have enough bandwidth. They're okay with devices, those little cheap phones. Everybody in Africa has a phone. And they do far more sophisticated things than we do in the more developed countries, running all of their finances from the phone, for example, finding work, and so on. But what they lack is bandwidth.

Donald Clark (16:15):

And I think once we have 5G moving up to 6G with no blind spots or we need a little dish, line-of-sight to satellites, I think that will be revolutionary in our ability to deliver technology-based learning to anyone, anywhere, anytime. That's never been true before, but it will be. Of course, the great thing about having high bandwidth anywhere is it really does allow you to use personalization and AI and data in a way we can't before because streaming is quite data-hungry, but also the use of AI, especially if you're calling back to a service, all of those sort of calls out needs high bandwidth because you don't want latency. You want the experience to be quite smooth. I think this is a big deal. I don't really understand why it's not got as much

attention as it should. I'm just going to stop here and put an edit because Alexa has just sprung an alarm on me. Alexa, stop. Now there we are.

Celisa Steele (17:18):

Is everything okay?

Donald Clark (17:19):

I think that was a fascinating example of what I was talking about. In other words, this pushing and pulling. So she set an alarm because I know I've got something to do in about 15 minutes or so. But I think that's the real world now, isn't it, where we are really closely enmeshed with technology. It helps us get through the day, as it were. Anyway, sorry, let me rewind a little bit then. Let's go further out because there's one area that's become quite fascinating for me and that's the work by Neuralink and others. And we have to be careful. And that's these invasive and noninvasive techniques around the brain. Now the noninvasive techniques, I am highly suspicious of the sort of brain link type things where you put a little helmet on, and you have a little light flashing on your forehead. Most of this is taking place in China because people have less moral objections.

Donald Clark (18:08):

It's more a collective culture, Confucian culture, and the parents don't seem to mind as much as they would in a more individualistic culture, such as Europe and in the US, but actually what they're measuring is EEG. And having done a lot of medical training in my time, if you speak to somebody who uses EEG in the medical world, they'll tell you it's by and large a very odd and messy signal. It's a bit like just noise that goes up and down. And so some of these brain sets that are claiming to be able to tell whether you're paying attention or not, whether you're actually doing something or not, that, I think, is farfetched. However, the invasive techniques are starting to get interesting. Perhaps the most famous example's Neuralink from Elon Musk. I mean, we already have this. People think it's science fiction, but we already have the Utah Array, and there was 150,000 people with that in their heads, helping them to move their arms and legs.

Donald Clark (18:57):

So we know that the fibers into the brain, which stimulate portions of the brain, do work. The interesting thing about Neuralink—and there are others doing this—is the ability to read and write to the brain. And so when you've got really tiny fibers, a fraction of the width of a human hair, and you can put them in without bleeding, noninvasively, well, invasively, but without bleeding, and then you can start reading data, this becomes fascinating because you need AI to interpret that data accurately. But then there is also this weird possibility of writing data back to the brain. When you think about this, and this is getting a bit science fiction, of course, because we're nowhere near this practically, but imagine sometime in the future you can actually write things to the brain. If that were even possible then, would you pay $50 to learn Spanish in a day, or would you rather, like 99 or 100 people, take years to learn Spanish and never quite get there?

Donald Clark (20:01):

I think I'd take the $50 injection route myself. Now, imagine if this were possible, this massive acceleration of learning through technology. But I think there's a bigger prize at stake here, which the Neuralink people focus on, and that's being able to solve mental illness problems. You think of just one, depression. Imagine the amount of suffering our species would save if we

use that type of technology just to get rid of depression. I think that would be a gargantuan win in terms of the pure quantifiable reduction in suffering. The other forms of psychotic events and so on may be possible with this as well. So there are big prizes at stake. This is not just some sort of toys type world or gimmicks or gadgets. There are some possibilities here that the technologies will afford us, I think.

Jeff Cobb (20:53):

If you're looking for a partner to help you realize the possibilities of learning technology, check out our sponsor for this series.

Celeste Martinell (20:58):

BenchPrep is a pioneer in the modern learning space, digitally transforming professional learning for corporations, credentialing bodies, associations, and training companies for over a decade. With an award-winning, learner-centric, cloud-based platform, BenchPrep enables learning organizations to deliver the best digital experience to drive learning outcomes and increased revenue. The platform's omni channel delivery incorporates personalized learning pathways, robust instructional design principles, gamification, and near real-time analytics that allow organizations across all industries to achieve their goals. More than 6 million learners have used BenchPrep's platform to attain academic and professional success. BenchPrep publishes regular content sharing the latest in e-learning trends. To download our latest e-books, case studies, white papers, and more go to benchprep.com/resources.

Jeff Cobb (21:49):

We're truly grateful to BenchPrep for helping to make this series possible and we encourage you to find out more at benchprep.com/resources. Now back to the conversation with Donald Clark.

Celisa Steele (22:03):

If we get learning technology right as society, collectively, what's the good that we might see coming from learntech, and what are some of the things that we need to do to make sure that we get it right?

Donald Clark (22:17):

Yeah, this is a really important question for me because I find it quite tiresome at the moment. There is a massive army, in academia especially, of people who want to just, well, they say they're involved in AI and ethics, but it's not really ethics. Ethics is the study of moral principles, good and bad. Actually, what they're doing, it's more like activism. They're just looking for bias or gender issues or racism around AI. It's just looking for the flaws. That's not really ethics because they're just discounting the one other side, which is the good side. Ethics looks at a more balanced view of what's good and bad. We have cars, for example, but we know that about 1.5 million people die horrible deaths through car accidents. But we live with that because we have come to a moral accommodation that the benefits outweigh the disadvantages.

Donald Clark (23:04):

Now, I think there are big moral issues here. Let's not imagine that the current system really works. I myself think, politically, that higher education, in particular, produce massive inequalities. It's become a generator of inequalities. In the US, we had the Trump years and the populism there, which I think could be partly explained by this oil-and-water separation of the graduate college-type class that looks down on the other somewhat. I think that's certainly true

in Europe as well. We had Brexit here in the UK. I think that was a sort of result of that. There is some detailed analysis on this, by people like David Goodhart and so on, and I agree with this, the abandonment of vocational and practical learning, which I think has been a complete disaster. So I think the current system doesn't work. What this future technology-driven world, I think, offers—and I give you Starlink and cheap bandwidth into the rest of the developing world as an example—I think it gives us a chance to balance things out, in other words to get education to everyone cheaply.

Donald Clark (24:08):

We cannot go on charging people tens of thousands of dollars a day for a little certificate at the end that's really a sorting mechanism. Of course, it has value. Of course, people learn things at college, but about 80 percent of it is signaling. In other words, it's giving employers a signal that you stuck at it a little bit, that you come from a certain class and background, and so on. I think that's unacceptable now because it's led to such inequalities and such a fractious world that I think it's no longer sustainable. So I think we have to make learning cheaper, faster, better, more accessible globally. *Globally* is an important word here if we're going to solve climate change and get around the economic issues that we all face today.

Donald Clark (24:53):

So I think it's a necessary condition for success that technology starts to deliver more and more of this. But let's not imagine that the current system works at all. It's just far too expensive, clumsy, and slow. We're just keeping kids at school longer, longer, longer, getting more and more pieces of paper until it's become almost *reductio ad absurdum* that you would need three bits of paper to become a barista almost. We're getting to that level now—massive underemployment amongst graduates, and so on. We have to the rebalance system. Sorry. I was getting quite political there for a moment.

Celisa Steele (25:30):

No, I think that's fine. I mean, you obviously have thought through this and see the implications. And I think that's an interesting perspective because so often, sometimes when we talk about learning, maybe we're too narrow in how we think about it. But to your point, learning has the potential to help us solve the existential issues of our time—climate change and inequality and things like that.

Donald Clark (25:53):

Lifelong learning is a sort of glib phrase that's used here, but, yeah, I just don't buy the idea that lifelong learning has anything to do about going back to college. Hardly any adult who went through college wants to go back—and hardly any of them do, of course, because it's not really what lifelong learning is about. You become an autonomous learner, you become curious, and you learn on your own. And that's what we need to open up. That's how it really works in practice. I think the universities and colleges have absolutely no role to play in lifelong learning at all. Yeah, a few go back, but hardly anybody does in reality. I spent a lot of my adult life helping those kids who didn't go to college who end up—I'm a big believer in opening up fruitful vocational and other educational opportunities for those kids. I spent decades doing that, but it's still a hard fight because all the money naturally flows into the college and university systems. The whole of the schooling system in a sense is built around the idea that we have to funnel these kids towards college and university. That, I think, has been a 20th- and now 21st-century disaster, almost.

Celisa Steele (26:57):

Well, you just mentioned the word *disaster*, and so this might be your answer here, but the last question was about if we get it right and what that might bring. The flip side, then, is if we get it wrong. What are the dangers that we're up against if we don't approach learning technology in the right way? And, again, maybe if you have any additional thoughts around what are some of those actions that might lead to that detrimental sort of getting it wrong side of an approach to learning technology?

Donald Clark (27:29):

Yeah, we're already getting it wrong. I mean, the proof points on how wrong it's become, number one, is cost. When you're getting to $1.8 trillion federal debt around student loans, where people are struggling to pay that money back because they're unemployed or in lower levels of employment, lower rewards. Whether you're still sticking with an academic system that flies people around. Academics are the only people in the world who just fly everywhere at the drop of a hat to a conference. If we think that's acceptable in terms of climate change, then we have to think again, really. We have a €30 billion project in Europe called the Erasmus scheme, which is spent on really a lot of rich kids flying around Europe to universities. It's just absurd that we should be even thinking, never mind funding, that type of stuff.

Donald Clark (28:20):

But I think we need to sit back and avoid the traps. We're now in sort of disaster avoidance mode, aren't we, with economic issues and climate change. Now, what the technology does, I think, is promise a greener world for a start. We went through this amazing experiment during COVID, where almost everybody on the planet had to do online learning. And, by and large, I don't buy this idea that all these kids—I passed by my local school recently. It wasn't a bunch of traumatized kids. They were just happy-go-lucky, boisterous kids as usual. I don't think there's been a massive amount of trauma around this. I think that's an educational conceit, by and large, the idea that when kids are at home with their parents, it's toxic. Since when was that ever true?

Donald Clark (29:06):

I think actually we need to look forward to almost blend. I'm not against school. School's marvelous, but I think we have to have more of a blend between the online and offline stuff. Get your homework stuff sorted out so it's more sophisticated. Some kids actually like learning at home. There's no problem with that at all. Just as we're going to move into this area of blended working, where we may be spending almost certainly two or three, four days a week working at home. The other two days, perhaps in an office or maybe wholly at home. That blended working as well as blended learning. We're blended eating. We get the stuff delivered to our doors in times of COVID. So we've seen a future here where everything is blended. Blended entertainment. The cinemas have been shut, but never have we watched more movies, probably, than we have through Netflix or HBO or whatever.

Donald Clark (29:53):

So I think the technology has shown us the way here, where we can help solve the climate change issue. Of course, technological innovation is ultimately perhaps our only hope on that one, and that's a result of education and learning. I'm quite an optimist in this because I think this technology is a force for good. And that's why I get a bit disappointed when I see armies of people in social media just looking for little bits of bias in algorithms when we know damn well Kahneman got a Nobel prize for finding 50 to 100 biases in our own brains, most of which are

innate and uneducable. Human beings are just packed full of bias. We know this. We're all racist and sexist. It's very difficult to get rid of that, but at least we can work towards improving these other systems to reduce the levels of bias within the systems.

Donald Clark (30:45):

So the danger—going back to your original question—is that we throw the baby out with the bathwater. And the bath. We throw the whole lot out just because we think there's some sort of bias or unfairness within an algorithmic system that actually exists in the human system anyway. And, actually, I think what's most likely to happen here is that China perhaps would leap ahead because I don't think they have the same view of this. And that Europe is certainly lagging behind here because Europe tends to be stuck in the middle here, less innovation, loads of regulation. Whereas the Americans—I think one of the great things about America, it always has innovation on its side. The great tech innovations now have come from the US and will continue to do so, I think.

Celisa Steele (31:33):

Are there learning-related problems or opportunities that we need technology to address, meaning things we can't solve without learning technology or perhaps just technology more broadly?

Donald Clark (31:48):

Let's focus right down on the learning thing. That's a really good question because I think technology has already. I mean, a good example, are those people with learning difficulties, and, by learning difficulties, people often think that accessibility is about people who are maybe blind or deaf or have a hearing or visual impairment or physical impairment. Actually, most learning problems are learning difficulties, and we all have them. We all forget almost everything we try and learn. You know the famous Ebbinghaus forgetting curve. In 140 years of research, nobody does a thing about spaced practice. It's bizarre. But I think we have a chance of tackling the difficulties every individual has in learning, and we all have them. Now, this has already happened in the world of accessibility, and, for people with hearing and visual impairment, it's been AI that's led the way with text-to-speech and speech-to-text systems.

Donald Clark (32:34):

Almost everyone with learning difficulties in that area have been helped by AI and data. But I think it's a matter of expanding that out to almost cover everyone. And, always, whenever we have a difficulty with something, we get stuck on something in maths, if you look at mathematics and language learning, there are areas of catastrophic failure. Most people never get anywhere. You know that you have to learn a language to get into college, and most people end up after a couple of years saying, "¿Cómo está? Oui, bien." That's it. That's about all you remember after a couple of years. It's totally and utterly bizarre. And the same in mathematics. Almost everybody falls off the conveyor belt at a very early stage because they get stuck in mathematics, a subject I've taught. It's terribly difficult to teach and learn. And if you have that catastrophic failure, you'll never progress.

Donald Clark (33:26):

So I think we have this increased focus on solving failure, getting people through obstacles. That's a big barrier. In working memory, you can only hold two or three things in your memory at one time, and you've only got about 20 seconds of attention. I think once we pay attention to the learning theory, match that with the technology, we can massively accelerate learning for

the good of all, for the good of everyone, as opposed to focusing all our money and time in squeezing people in a very long-winded holiday-punctuated degree courses. It's about time we looked at getting our fingers out and making things a little bit faster than four or five years.

Celisa Steele (34:05):

So what advice do you have for a learning business looking to effectively use learning technology and trying to decide what to focus on, what to invest in, where to put their resources?

Donald Clark (34:18):

Well, I think the big shift here now, at the risk of repetition, I do think learning businesses really have to look at this AI and data stuff with more vigor. And we have to go back to learning theory here. Learning is not an event; it's a process. Nobody learns anything by just sitting in a lecture or a one-off little course, online or offline. Almost all learning is actually asynchronous and after the event. We all know this is true. We all passed our exams by cramming. We didn't pass our exams by sitting in a classroom or watching lectures. It was all the work we did afterwards to get it into our brains through working memory into long-term memory. That's what really mattered. We know a lot about that now. We know how people learn. More importantly, we know a lot about how people forget and fail.

Donald Clark (35:07):

And if we start addressing those issues using the technology, we will accelerate learning and have much higher degrees of success. I'm really a business person. I started an e-learning company many, many years ago, before the Internet, before being online, floated that on the stock market. I'm a director of several companies. I only invest in AI- and data-based learning companies now because I think that's almost certainly the future. I think we should all be looking at ourselves and say, "Well, what is the consumer technology of the age?" When I pick up my smartphone or I watch my TV or I ask Alexa a question, what is the technology that's being used there? We live in the age of algorithms, AI, and data. And if you're not thinking about using that, then somebody else will come along that has that.

Donald Clark (35:55):

Those companies are already starting to grow. The biggest companies in the world—who are they? They're either American or Chinese. They're Google, Facebook, Microsoft, Apple. Those are all really AI companies. They're really AI companies. If you ask any of the CEOs of those companies what the underlying technology was that they use and develop, it would be AI. Same in China with Baidu, Tencent, Alibaba. So these names that I've just said account for most of the value of the stock market at the top end now, and they're all AI companies. Now they're starting to dabble in education now and learning. So Microsoft made a big move recently. You'll see the others do so. Interestingly, Google this week just bought a company called Wysa in India, which is a healthcare chatbot, AI-driven.

Donald Clark (36:46):

You say, "Hmm, why? That's interesting—Google are in the healthcare market?" But it's not really. It's the education market. It's a chatbot that allows you to speak to somebody if you have depression or whatever, all generated by AI, chatbot frontend. Interestingly, at the backend, it has real human therapists who come in if things get a bit too much for you, and, of course, on a paid basis, but that's fair enough. Real therapists have to get paid. But I think we're looking at

hybrid AI-human models coming along now. And I think that's happening already in adaptive learning, in LXP systems, learning experience platforms. I think the show is on the road already.

Celisa Steele (37:25):

I've heard you say before—and it's come up in this conversation—that consumer technology drives learning technology. And so, in terms of the consumer technology that's out there, I mean, what do you see having the most potential for learning? Is it this voice interface that you've mentioned? Is it the underlying AI that you've repeatedly come back to? Or other ideas in terms of what the consumer technology is that could be mined for learning technology?

Donald Clark (37:51):

When I say AI, of course, AI is not one thing. It is many, many things. Text-to-speech, speech-to-text—that is one species of AI that relies on natural language processing. But then there are the big models, such as GPT-3, that generate online learning content automatically. I've built a system that does that. So you just send me a video, a PowerPoint, text, a document, I literally cut and paste it into that system, and it generates online learning content—and not multiple-choice questions, but questions that can be interrogative. So I'll ask you a short question, you type in a short paragraph, and the AI would interpret that paragraph semantically and meaningfully. It's all these little bits of AI that are moving ahead on a broad front that are allowing us to do things we could never do with technology before.

Donald Clark (38:43):

And I think AI will have this big cultural and economic impact. It's a massive multiplier. You really can scale it, and it extends cognition in a way that other technology doesn't, multiple-choice question, watching a video. I mean watching a video is fine, but, if I asked you what the second episode of the last box set you watched had, you have no idea because video is a bit like a shooting star. All your memories burn up behind you as you move through it because working memory can only do three or four things, and we've got 20 seconds of attention. So a video is a very poor medium in actual fact for learning, unless it's emotional or attitudinal shift. But AI is replacing some of the teaching tasks, and that's why I think it's more important. It can scale. It allows us to enable new pedagogies like spaced practice, interleaving, all the things we know will work but never had the chance to actually apply through technology.

Donald Clark (39:38):

And, of course, it draws from consumer technology. If you buy something on Amazon or go on Netflix, the reason they have these personalized tiled screens is they know when they're trying to target what you want, and that's exactly what we need in learning. And AI melds this hardware and software together in a very potent and powerful fashion. And, of course, you mentioned good and bad, but all technology is both good and bad, but I think there's a huge amount of good from this in the learning and education sphere. That's the one that holds most promise for me as opposed to commerce or selling stuff on eBay or watching more Netflix. Can we watch more Netflix? I don't think so. And, of course, technology tends to get declassified.

Donald Clark (40:24):

Technology is an interesting thing. I mentioned writing, printing, books, computers. We don't really regard many of those things—books for example—as technology, but they were in their day. So what we tend to do is, historically, declassify or discount technology, the stuff before we were born. We don't see a dishwasher as a piece of technology now, but my mother did. I think we'll see the current e-learning, LMSs, all the sort of stuff we see, MOOCs, and so on, as a bit

passé, still technology, but a bit old hat very, very soon because of this newer age of algorithms and data and AI.

Celisa Steele (41:05):

So I've heard you describe AI as comprehension without competence.

Donald Clark (41:10):

Yeah.

Celisa Steele (41:10):

Would you talk a little bit about what the implications of that might mean when applying AI in the service of learning?

Donald Clark (41:17):

When describing AI to people in the education and learning profession, as it were, it's terribly important that we understand what it is. I think the first phrase I like to use is that it's an idiot savant. In other words, it's incredibly smart at very precise things but incredibly stupid at general intelligence. And I often use the example of my little robot vacuum cleaner, which is in the next room moment. It will come through and clean my house. It has a brain. It can map all my floors out. It's superb. It cleans up all the dust, huge time-saver, but it doesn't know anything. I have a dog called Doug, a schnauzer, and if he comes and does his business on the carpet, it will smear that into every corner of the room—and has because it doesn't know anything. It doesn't know S-H-I-T, as it were, as the famous phrase goes.

Donald Clark (42:05):

So this is what you're referring to as competence. AI is competence without comprehension. It doesn't know anything. It could beat you at chess, poker, Go, Jeopardy. It doesn't even know it's won, but that's okay. I think we can live with that. It doesn't have to be a sort of form of human intelligence to be effective. And this is terribly important in terms of the application of AI—that we don't over anthropomorphize this stuff. I just get tired whenever I turn up at a conference, and the speaker before me has been a little robot or something—my heart sinks, really. The future of AI is not going to be little robot teachers. It's not going to be robot teachers, full stop. It's such a great fallacy this. It's going to be more like Google. It's going to be online. It's going to be from Starlink.

Donald Clark (42:48):

It's going to be on whatever devices we carry around with us, coming into our glasses, AR, whatever. It's going to be online stuff. Incredibly smart because of the hidden force of AI behind the scenes. It will be invisible, and that's the point. But it doesn't need to be replacing the human brain in that sense. The human brain is a terrible organ. It's a messy, evolved thing. It's inattentive. It gets easily distracted. It's emotional. It gets depressed. We forget almost everything. We get dementia, Alzheimer's. We die. We can't network from other brains. We can't upload, download. Computers can do a lot of that stuff. So we can take a load off ourselves by using this technology. And that's what I mean by competence without comprehension. AI has a long way to go before being human in that sense, but it doesn't have to be to be effective.

Celisa Steele (43:49):

I wanted to ask about LXPs. I know you've brought them up. I feel like they're getting a lot of attention these days, the Netflix-like learning being very attractive for folks. What are your thoughts on the differences that LXPs represent versus other learning technologies like LMSs, and what do you think is going to happen with LXPs? And what's driving that shift? Is it more the learner experience? Is it the data? Is it both working together?

Donald Clark (44:21):

Yeah, what's driving it? I think dissatisfaction with the idea that you spend a lot of money just storing and managing stuff on an LMS, which is really mimicking the old course structure. So people commission online learning a bit like buying sausages. They buy it by the kilogram or whatever, and then we deliver these courses. But, as I say, learning is a process, not an event. So the LXPs, we flip that model really, and we say, "Well, how do people actually learn?" Well, we learn in a much more fragmented and informal fashion. We knew this for certain, going way back to the 1970s. Gloria Gery wrote a brilliant book in 1991—that's 30 years ago—called *EPSS*, *Electronic Performance Support System*, and she talks very eloquently about unintentional learning and how most of the learning just happens to us. While we're working, we pick things up as we go along.

Donald Clark (45:13):

But if you come out of that and say, "Well, how do people actually learn in the real world?" Well, when they get stuck, these moments of need that Gottfredson and Bob Mosher talk about, when things change or I need to know something very quickly—"God, I'm interviewing somebody tomorrow. I've forgotten how to do interviews properly." We have to respond to these needs. So LXPs are more dynamic. They use AI for recommending and predicting the future and automating processes. They push stuff to you, but also allow you to pull stuff towards you. So, if you get stuck, you've got a Search button, or in Stream, an LXP I've helped build, we have a chatbot, which may exist in Slack or wherever you're using your social system. And you just ask it a few questions if you get stuck, or you have a Search button, and you go to search, and it searches and interrogates all the internal learning content you have to find the right thing for you at that time.

Donald Clark (46:05):

So that's pulling stuff through search, but there's also pushing stuff to people like playlists, using predictive engines, recommendation engines, to work at what you are most likely to need. And then there are other species of push as well that are more dynamic and process-like. Take spaced practice. Now we know that spaced practice works superbly well. How many of us use it in practice and learning? Almost nobody. But now we have the technology where the algorithms themselves can personalize spaced practice, just like Duolingo does with a language, for example. Duolingo is worth $1.5 billion, and it has 100 million people. How many people have 100 million learners in their system? And that's because it uses this type of tech. It's adaptive. It's an LXP-type system that will send notifications to you. If you go away for the weekend, and you stop learning Spanish, it knows you're going to forget some stuff, so it takes you back a little bit.

Donald Clark (46:59):

That's smart. It's this smart technology that's going to shape the future of learning. It already is. Also, the way in which data's used, LXPs are data-driven, often using a learning record store, like Learning Locker, whatever, to fuel the LXP. Learning management systems—I was there when SCORM was invented 20 years ago. Even then I was astounded at how stupid and primitive it was. It was all about little course completion. It's not about completing courses. It's

not what learning is about. It was really pushed by the American military and a very small band of people, actually, who thought that learning was all about little learning objects and completion of objects. It isn't about that. It's a process, a complex process. If we're looking off into the future—this would be very much leading-edge technology in the future—I think we have to have an ethical concern, an ethical worry sitting on our shoulder, but also think we need to really focus down on what really matters, and that's people and their needs in terms of accessibility and cost.

Donald Clark (48:04):

Everything has just got too expensive, making it far too elitist. We need to bring this down to make sure that people can afford it, that it's available, most likely for free. Almost all the learning I do is free. Listening to podcasts, using Google, you name it, it's all free. These podcasts are interesting. You asked a really interesting question yesterday about what's new, and what's new is often surprising, isn't it? Who saw the podcasting coming?

Celisa Steele (48:30):

Yeah.

Donald Clark (48:30):

Nobody. And then, suddenly, these amazing stats, 60 percent of all Americans listen regularly to podcasts. Who would have predicted that? Nobody predicted it. It was like texting and so on. And I think that's what really excites me about this sort of technology. I've tried to be predictive a little bit, but we don't really know, and we're going to have some really interesting surprises, but these surprises are good. I love the fact that podcasts exist. I'm sitting on the other side of the planet to you doing this on technology that's free. How cool is that? And then you can publish it, and anybody else on the planet can see it for free. And when Starlink comes along, anybody, literally anywhere on planet Earth can listen to that podcast for free. I think that's a pretty awesome, weird, and wonderful thing. We've got so pessimistic about technology—I don't know what really drives that—but I think we need to have more optimism.

Jeff Cobb (49:35):

Donald Clark is CEO of WildFire, an AI content creation company, and author of *Artificial Intelligence for Learning*, which is recommended reading if you want to better understand how AI can support learning. And we're pleased to be able to offer Leading Learning Podcast listeners a 20-percent discount with free delivery in the US. The link to the publisher site is in the show notes for this episode at leadinglearning.com/episode266, and you can use the code AHR20 to receive the discount. That's all capital letters, A-H-R-2-0 to receive that discount.

Celisa Steele (50:15):

We also encourage you to take time to peruse Donald's blog. There you'll find insights and reflections on learntech, including the series on 100 learning theorists we mentioned at the start of this episode. You can a link to Donald's blog in the show notes at leadinglearning.com/episode266 along with a transcript and a variety of resources related to my conversation with Donald.

Jeff Cobb (50:37):

At leadinglearning.com/episode266, you'll also see options for subscribing to the podcast. To make sure you don't miss the remaining episodes in this series, we encourage you to subscribe and subscribing also helps us get some data on the impact of the podcast.

Celisa Steele (50:53):

We would be grateful if you would take a minute to rate us on Apple Podcasts. Jeff and I personally appreciate it. And reviews and ratings feed the artificial intelligence behind the recommendations that show up when people search for content on leading a learning business. Go to leadinglearning.com/apple to leave a review and rating.

Jeff Cobb (51:12):

And we encourage you to learn more about the sponsor for this series by visiting benchprep.com/resources.

Celisa Steele (51:20):

Lastly, please spread the word about leading learning, in the show notes at leadinglearning.com/episode266 there are links to find us on Twitter, LinkedIn, and Facebook.

Jeff Cobb (51:31):

Thanks again, and see you next time on the Leading Learning Podcast.

[music for this episode by DanoSongs, www.danosongs.com]