Future of Learning: 2020-2025

FUTURESCAPE 248
THE FORECASTING LAB

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FutureScape 248

FutureScape 248 is a forecasting lab and social innovation advisory researching and showcasing the most powerful innovations that will benefit business and humanity.

Founded by multi-award winning Futurist Shivvy Jervis, we provide research, branded content, masterclasses and custom keynotes to organisations.

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The following investigation was published in September 2020, as the world grappled with a global pandemic and the unique and unprecedented challenges it posed. Throughout this period, people had to adapt to new ways of living, working and learning. Technology played a fundamental role in how we adapted to this "new normal".

This investigation outlines the findings from FutureScape 248, in partnership with London & Partners, surrounding the future of learning in the next five years, and the role that technology plays — and will play to an even greater scale — in relation to learning.

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Lalage Clay, Director,
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> **London is a global centre of learning, home to four of the world's top 50 universities.**

Due to the coronavirus pandemic, our daily routines, habits and learning patterns have changed in ways we previously couldn't have imagined. Populations around the world have adapted to drastic changes, as schools and universities closed, and large proportions of the global workforce shifted to remote working.

One sector that has seen considerable growth during the pandemic is edtech, with technology platforms and apps for education and learning experiencing soaring demand as schools and teachers embraced online learning. The UK and London's edtech sector is one of the fastest growing in Europe, with more than 1,000 companies supplying products and services aimed at children of all ages and adults, and an expected value of £3.4bn by 2021.

While the edtech sector is in its relative infancy compared to others such as AI, fintech and healthtech, companies have used their expertise to develop practical solutions and online learning tools, paving the way for new technology to help the transition to a more advanced future for education. Edtech has huge potential around the world to democratise access to education, and London is well placed to emerge as a global leader in this field.

Home to the highest proportion of edtech firms in the UK, London's thriving edtech ecosystem provides access to growth capital, expertise, talent and world-class universities all in one city. There are a number of accelerators and incubators that specialise in edtech, such as Techstars and UCL Educate. Meanwhile, London VC firm Emerge Education invests in pre-seed and seed rounds in companies focused on higher education, lifelong learning and future of work.

London is a global centre of learning, home to four of the world's top 50 universities, which provides research and collaboration opportunities for growing startups in this space. Leading universities collide with world-class tech expertise to innovate and produce game-changing companies.

The UK capital is a diverse and open-minded city, with more than 233 different languages spoken and millions of international workers. It is home to a highly skilled population and more than 250,000 software developers.

There are a number of exciting companies in London who are already revolutionising the way we learn. From Century Tech, an intelligent intervention tool that understands each student's individual strengths, weaknesses and behaviours and tailors learning content to them individually, to FundamentalVR, a medical education platform which provides surgical simulation using virtual and mixed reality to train surgeons how to perform surgical tasks.

At London & Partners, we have collaborated with FutureScape 248 to explore four themes that we predict will influence the way we learn over the next five years. There are skillset shifts as new job specialities become commonplace, such as a Data Ethicist. There are also emerging technologies that will shape our learning experience, like emotionally aware AI or the tactile web. And what opportunities will hybrid learning unlock?

As we look towards recovery from the coronavirus pandemic, we have the opportunity to consider how learning will evolve.

London is a city of creativity and innovation, with a thriving ecosystem that's ready for entrepreneurs to develop new technologies and shape the future of learning.

Future of Learning: 2020-2025

Shivvy Jervis,
Futurologist and Founder
at human-centred forecasting lab
FutureScape 248

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> **There's a phrase I recall hearing during my childhood that has stayed with me across my life trajectory – "knowledge is power".**

Could we absorb information more effectively if taught in a way that is deeply personalised to each of our unique styles of learning?

Can we extend our active learning phase beyond the traditional education that takes place during the first two decades of our lives?

And will we transfer not just knowledge, but physical experience through a "tactile web"?

There's a phrase I recall hearing during my childhood that has stayed with me across my life trajectory – "knowledge is power". My parents didn't mean power in the context of status or influence, rather that a deeper understanding enriched your ability to make an informed decision or even catalyse change.

In a year full of uncertainty stemming from a global pandemic and economic turbulence, it is more crucial than ever to take stock and investigate how "learning", both educational and professional, will evolve, and what it will take to elevate it.

We are already halfway through the fourth industrial revolution or "Industry 4.0", and we continue to see technological and scientific breakthroughs spark systemic change across nearly every sector. According to the Tech Nation 2020 report, the global digital economy is worth $11.5 trillion and continues to thrive. London remains a steady breeding ground for emerging advances in tech that have meaningful social impact.

Technological and societal progress must surge in unison. I've articulated this quite literally from the rooftops for nearly a decade – on a soaring stage to 3,000 wonderful people during an opening keynote and an online broadcast to the virtual stratosphere.

Which forces or elements will shape how we learn, our motivation to do it and where it takes place? And what does the act of learning look like?

Will the next wave of learning call for a campaign or a global movement; or might a quiet, organic shift spark and sustain momentum?

As the dynamics of our social and working environments twist and turn, the very act of learning is evolving. Neuroscience studies show we stand to absorb up to four times more, when we use immersive mediums. E-learning has been found to require 40 to 60% less time to learn a subject than traditional classroom settings, so enabling advancements such as emotionally-aware AI, means education can finally start to adapt to each of our unique ways of learning.

As young children – particularly under the age of seven – we are taught heavily via play and the stoking of our imagination. However, we are mostly expected, save for some startup environments, to abandon this playful mindset and deal largely in the language of spreadsheets and endless slide decks as soon as we commence our working lives.

And yet, our ability to learn effectively through the act of discovery, field trips and imagination, does not dissipate solely because we are 30 and not 13.

In fact, research shows we need a particular cocktail of chemicals and neurotransmitters to learn effectively.

The toolkits we equip ourselves with must engage multiple senses even when we have our "grown-up" hats on.

This ambitious, joint investigation from my social innovation forecasting lab FutureScape 248 and London & Partners identifies four principal themes that stand to influence learning now and through to 2025:

1. Skilling for the future

A rapidly shifting wave of specialisms is shaping the workplace. Which skillsets will best equip us to cope with our collective futures and how useful will skills we already possess in our toolbelt prove to be?

2. Breakthrough technologies driving learning

Emerging advancements slowly entering the mainstream are shaping the very experience of learning itself with breakthroughs such as emotionally aware software that can perceive the learner's mood, adaptive learning systems that respond to each of our unique ways of learning, and a mind-bending Internet of Touch.

3. A hybrid learning reality

Our on and offline worlds stand to be augmented, with digital content and experiences overlaid onto our real worlds, keeping us firmly in our own reality and yet enhancing it dynamically.

4. Mindset shifts for "future-ready" learning

As different forces shift the work and learning environment around us, we must evolve our ideas about when and how education takes place. From a learn-then-work approach, might we see more nonlinear trajectories?

As a Futurologist focusing on human-centred innovation and social good, I ardently believe that ultimately, we must search for new learning opportunities that will help humanity thrive.

Whether this caters for the mature employee boldly transitioning to a new career, the aspiring freelancer trying to make their way in a digital marketplace, the gig economy worker dropping off our dinner or the bright-eyed undergraduate navigating their physical or digital campus, a singular goal appears to be common to all.

We are united in our desire to prepare best as we can for our collective futures, to understand the "now" and the "next". And ultimately, to responsibly enhance human potential and create an uplifting legacy for those who will inherit this future.

Skilling for the future

How can we educate our youth, upskill our adults, and build an engaged workforce? What will it take to prepare citizens for the jobs that are niche now but will become intrinsic to the way we do business?

Many current, in-demand job specialties and skill sets didn't exist a decade ago. This pace of change is set to accelerate. An oft-quoted finding from the World Economic Forum (WEF) reveals that as many as 65% of children currently in their first year of primary education will end up working in a job role or type that doesn't yet exist.

Anticipating this transition, and the skills shortages that will need to be plugged, is critical.

Demand for certain specialisms in the technology arena – blockchain specialists, deep learning experts or data science pros – has surged only in the past five years. Degree subjects in Artificial Intelligence are a mere 4 to 5 years old as independent areas of specialism. The "Data Ethicist", a role based around the ethical and moral use of data within an organisation didn't exist a few years ago and is still niche, but becoming fundamental to maintaining consumer trust and confidence.

In order to best approach skilling, it will be vital for organisations, independent workers and employed workforces alike to challenge some long-held notions, enhance innately "human" traits and advantages, and transfer knowledge creatively and nimbly.

The mighty task: skilling, upskilling, reskilling
At the outset, we would do well to distinguish between two terms frequently used in relation to learning at work.

Upskilling implies teaching an employee additional, valuable abilities in order to expand their role, whilst reskilling is where we teach an employee or unemployed person the skills to change their role completely, redeploying their talents elsewhere in the same organisation.

So what does this mean for those in the world of work or for adults retraining?
While learning at work, efficiency is a huge motivator because time is quite literally money. We will see a shift towards employers setting aside not just time but space and money for employee retraining and upskilling within the workplace in order to retain talent.

It is easier and cheaper to retain an employee than to hire a new one, especially as far as onboarding is concerned, and therefore retraining across departments is a superior method of staff attraction.

Picking up new key skills to increase the number of "tools in the belt" can now be achieved via e-learning, distance learning, or with apps and other more informal means.

Digital fluency and soft skills as core competencies
FutureScape 248's analysis of multiple studies, including a piece on common skills by McKinsey and a WEF Future of Jobs Report, reveals that demand for what we term "soft skills" is likely to surge even as automation becomes a part of most job roles and that interpersonal and non-technical abilities are becoming more important in the hiring process. These skill sets – such as empathy, people management, persuasion and a can-do disposition – will start to be seen more as core competencies are essential to staying human in a digital economy.

The human element is especially important because we need to counteract and balance out the effects of automation.

What automated systems cannot do, and may be unable to do for decades yet, is replicate those traits and skills that distinguish us from machine intelligence: human consciousness, intuition and organic creativity for instance.

University College London

These skills are not always given their due importance however, with a report from Burning Glass Technologies suggesting that most companies are still treating soft skills "like the weather: as an external factor in the labour pool that employers can't change" – in other words, they would hire for these skills but still would not pay for employees to develop them in the same way that they would for software training. But now that the importance of these non-technical and interpersonal skills is shooting up, we can hope for organisations to focus on developing them within their employee base.

While many new roles require technological understanding, this does not necessarily mean that everyone suddenly needs to be able to code or develop their own software. We are not expecting hardcore technical skillsets to be foisted on everyone despite their job role. There is a middle ground.

What we can hope for and work towards is digital fluency, so that employees can work alongside AI-powered tools that remove repetitive aspects of the job, or have some fundamental knowledge of how an object connected to the Internet of Things works in order to monitor a piece of equipment remotely.

Middle managers, sales and marketing agents, as well as many more people in similar roles, will need to understand the concepts behind things like AI and Machine Learning, because they will be intrinsic to the tools used to do their jobs.

Striking statistics

In the startup ecosystem, the growth rate for London tech scaleups is 56%, making the cluster first in the world for scaleup growth.
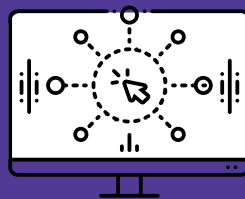
56%

London ranks second behind Silicon Valley in the Global Startup Ecosystem Report 2020. This makes it one of the world's most favourable breeding grounds for can-do founders from which to create a potentially global success story.

London-based companies raised $4bn from January to June 2020, surpassing Paris, Stockholm, Berlin and Tel Aviv combined — testament to its great resilience during the pandemic crisis.

$4bn

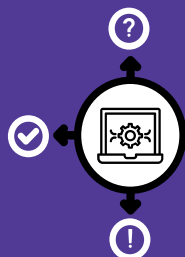**There are more software engineers in London than comparable innovation-focused cities like Dublin, Berlin and Stockholm.** Employment in technology is growing year-on-year with a 40% increase between 2017 and 2019, find Technation.io.

Six jobs for whom FutureScape 248 envision demand surging between now and 2025

Soft skills we anticipate will continue to stay in demand

Tech Ethicist

Emotionally Aware Software Expert

Alternative Energy Expert

Human-Robot Interaction Counsellor

Genetic Counsellor

Immersive Reality Coordinator

- **Social intelligence**
- **Novel and adaptive thinking**
- **Cross-cultural competency**
- **Creative and design mindsets**
- **Persuasion and negotiation**
- **People management**
- **Empathy**
- **Intuition**
- **Judgement and decision making**

Even just five years from now, more than one-third of the skills we believe are essential for today's workforce will have changed, according to the Future of Jobs Report from the World Economic Forum.
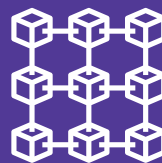
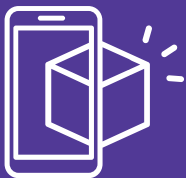## Desirable skills FutureScape 248 anticipates to be in demand from 2020 to 2025

Technology "management": the fluency to work alongside and coordinate between systems powered by AI, data science, Internet of Things and other digital technologies.
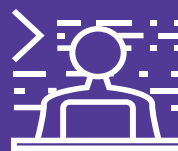
Artificial Intelligence expertise: in particular, deep learning, neural networks and affective computing.

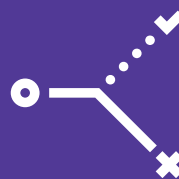**Forecasting**: an ability to anticipate market trends, foresee bottlenecks and map out predicted outcomes.

AR (augmented reality) communications: an understanding of developing impactful content for immersive formats such as AR for organisations.

User Experience (UX) knowledge: the creative process that goes into making meaningful experiences for users, encompassing all touch-points of the user's engagement with an organisation.

New media literacy: a healthy grasp of new digital and social media tools and services and how they can be applied to grow any type of organisation.

Cognitive load management: the ability to discern which information is most important and learn how not to overload our brain capacity so as to leave space for new learning to "register".

Data Science expertise: knowledge of how to find and interpret digital data and find useful patterns between different sets of information, and content for immersive formats such as AR for organisations.

Edge Computing expertise: the ability to understand and deploy edge computing, i.e. computing that takes place at or near the source of the data, bringing cloud services closer to where it's needed.

Breakthrough advances enabling learning

The right ecosystem for talent and skills

With a reputation for producing ingenious founders, farsighted engineers, critical thinkers and many other world-leading specialists, London will likely see upskilling into new roles move with the right momentum – provided employers recognise this need for their respective workforces.

A myriad of factors including healthy investment, a multicultural population makeup and strong transport links with the rest of the UK (also aided by international travel hubs such as Gatwick Airport, Heathrow Airport and London City Airport), mean London is fertile ground for some of the world's best talent.

Home to unicorns such as Deliveroo, TransferWise, Farfetch and Funding Circle, London has firmly established itself as a powerhouse in Europe. The level of venture capital funding within its city limits has continued to rise year on year.

The higher education institutions found in London in turn contribute to this, helping fuel British economic and social health with their highly skilled graduates who are eager and "work-ready".

It is not just new theories of learning that are revolutionising the future of both adult and child education and workplace learning. There are a number of groundbreaking areas of innovation that FutureScape 248 sees as becoming central to the learning industry through to 2025.

These will help in the development of new ways of learning not just in terms of theory and retention, but the very experience itself.

1 | emotionally aware AI that can respond in context

One of the newest, but most powerful, developments is the use of Emotive AI in the learning experience. Officially known as Affective Computing, this is a specialist area of Artificial Intelligence that allows machines to replicate the way that humans think. This may sound only marginally useful at first, but it actually enables software to understand human emotion. It perceives the state of mind or mood of the person at the other end and factors that into its response – for example "I can sense you're really frustrated, let's see how we can find the information you need and help you feel a bit better". This simulates a more natural conversation between man and machine.

Used during the learning experience, this can supplement the work of a human teacher – or for brands, aid in customer service.

Emotive AI is already progressing the learning landscape thanks to its use in two principal forms: socially-assistive friendly robots and emotionally-aware chatbots. The latter are being used to help teach autistic children and help them read social cues and the former take the shape of either virtual chatbots with a pleasing human face (activated from your device in the same way you open up a text bot from an organisation's website or app), or home assistants such as smart home gadgets that incorporate this functionality.

Who are the "Digital People"?
One of the most advanced emotionally aware bots are the Digital People avatars from New Zealand company Soul Machines that act as virtual assistants and customer service bots. Once it appears on your screen, you are made aware that you are not talking to a real person (crucial for transparency) and this friendly avatar aims to gauge your mood or emotions together with what you are asking of it, and respond in full, situational context.

The user chooses whether to enable their front facing camera (the way we do on a video call) or conduct this via just audio – with the camera option being more accurate as the AI uses advanced facial expression recognition to glean your mood from your micro-expressions. Is the customer or learner angry? Confused? Tired and disengaged?

These extremely lifelike human faces with AI behind them claim to have a healthy grasp on a wide range of human emotions, expressions and motivations.

Pepper the robot assistant

Already, SMEs and other companies are using tools such as Digital People in online training for employees, for onboarding new recruits (embedding them into the company intranet or app) and most successfully in customer service. Given these digital humans can be "on" 24/7, they are available to field queries from an anxious customer who wants to contact their banking or internet service provider after the confines of usual customer service phone lines – be it at 8pm or 6am.

Meet emotion-reading helpers Milo and Pepper
The second form – known as "socially assistive humanoid robots" are short-statured robots with a kind, expressive face with the ability to understand basic human emotions. One of the world's most advanced emotionally aware humanoids is 4'3" Pepper from Japanese SoftBank Robotics. It is used as a teaching aid in numerous schools worldwide, including at a nursery school in Plymouth, UK, a high school in Texas, and for business, ranging from HSBC branches in Toronto where it greets customers, to the Humber River Hospital in Canada and patients can ask it questions.

Another emotionally aware robot has been designed for children with autism, who often find socialisation challenging. Milo can walk, talk and model human facial expressions and deliver lessons in a way that learners respond to. The goal is to "create a recurring positive experience that creates an environment in which learners can learn and thrive".
Both Milo and Pepper are being used to help young people with learning disabilities by teaching them to recognise emotions such as excitement, sadness or discomfort and other important social cues, and then apply this in their day-to-day lives.

It is not a matter of emotionally intelligent systems taking roles away from human beings – this technology is aimed at empowering us to accomplish our tasks better and acting as a supporting tool that augments our efforts.

2 | Hyper-personalised online learning journeys

Teaching people is only half the battle. We should be asking: how best do we learn?
The future of learning will answer our need for more personalised, adaptive digital learning platforms that respond in real time to our individual ways of absorbing and retaining information.

If you tell a group of 100 people to read the same four pages of online material ready for the next lesson's mini-test and some proportion of them interpret the content incorrectly, you may assume this is down to a lack of focus or willingness to learn.

But what if there was a way to glean – from personal metrics of their individual learning experience – that this group were responding to the information differently? Or via their consent to activate the front-facing camera on their devices as they were reading the material, the system caught not only intense concentration but also measurable frustration on their face at certain points?

Perhaps then we might view them in a different light. They're not demotivated, they're struggling.

Picture a different scenario – the same 100 are on this online learning module and have finished the first section. Instead of everyone seeing the same content presented in the exact same way in section two, the system serves up variations per user tapered to suit their individual styles of learning.

If it notes that you performed better in answers where the question contained visuals or video, it learns that you respond better to content in that format. For people who find visual content distracting, the forthcoming section would focus more on text rather than video. And therefore it learns how people learn best.

For those who read slowly or process differently, the system would adapt the time provided to complete each section. And when one person's brain gets frazzled at multiple choice questions, it would serve them up the same query sans multiple choice, and in a format best designed to help them succeed.

A few findings to note:
- Sampling teachers in five countries, a notable study in Nature found that 93% of teachers said that they found students learned better if they could choose their preferred learning style.

- This article found that our brains build connections between different areas, creating whole new systems of neurons built on more natural architectures such as pattern recognition. As such, our brain changes whenever we learn new skills, so each of us has a unique brain layout depending on our life experience.

- A study in the Journal of Neurolinguistics found that the number of spatially aligned fibres in our right hemisphere dictates the difficulty with which each of us learn a foreign language.

The ability to provide personalised learning resources that could stimulate that curiosity within an individual student by creating unique narratives and questions to spark interest could transform teaching effectiveness – and such systems are starting to finally cater to this in new online learning systems and in classrooms.

Companies, such as London-based Century Tech, use a combination of neuroscience, learning theories and technology to personalise learning for each student and allow dynamic adjustments to be made as they go. It is an intelligent intervention tool that understands each students' individual strengths, weaknesses and behaviours and tailors learning content to them personally.
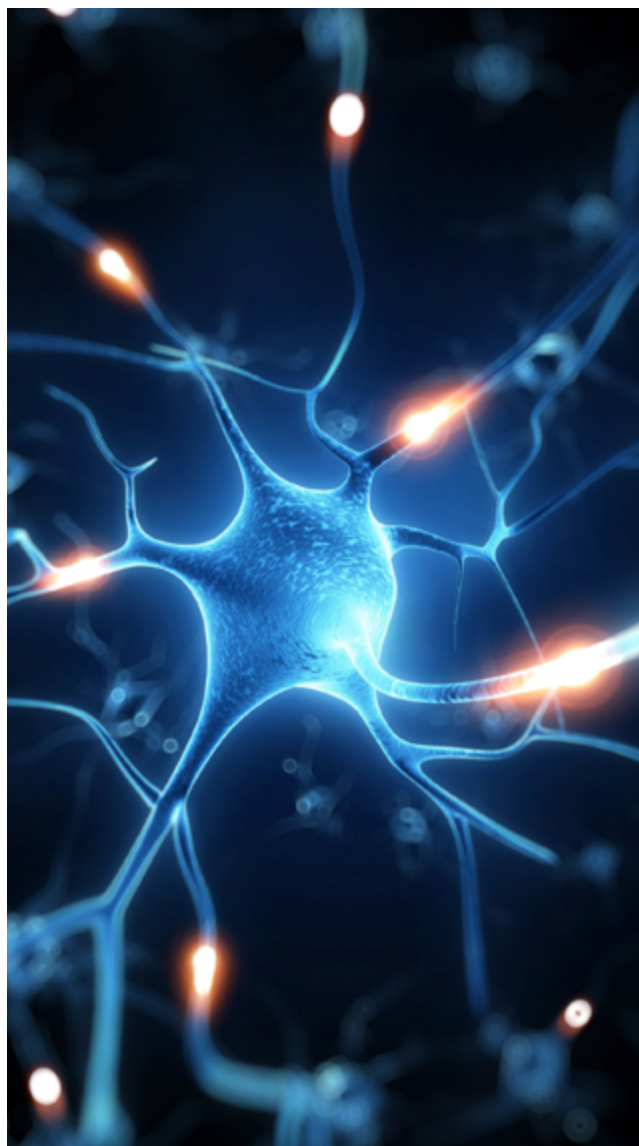
London-based Emotech are developing an AI-powered English teaching assistant, with the algorithm designed to track the individual differentiation of each student, both for children and adults. It uses this "memory" and the system's "senses" to ascertain these variations in different users and track their progress.

Sparx, a "socially focused learning technology company" from Exeter, UK works with 1,400 UK schools to change how maths is taught.

Duolingo, the language learning app from Pennsylvania, tests your understanding of words at the end of each section. Words you frequently get wrong will appear more commonly in future sections.

London-based SimpliLearn is a business-centric digital learning platform that awards real certifications for completion of distance learning. It blends self-paced, interactive, and applied learning with customised material for the learner – and has been used by VMware, Amazon, Visa and more.

New York-based Knewton, a personalised learning platform for both individuals and academic institutions, adapts to students' proficiency levels without the need for formal diagnostics or assessments. It identifies gaps in student knowledge and uses just-in-time remediation to plug those gaps.

3 | The tactile internet, or web of touch

A truly jaw-dropping advancement that could build an Internet of skills is the web of touch. The ability to transmit and send the sense of touch across the internet will enable a tactile transfer of not just knowledge but an actual experience. This is in very early stages; but big names such as Ericsson and King's College London – with their 5G Tactile Internet Lab are making great strides.

"Imagine what we could do if we are able to send the sense of muscle movements from one person to another, where they are thousands of miles apart. We could teach a budding pianist how to play the piano using techniques from a world-class expert they would not ordinarily have access to; or a junior trainee surgeon the most advanced technique for surgery from a medical genius without them being in the same place," proposes Prof. Mischa Dohler, one of the foremost authorities in this space.

In healthcare for instance, relaying the sense of touch or motion across the internet can have powerful implications – by a doctor using a specialized glove (called a haptic feedback glove) and virtual reality (VR) equipment, as well as connectivity through 5G and robotics, they can operate on a patient in a different continent.

The project has been trialed in the lab at King's College in London, as well as being demonstrated at a number of different events, including Mobile World Congress in Barcelona. London startup Valkyrie Industries is attempting to integrate the sense of touch in virtual environments so that employees can learn how to handle both hazardous chemicals and everyday tools in a simulated workplace with minimal risk and cost. Using 5G and remote connectivity, it wants the user to feel and control for instance a remote robotic arm "as if it were an extension to one's own body".

Learning via this web of touch is not just "hype" tech – it can help us much more efficiently across a much wider spectrum of skills. "My vision is to standardize this experience. Touch is not a mass medium but we think one day it will be," explains Prof. Dohler.

Imagine you're a rookie ice hockey player. You play for fun on the weekends, but you want to improve your skill so you can work up the rankings. Thanks to the web of touch, the day will soon be here when that ice hockey player can put on

some haptic mittens and/or haptic boots, grab the stick, and have the surreal experience of an expert coach teaching the exact muscle movements of the perfect shot or the perfect stride.

It's not just sport either. Teaching surgeons, nurses, engineers, and a whole host of other professions will be cheaper, easier, and safer than ever before.

Surgery teaching can be done across great distances, so that a world-class surgeon in London can teach others in India how to undertake a complex procedure. Flight technicians in Wales can teach trainees in Northern Ireland how to undertake repairs on niche aircraft or rare problems.

Music is another area that could benefit greatly from this, with many instruments such as piano requiring very precise finger movements. In the very near future, a piano student could download the required finger movements from a database and learn from a professional.

"Imagine a skills database," offers Dohler. "You would slip on a slender glove, 'download' the skillset you're seeking from a world-class expert and the glove chock full of sensors would recreate those movements, pressures, rhythms on your fingers, guiding your hands without the teacher physically present."

The web of touch stands to fuel an internet of skills that will teach us in a way never imagined before. Might this remote tactile learning experience help democratise learning?

Image courtesy of Fundamental VR

A hybrid learning reality

The COVID-19 lockdown has already stimulated a massive diversification in the mediums through which learners gain knowledge. FutureScape 248 proposes that this calls for more creative platforms of dissemination to continue in 2020 and beyond, combining the strengths of both physical and online worlds whilst not forsaking one for the other.

Our realities will start to feel more blended, augmenting the digital world over our real environments in a bid to enhance our learning. This advancement – the ability to combine the virtual and the real – allows us to harness the strengths of both worlds in real time. It isn't just a fad or gimmick, nor a technology solely for gamers and creatives, its applications span multiple industries.

Neuroscience research shows we learn up to four times more using immersive mediums. A report from Bridgespan reveals that most of us – particularly in a work environment – acquire 70% of our knowledge from experiential learning.

"Learning is a complex brain-based process. One's ability to learn is directly affected by emotional, motivational, cognitive, and behavioral considerations. The best way to optimise learning is to understand the complex interplay among these factors. We believe that emerging technologies, along with a detailed understanding of brain science, provide the mechanism for taking training to the next level," explain Todd Maddox, Ph.D., CEO and Founder of Cognitive Design and Statistical Consulting, and Dr. Charles Nduka, M.D., co-founder and Chief Scientific Officer at Emteq, in an insightful article.

Getting to grips with mixed reality

To explain at the outset, Mixed Reality (MR) takes two primary forms. Augmented reality (AR) is the first level wherein you use any digital device for example, a smartphone or tablet with a camera or browser to overlay digital content or experiences onto your real world, triggering an AR experience.

To illustrate, the IKEA Places app allows the user to choose any item from their website and drop it into their own rooms to visualise how it might look in situ.

London company Blippar – a widely recognised leader in AR – brings everything from wondrous zoos to Cadbury's chocolate to life with their AR platforms. They enable multiple ways to use AR to help others learn about a new subject. With the user looking through their smartphone camera, they can be made to see an AR environment or space around them (a solar system or any special room), place objects onto a surface (a dinosaur in their kitchen) or activate an AR experience (a professor in 3D talking or a campus tour) from printed material such as a brochure.

Projection based AR is also finding its way into the learning context. London's HYPERVSN scales this mixed reality into larger, life-size proportions for organisations such as UNICEF and events like the 2019 Da Vinci exhibition in Tel Aviv, allowing large 3D holographic visuals to appear in any physical location such as a museum, school auditorium or store in order to evoke real emotions within audiences.

Myriad educational apps and freely available tools such as AR in Google Search enable people to place 3D digital objects ranging from NASA's Curiosity Rover, our human anatomy and the world's most fascinating animals in their own homes or outside.

Smartphones – which, according to Statista are used by more than 3.2 billion users worldwide – have been instrumental in the explosion of AR advancement. AR apps like Pokemon Go, Snapchat filters, and Yelp's Monocle app make this technology highly accessible.

The second, more immersive form of Mixed Reality fuses AR with a richer and more dynamic experience – think of this as the "headset version". While not for mainstream consumers,

the enterprise and education sectors are early adopters of this piece of kit.

A learner dons a lightweight augmented reality headset such as Microsoft's HoloLens or the Magic Leap One, looks through the transparent lense and is able to see their real-life surroundings with digital content projected over the area around them. They can bring up a web browser or 3D organ in their field of vision and be situated in their classroom, living room or at an office desk.

This differs from the plethora of virtual reality (VR) headsets such as Oculus Quest or Playstation VR which are designed to transport you to a simulated environment, versus keeping you in your real-life one.

At Imperial College London, a medical simulation powered by the HoloLens headset creates interactive holograms to allow radiology trainees to learn new skills. Developed by a team of experts from Imperial's Faculty of Medicine and Digital Learning Hub, this addresses the challenges in medical teaching and learning.

Put simply, this mixed reality is a combination of real and virtual elements. It engages multiple human senses to enhance memory and comprehension as opposed to using only video or audio to learn. MR's economic scaling and hence accessibility is increasing rapidly, with entry to high-tech equipment now as low as £450 for many institutions, and DIY versions at £120.

Image courtesy of Microsoft

Teaching skills and boosting remote experiential learning

We are already seeing a growth in appetite for online and innovative learning approaches, even from within traditional bricks-and-mortar campuses.

In one of many examples, at the time of writing The University of the Arts London announced plans to hold its signature UAL Graduate Showcase virtually for the first time, allowing members of the public to interact with the next generation of creative talent, buy their work and attend live digital events.

When it comes to hard skills such as engineering, manufacturing or surgery, being able to train employees in a semi-virtual environment where mistakes harm no one is a major bonus. It not only prevents unnecessary costs or safety issues, but frees up the learner to practice without anxiety.

London-based Touch Surgery is a great example of boosting experiential learning with mixed reality. It develops apps and augmented reality technology for medical training such as surgery simulations so that doctors can practice operating and medics can study and review surgical procedures, or watch simulated operations.

Companies in manufacturing and engineering use AR so that employees onsite can have experts explain issues or complications to them in real-time, even when those experts are at a different site. Using hands-free smart glasses and video transmission, the expert can see what the worker sees and add floating annotations or notes to help explain to the worker what must be done. This way, the worker can begin repairs or fix problems immediately with remote guidance from a qualified expert.

Bupa has used AR and MR to train fire wardens within care homes by simulating fire with smoke and other obstacles in order to make the simulation more realistic and to help train fire wardens for the challenges of that particular building. When compared against the old methods on the basis of trainees' emotional reaction and the impact on training effectiveness, Bupa assessed the results as "outstanding".

The afore-mentioned HoloLens also features a Galaxy Explorer, allowing users to interact with the universe around them with their hands to learn about physics and how our universe works. This is a game-changer for physics students, who can now learn by experimentation.

What happens if the moon is closer to the earth? How is its orbit affected? How far apart are planets in real terms?

HoloTour also allows people to experience famous locations around the world as if they are actually there – and not just in a contemporary setting but back in time, too. This allows students of history and geography to experience their topic through in-person immersion.

For staff in younger education such as primary school, secondary school, and college, this technology would also help to close the wealth gap when it comes to opportunities – allowing field trips to places that the school could not normally afford.

Key facts about mixed reality
- When surveyed, teachers and instructors using MR as opposed to other methods, reported that in 91% of cases they saw a medium to large positive impact.

- When classes were divided into immersive learning and traditional learning in scientific trials, those exposed to immersive mediums consistently scored better, with improved retention of knowledge and increased ability to explain complex or abstract concepts.

- A University of Liverpool study in 2017 found that even when studying non-digital or non-technical degrees, undergraduate students who used immersive mediums, such as VR, developed a greater technical proficiency than other students and were more digitally capable.

- 2017 studies showed that disabled children with impairments such as deafness or autism who trialled virtual immersion adapted for their needs, quickly adjusted and were able to utilise it "without significant problems".

- A PwC report predicted that nearly 23.5 million jobs worldwide would be using AR and VR by 2030 for training, work meetings or to provide better customer service.

Alongside astounding technological innovations that will propel learning, in order for education to evolve – be it in the work or schooling context – society's mindsets and perceptions will need to adapt too.

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A PwC report predicted that nearly 23.5 million jobs worldwide would be using AR and VR by 2030 for training, work meetings or to provide better customer service.

Mindset shifts for "future-ready" learning

Adjusting notions of when education takes place
More than 70% of education spending has thus far been allocated to the first 20 years of a person's life, find Goldman Sachs. This is understandable as these are our foundational years, after all.

For most of the UK's history, we have expected the overwhelming majority of education to occur between the ages of three and 23, with some continuing education up to 30 for the more complex specialisms. Learning, until recently, was treated as a one-off event to prepare for a future career or a specific role, and beyond that, most were expected to leave education and begin work in their chosen field.

However, that notion is now evolving. We will need to see a shift in mentality to embracing lifelong learning. According to Ravi Kumar, president at Indian digital services giant Infosys, we will now have to move to a continuum of lifelong learning. Kumar sees two big shifts on the jobs front. The first will be from repetitive tasks to non-repetitive tasks. When that happens, humans will do the cognitive, non-repetitive tasks, looking at using machines as a way to amplify their own abilities. The second shift will be from problem-solving to problem-finding, with machines solving problems and the human workforce bringing agility, planning and imagination to the workplace.

This does not just impact workers either, even board members and the most senior people in organisations must come to realise that in order to remain not only valuable to their business but a healthy threat to their competitors, everyone from the intern to the CEO would do well to stay receptive to acquiring new knowledge to stay relevant.

The concept of lifelong learning has been around for a while, with many successful figures touting the benefits of continued learning and study throughout one's life.

John F. Kennedy said that "Leadership and learning are indispensable to each other", while Albert Einstein had the forward-thinking view that "education is not the learning of facts, but the training of minds to think".

It is becoming necessary to reintroduce learning in different stages of one's career in order to remain competitive both on a personal and organisational level. The UK L&D report 2018 showed that, even in economic downturns, 94% of the best performing businesses said that learning and development is critical to success.

And of the UK companies spending above the national average of £300 per employee on training, none have a retention rate lower than six months, finds the same report. In addition, high training investment can translate to as much as a 24% increase in profit margins, finds The American Society for Training and Development.

Part of the motivation for lifelong learning during careers for many employees is the feeling that they could be doing more. According to Middlesex University's Institute for Work Based Learning, of almost 4,300 workers surveyed in the UK, 74% felt that they weren't achieving their full potential at work. This could be part of the motivation to learn more, increase in value, and become more mobile within the organisation.

Employees need effective retraining in some areas too, especially for those late in their careers. A McKinsey Global Institute report found that by 2030 approximately 375 million workers (or 14% of the global workforce) may need to be redeployed or switch organisational categories due to advances in digitisation, automation, and artificial intelligence disrupting their places of work.

However, upon analysing these and other studies, FutureScape 248 has found that by learning well into our 40s and 50s, scope for remaining employable and progressing within a surging digital economy increases due to the ability to rapidly and efficiently learn new skills even in one's own time, but especially when sponsored by a company.

Instead of our lives being split into two parts, education and work, the future of learning will meld the two together. It will not be enough to sit in a classroom or to keep working as you always have. It will be necessary to combine the knowledge of education and the experience of work with continuous learning.

Openness to entertainment as a credible way to learn

Who is to say that someone who has watched six YouTube videos has absorbed less than a person formally enrolled in a six-month course? Many of us still look at education as sitting down to write and learn, but one of the unsung heroes of the learning shift is the use of increasingly realistic entertainment systems to educate children and adults. If people can have fun, and yet learn without feeling like they are learning, they are developing skills even in their downtime.

Skills such as strategic prowess, the ability to anticipate and the ability to swiftly coordinate actions with others have been found to be learned well via gamification. Indeed, avid gamers themselves are found to be sought out by the likes of Britain's Royal Air Force (RAF), cites a BBC article creatively titled "How playing videos could get you a better job".

London startup Game Academy who "analyse gamers' habits from their online gaming profile, and offer courses in valuable skills that reflect their aptitudes," see the medium of games as a valuable resource for talent.

Good examples include Minecraft, where players can build grand structures from their imagination while simultaneously getting an understanding of calculating area and volume from complex shapes. Researchers at the University of Delaware are using the game to teach middle schoolers software engineering, studying networks and learning how the internet works all in-game. If you sat most people down at a desk and tried to teach this topic with a pen, paper, and protractor it may not be as engaging. But children and adults around the world are doing it for hours on end with increasing enthusiasm because they are learning by experimentation on a topic they care about.

In a similar vein are people who, in their spare time, produce educational content for others. This is particularly popular in comedy, where new trends involve combining educational topics with humour. One of the most famous examples is the YouTuber OverSimplified who uses humorous animated cartoons to teach many historical events, from how the Battle of Hastings shaped the English language to the complex political events that preceded World War II.

These approaches display a growing mindset shift which will help to direct the future of learning to a more lifelong, widely embraced future.

Future of Learning: 2020-2025

Calls to action for a learning evolution

What will it take to rally the evolution of learning and propel its momentum forward? For FutureScape 248 and London & Partners, this investigation highlights six considerations to guide those keen to benefit from the remarkable opportunities influencing the field of learning.

1 | Mindsets: both learners and enablers (employers or educators) must be open to lifelong learning, recognising that in order to maintain a healthy economy, the act of learning and skills acquisition need not cease after formal education.

2 | Skilling: in order to stay competitive, organisations must set aside resources for employee retraining and upskilling within the workplace, to retain the best talent and keep people in gainful employment so they are not left behind. In turn, a rapidly shifting wave of specialisms is shaping the workplace, with unusual roles such as "Technology Ethicist" and 'Immersive Reality Coordinator' expected to grow in demand between now and 2025.

3 | Mediums: the integration of Immersive Reality tools such as augmented reality (AR) into the learning journey will be significant in aiding learners of all ages to absorb and retain vital information, but also mindful of "neuro-diverse" users and learners of different aptitudes.

4 | Emerging, purpose-driven advances: a number of groundbreaking areas of innovation aimed at keeping humans in the picture will support the learning industry through to 2025 and beyond, including emotionally-aware AI, an Internet of Touch and online platforms that adapt to each user's unique way.

5 | Bringing in the science: fields such as neuroscience stand to offer deep insights into how our minds are primed to best receive, perceive and interpret knowledge — something that may be valuable to factor in when framing a curriculum or e-learning module.

6 | Innovation playground: creating advances on a globally-competitive level calls for an ecosystem with scale and diversity, bringing about connections and encounters that simply wouldn't be possible elsewhere. London's universities and talent pool, its large and small companies, its clusters of life scientists and educationalists, provide a magical melting pot.

Some call for a learning "revolution", but FutureScape 248 envisage a fluid, steady "evolution" serving as a more attainable and sustainable route.

This elevation of knowledge — how we acquire and then apply it — has the capacity to help redistribute resources, support equitable growth and prepare future generations at the times that they will need it the most.