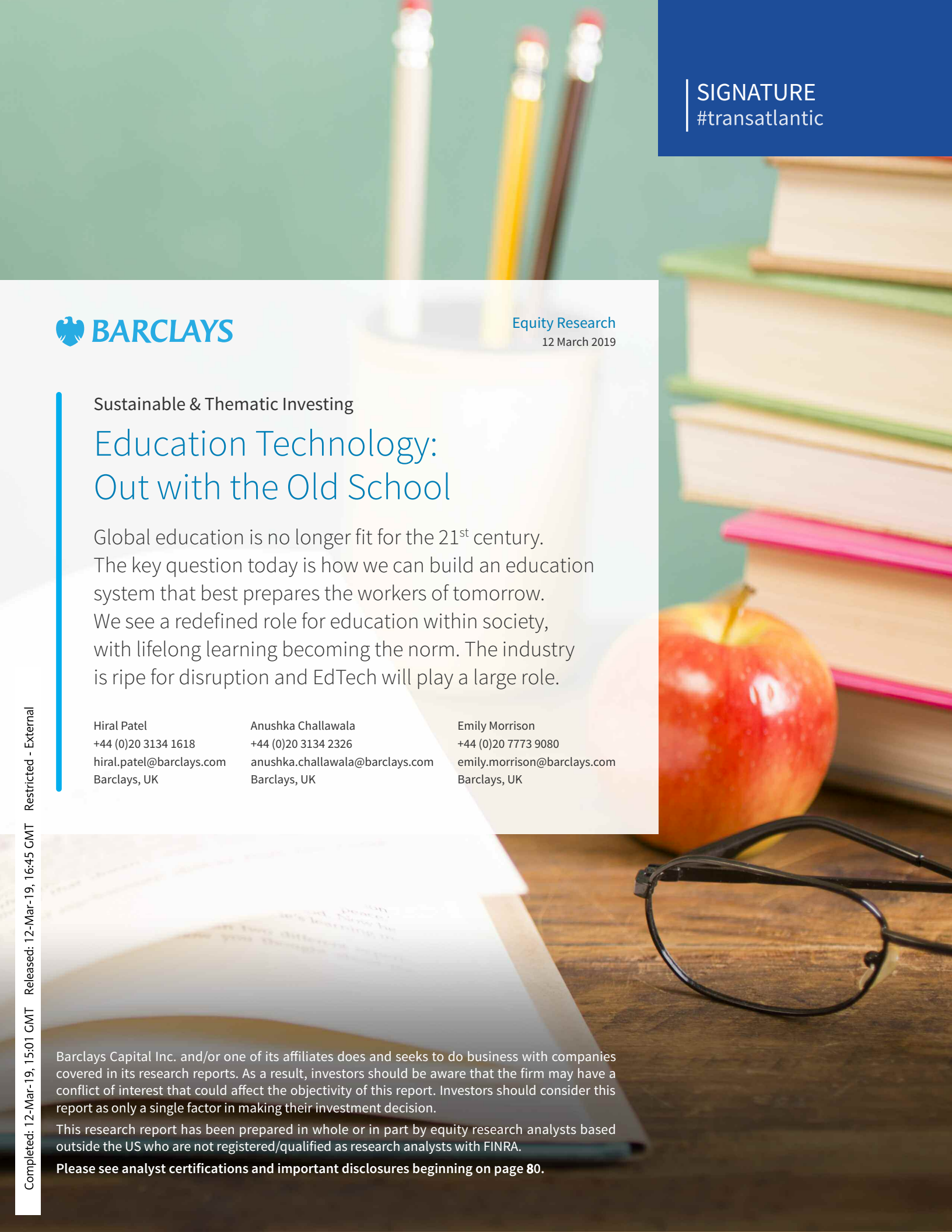

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Equity Research
12 March 2019

Sustainable & Thematic Investing

Education Technology: Out with the Old School

Global education is no longer fit for the 21st century. The key question today is how we can build an education system that best prepares the workers of tomorrow. We see a redefined role for education within society, with lifelong learning becoming the norm. The industry is ripe for disruption and EdTech will play a large role.

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Please see analyst certifications and important disclosures beginning on page 80.

CONTENTS

EXECUTIVE SUMMARY

Global education is no longer fit for the 21st century. We need an urgent rethink of how education is provided if we are to keep up with the evolving needs of modern society. The World Bank has already warned of a global learning crisis, and as the modern learner demands new forms of education delivery, it has become more apparent that a one-size-fits-all approach no longer works. The key question today is how we can build an education system that best prepares the workers of tomorrow. We believe the automation era will redefine how society views education. It will no longer just be about "knowing," instead the emphasis will be on a broader set of skills that are continually developed through lifelong learning. The industry is ripe for disruption and we believe education technology – EdTech – will play a large role.

We define EdTech as the application of digital technology to deliver a new form of learning architecture; one that has the power to harness the social reach of the internet to create efficiency, enable new levels of standardisation and encourage democratised access. We believe EdTech will redefine how education is resourced and consumed, and will ultimately change the results it can yield for individuals and society as a whole. We urge readers to look beyond the digitalisation of traditional textbooks because EdTech, via gamification and immersion, has the potential to reconceptualise the learning experience to one that is adaptive and hyper-personalised. We see consumer-facing education apps proving popular in after-school and adult learning, as well as seeing value in virtual learning environments and online degrees. In the long run, these technologies could redefine the role of the teacher, question the relevance of higher education and transform the traditional career path.

According to HolonIQ, total global education expenditure is expected to reach $10tn by 2030 (+4% CAGR 2018-30). Within this EdTech is likely to play a large role, with spending forecast to reach $342bn by 2025 (+12% CAGR 2018-25). The market opportunity for EdTech is no longer confined to the US classroom, having shifted to a market that is now considered global thanks to growing consumer and corporate demand. This has provided additional opportunities to gain scale, supported by a strong start-up community and growing VC funding (Figure 1).

In collaboration with our sector analysts (US Business Services, US & EU Internet, US Software and EU Media), we propose four entry points for investors wanting to gain exposure to EdTech within our Investor Guidebook (page 33):

1) Invest in EdTech start-ups.
2) Invest in listed EdTech specialists.
3) Invest in traditional education providers.
4) Invest in tech giants.

Our discussions with the VC community and EdTech start-ups suggest investor sentiment has improved following the recent wave of IPO and M&A activity. Our EdTech Landscape (Figure 2) highlights companies with emerging exposure to education and EdTech, including listed and private companies by region.

Why read this report?

Our thematic reports on Generation Z (*June 2018*) and Smartphone Addiction (*September 2018*) highlight EdTech as a way to capture the younger demographic's desire to learn using innovative formats. Although this developing field may sound like a specialised niche, the potential implications of digital disruption to global education are far-reaching and will impact broad segments of the population. We believe EdTech is not only a multi-year investment opportunity driven by socio-economic need, but also one that has the potential to scale profitably as the demand for skills to power the fourth industrial revolution continues to grow.

FIGURE 1
Barclays – EdTech 101

EdTech Reimagining the role of technology in education

We are facing a global learning crisis...

6/10

Schooling does not equal learning:

Globally, six out of ten children are not achieving minimum proficiency levels in reading and mathematics

...the rise of the modern learner

Impatient, distracted & overwhelmed:

Frustrated by traditional learning methods, yet hungry to learn and willing to pay for it

EdTech can help change the way we teach and learn...

Product innovation focused on making learning more accessible by leveraging:


Gamification


Experiential & Immersion


Personalisation & Adaptive Learning

...beyond the traditional school model

Learning will be a lifelong endeavour:

Solutions targeting corporate and direct-to-consumer will prove popular

EdTech to power the Fourth Industrial Revolution

New skills for new jobs:

STEAM

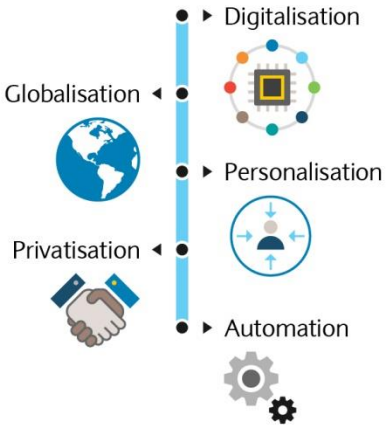
Collaboration

Critical thinking

Coding & technology

Social-emotional learning

5 key industry drivers...



Global Market Opportunity

Education is ripe for disruption

<3% of total global education expenditure is on digital

Global education expenditure

$10tn by 2030

vs

$6tn 2018/ +4% CAGR

EdTech will play a large role

Expected to reach $342bn by 2025

+12% CAGR

vs

$152bn 2018

2018 was a record year for start-ups

$8.2bn

VC investment, led by Asia

Investor Guidebook

Four ways to gain exposure to global education & EdTech:

1. **Invest in EdTech start-ups**
2. **Invest in listed EdTech specialists**
3. **Invest in traditional education providers**
4. **Invest in tech giants**

Source: Barclays Research, HolonIQ - Smart Estimates January 2019

FIGURE 2
Barclays – EdTech Landscape

		Asia		US		EMEA
Private	EdTech Start-ups	BYJU'S	Yuanfudao	Age of Learning	General Assembly	Bridge U
		Hujiang	Zuoyebang	Brainly	Knewton	Firefly
		iTutorGroup	17zuoye	Coursera	Udacity	Kahoot!
		VIPKid		Duolingo	Udemy	Kano
						Seneca
Public	EdTech Specialists	Ambow	New Oriental	2U	K12 Inc	
		China Distance Education	Puxin	Instructure	Pluralsight	
		China Online Education	Sunlands Online Education			
		LAIX	TAL			
		Liulishuo	Tarena			
	Traditional Education	Bright Scholar	Hailiang Education Group	Adtalem Global Education	Grand Canyon	Bloomsbury Publishing
		China Education Group	Maple Leaf Education	Barnes & Noble Education	Houghton Mifflin Harcourt	Lagardere
		China Xinhua Education	OneSmart	Bright Horizons	Laureate Education	Learning Technologies
		China YuHua Education	Virscend	Career Education Corp	Wiley	Pearson
				Chegg	Scholastic	
				Graham Holdings	Strategic Education	
	Tech giants & Internet	Baidu	Tencent	Amazon	Google	Naspers
		Alibaba	NetEase	Apple	Microsoft	
				Facebook		
	Investment Vehicle	EduLab		GSV Capital		EdTechX

Investment firms & VCs

500 Start-ups: Udemy, Brilliant	**Rethink Education:** BrightBytes, Pluralsight, 2U	**New Enterprise Associates:** Coursera, Zuoyebang, Duolingo
Sequoia Capital: Zuoyebang	**Insight Venture Partners:** BrightBytes, Pluralsight, Udemy, Chegg	**Learn Capital:** Coursera, Varsity Tutors, Udemy, VIPKid, Edmodo
Reach Capital: Nearpod, Epic!		

Source: Barclays Research

GLOBAL EDUCATION: SETTING THE SCENE

Education is a powerful driver of human development and is one of the strongest instruments for reducing poverty and improving levels of health, gender equality, peace and stability. For communities, education drives long-term economic growth, spurs innovation, strengthens institutions and fosters social cohesion. Although there has been great progress in the last decade – with more children in school today than ever before – poor learning outcomes mean much potential is still unrealised. Put differently, learning requires more than students' physical presence in a classroom. The World Bank believes schooling without learning is a wasted development opportunity and a great injustice to young people worldwide, and thus warns of a *global learning crisis*.

Our understanding of the global learning crisis suggests there are various regional factors to consider, given the vast differences between education systems in the developing and developed world (Figure 5). Furthermore, as global education moves to more digital formats, it is colliding with new realities in learners' jobs, behaviours, and preferences. We label this as "the rise of the modern learner," who is demanding new forms of education delivery that traditional methods of teaching have failed to keep up with (Figure 6).

In this opening chapter, we set the scene by defining the global learning crisis and the rise of the modern learner. We believe both are key to understanding our view on global education and why we consider education a long-term investment theme.

We are facing a global learning crisis

Education has been at the heart of international development for many years, with UNESCO, the World Bank and the United Nations all undertaking various initiatives. At the turn of the century, the UN announced eight Millennium Development Goals (MDGs) for the year 2015. The education goal was designed to ensure that every child in the world received a primary school education. While the headline figures suggested a success story, progress was primarily measured by the net enrolment rate, which often led to an emphasis on quantity even as the quality of education declined in many countries.

In 2015 the MDGs were effectively renewed when the United Nations launched 17 Sustainable Development Goals (SDGs) for the year 2030, taking a broader, yet more inclusive view on Education (SDG4: "Ensure inclusive and equitable education and promote lifelong learning opportunities for all."). Refocused efforts included the need to evaluate the quality of education and the role of education in achieving a more humane world. It also raised awareness of the importance of secondary school and lifelong learning.

Schooling does not equal learning

In theory the SDG on Education (SDG4) sounds promising; however the pace at which the world has experienced digitalisation and demographic change since has fuelled what is now considered a *global learning crisis*. So while the global push to promote free primary education under the MDGs increased enrolments, many children are still not achieving a minimum standard in reading and mathematics, according to the World Bank (*Guardian – February 2018*). In other words, recent years have shown that schooling doesn't necessarily equate to learning (Figure 3). Furthermore, even when students are learning, the education they receive often doesn't include the skills they need to succeed in this era of automation and technological disruption.

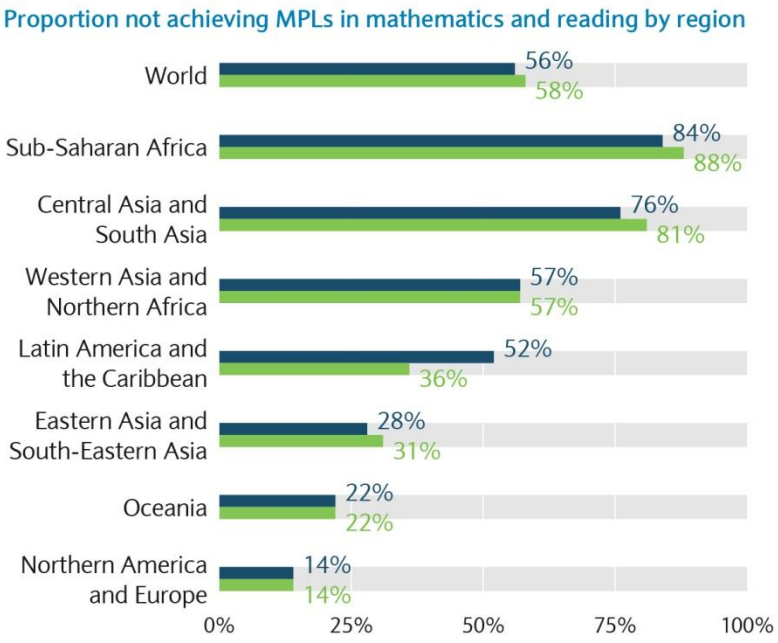
FIGURE 3
The global learning crisis in numbers…

6 out of 10
Globally, six out of ten children and adolescents are not achieving minimum proficiency levels (MPLs) in reading and mathematics

617mn young people
This is equivalent of three times the population of Brazil

The regional view…
The global figures on children not learning hide large regional differences. More than 85% of children in sub-Saharan Africa are not learning the minimum

2/3
Two-thirds of those who are not learning are in school



Source: Barclays Research, UNESCO Institute for Statistics (*2017*)

The global learning crisis is costing governments $129bn a year…

UNESCO estimates that 10% of global spending on primary education is being lost through failures in quality (*2014*). We think without attracting and adequately training enough teachers; the learning crisis will last for several generations and hit the disadvantaged hardest. On the other hand, UNESCO shows that ensuring equitable and quality education for all can generate large economic gains, increasing a country's GDP per capita by 23% over 40 years on average.

If this waste of resources and human potential is to be addressed, administrators must prioritise "learning" over "schooling" and adopt outcomes-focused metrics to guide policy, according to the World Bank Development Report (*2018*). This implies three complementary strategies:

i) Assess learning to make it a serious goal.

ii) Act on evidence to make schools work for learning.

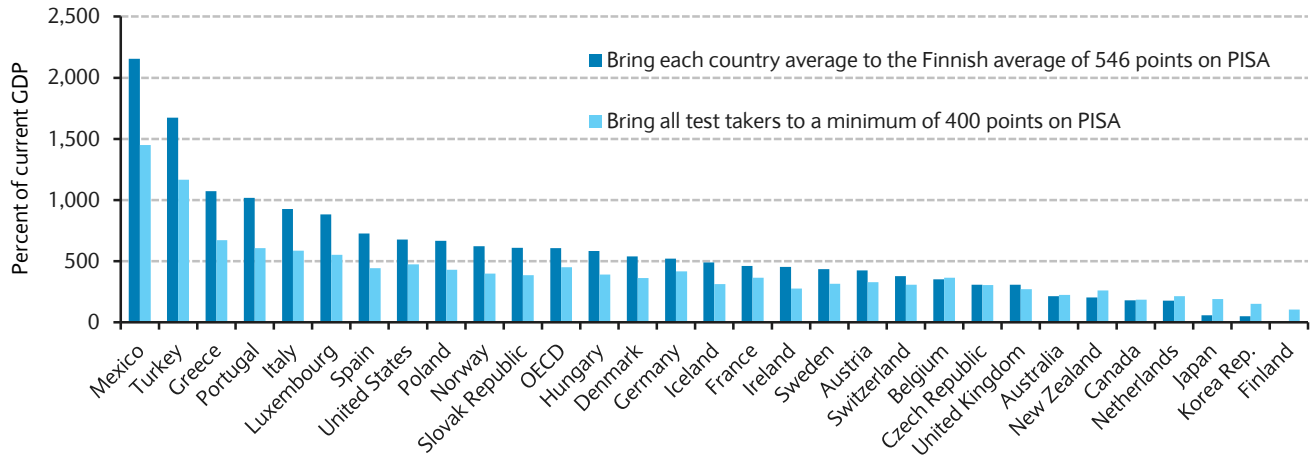
iii) Align actors to make the entire system work for learning.

The potential payoff is large, according to the World Bank, whose analysis showed that what matters is the knowledge that students acquire while in school rather than the number of years completed. Simulations by the OECD show that providing all students with basic cognitive skills could massively boost economic outcomes, especially in developing countries (Figure 4).

FIGURE 4

Increasing learning would yield major economic benefits…

Simulated additional GDP between 2015 and 2090 attributable to increased learning (relative to current GDP), by scenario, selected countries



Source: Barclays Research, OECD 2010. Note: PISA = Programme for International Student Assessment (aimed to evaluate educational systems by measuring 15-year-old school pupils' scholastic performance on mathematics, science and reading)

The value of education is increasing with time

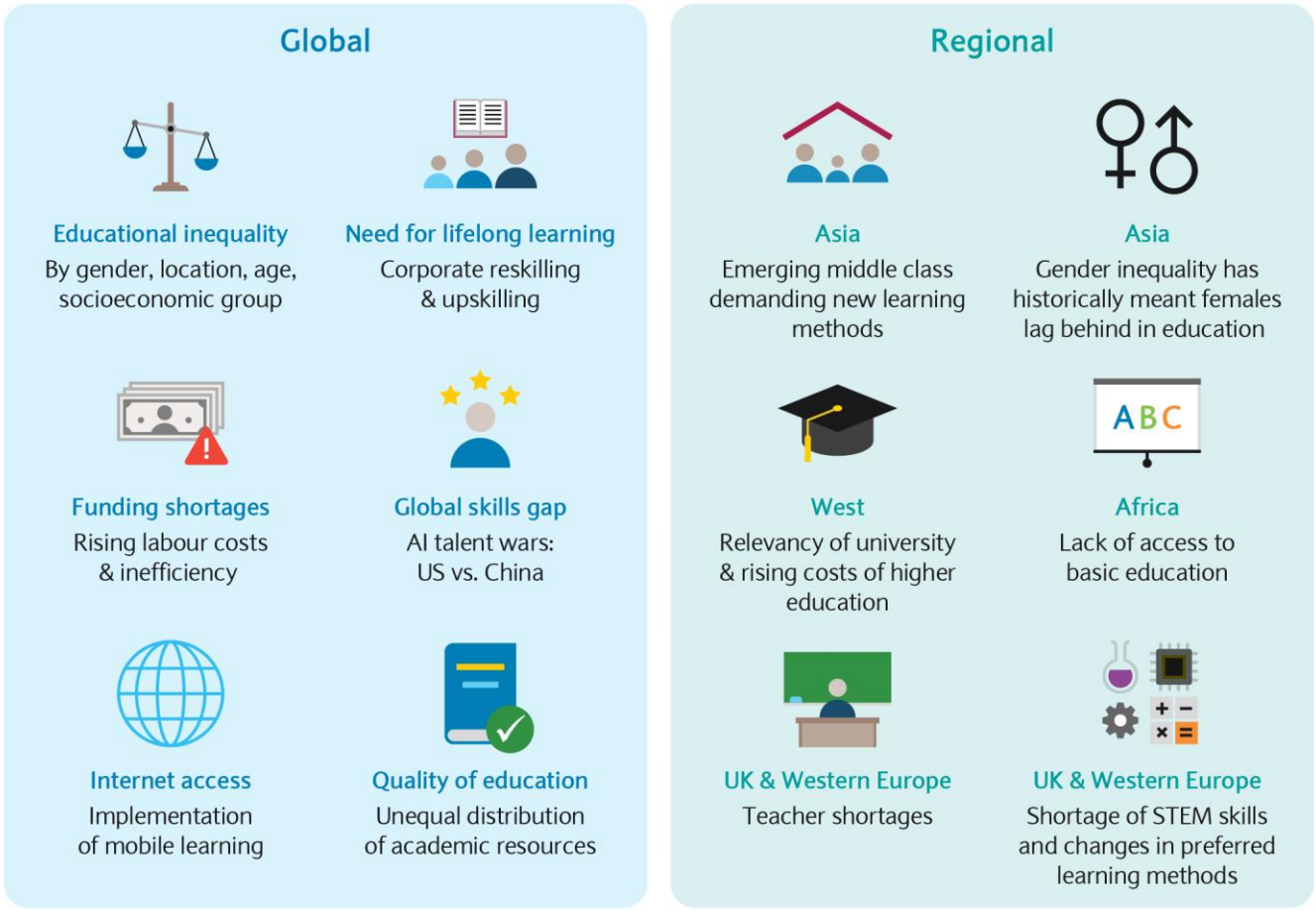
The UNESCO Education Commission suggests that more than ever before, human capital will be the most critical determinant of a state's economic success (*2016*). Education will determine whether the defining trends of this century – technological, economic and demographic – will either create opportunity or entrench inequality. The challenge facing all countries is not simply to get children learning, but to also adapt education systems to the fast-changing needs of the global economy and the growing technological risks attached to automation. We anticipate technology will play a growing role within global education, shifting the way education is resourced and consumed as the concept of lifelong learning becomes the norm within the 21st century workforce.

What factors are driving the learning crisis?

Global education is by no means homogenous and thus there are various regional factors to consider when understanding why the global learning crisis exists today. UNESCO believes that the estimates in Figure 3 are rooted in three common problems. The first being a lack of access as children who are not in school have little or no chance of reaching a minimum level of proficiency. Second, schools are struggling to retain every child and keep them on track. Third, there are large disparities in what happens within the classroom as well as in overall quality.

We explore what we consider are the main components of the global learning crisis in Figure 5, with a detailed explanation of individual factors in Appendix 1.

FIGURE 5
Regional disparities need to be considered…



Source: Barclays Research

The rise of the 'Modern Learner'

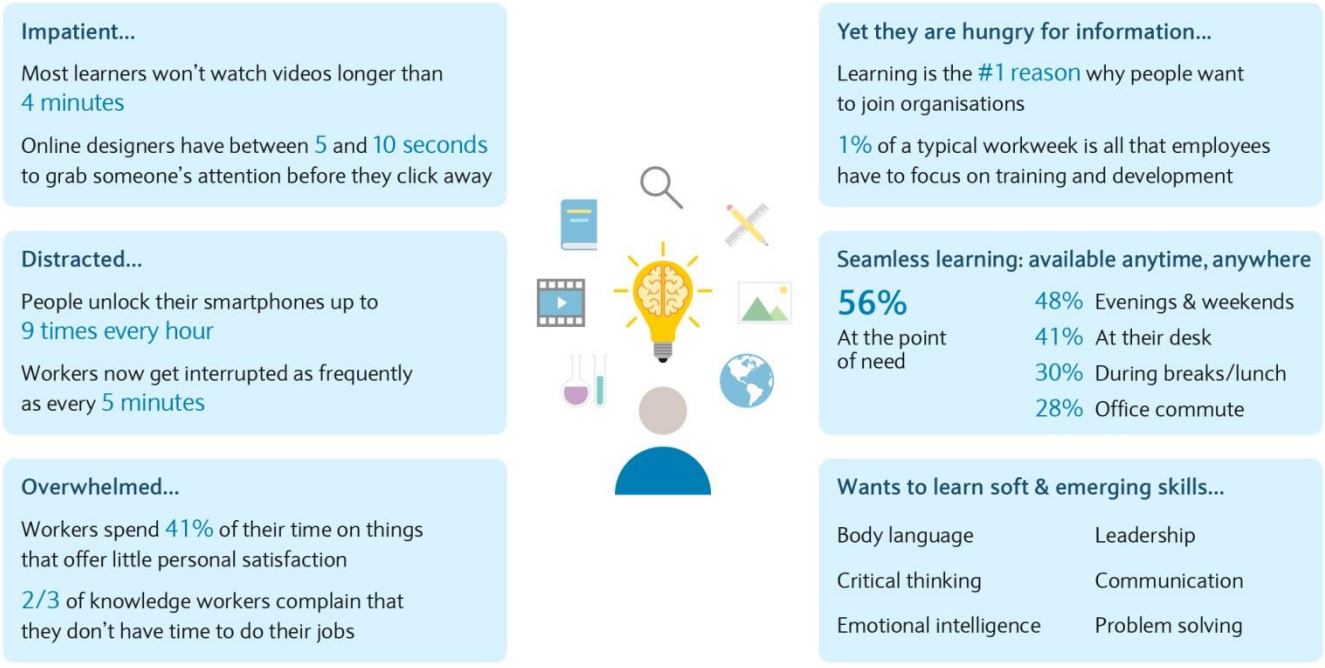
We are also starting to see a shift in how education or learning is perceived amongst the younger demographic (see *Generation Z: Step aside Millennials* – 28 June 2018). This is more apparent in the developed world, where rising costs have led the modern learner to question the relevance of traditional higher education methods and have left them more open to alternative methods of learning.

Meet the 'Modern Learner' (Figure 6). They are overwhelmed, distracted and impatient, yet hungry to learn and extremely savvy around the type of content that will equip them with the skills they deem important for the future. They are frustrated by traditional learning methods and traditional academic institutions and seek content that is timely, personalised and relevant. The modern learner also expects learning to be seamless; available anytime and anywhere. As their awareness builds of how job roles will evolve in an era of automation and artificial intelligence, they are reaching out for newly emerging and softer skills such as creativity and collaboration. We think the Gen Z cohort will push corporations to place a greater focus on employee training through EdTech solutions.

We believe understanding the modern learner is essential given they are not only demanding a new world of education delivery, but are also willing to pay for it.

FIGURE 6

Introducing the Modern Learner - Impatient, distracted & overwhelmed…yet hungry to learn



Source: Barclays Research, Bersin by Deloitte – Meet the Modern Learner Research Bulletin (*November 2014*), Elucidate – Profile of Modern Learner (*August 2018*)

INTRODUCING EDTECH

So why EdTech? Just as technology, and particularly the digital era, has disrupted major segments of our economy, education and training will undergo a tech revolution. Education technology or EdTech, is not only the digitalisation of traditional education, it is the application of digital technology to deliver a new form of learning architecture; one that has the power to harness the social reach of the internet to create efficiency and enable new levels of standardisation and democratised access. We believe EdTech will redefine how education is resourced and consumed, and ultimately, the results it can yield for both the individual and for society.

Products based on personalisation & adaptive learning, gamification and immersion have ushered a new era for education delivery. We believe EdTech has the potential to address many of the root causes of the global learning crisis once scale is achieved. The rapid growth in EdTech start-ups has provided a much-needed catalyst for change, shifting the focus within the EdTech market from schools to one which also includes corporates and a burgeoning direct-to-consumer approach.

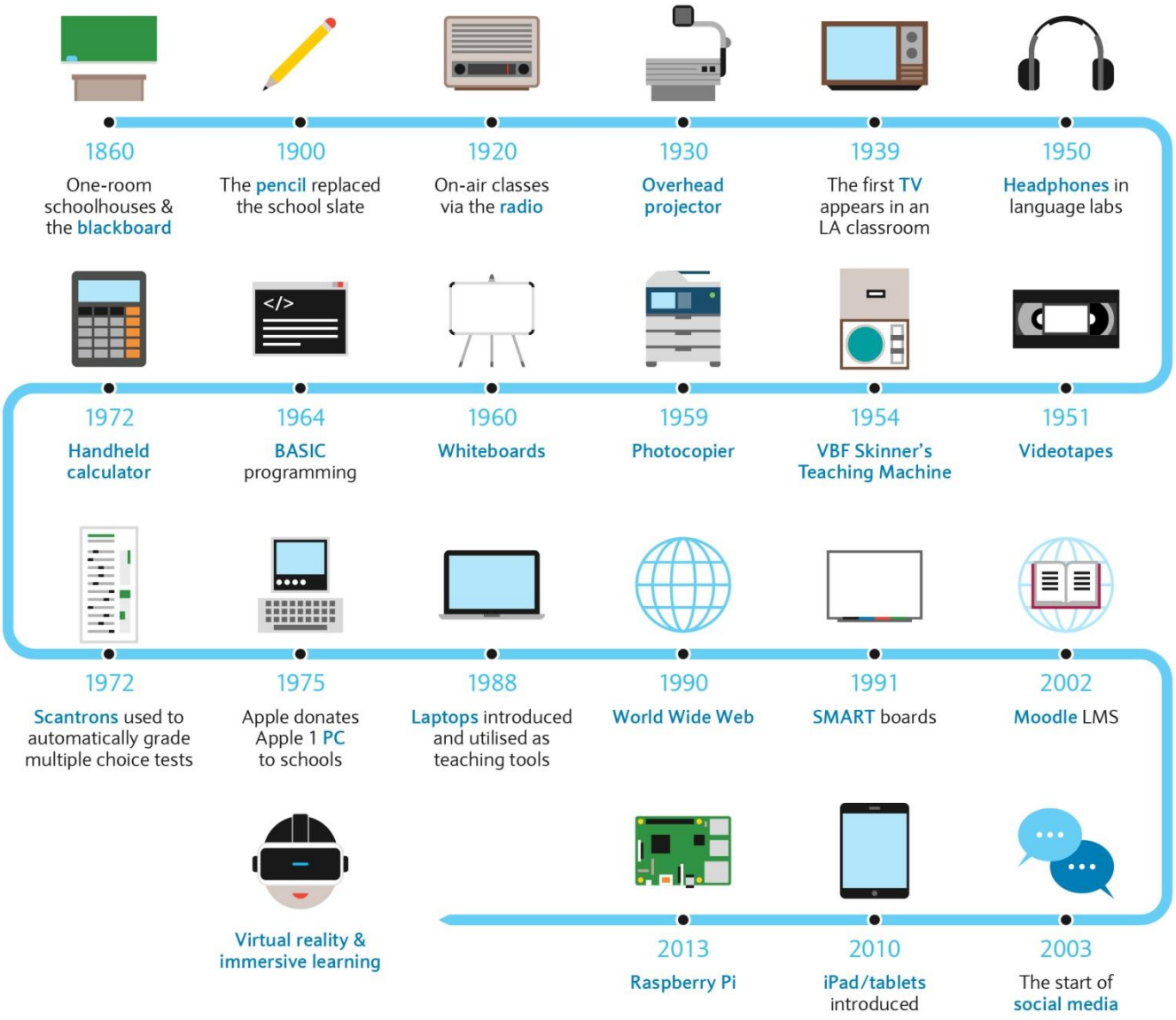
In this chapter we define EdTech by outlining the key product categories and customer types, as well as the leading trends within product innovation. Given the broad range of players within the education ecosystem (students, teachers, parents, schools, governments and corporates), we also include a stakeholder analysis to identify which requirements a successful EdTech proposition needs to satisfy. We then outline to what extent we believe EdTech will disrupt global education and how we expect the traditional career path to be disrupted (Figure 15).

> "Technology gives the quietest student a voice" - Jerry Blumengarten, EdTech Consultant

Defining EdTech

Education has remained broadly the same for hundreds of years, with a teacher, a blackboard and student desks defining the classic classroom around the world. However, technology is rapidly changing that (Figure 7). A student can now upload homework through a portal, learn chemistry through 3D immersion and engage in social learning across the globe; such is the rise of education technology. We define education technology, EdTech, as the use of technological processes and resources to improve education and facilitate the learning process.

FIGURE 7
The evolution of technology in schools…

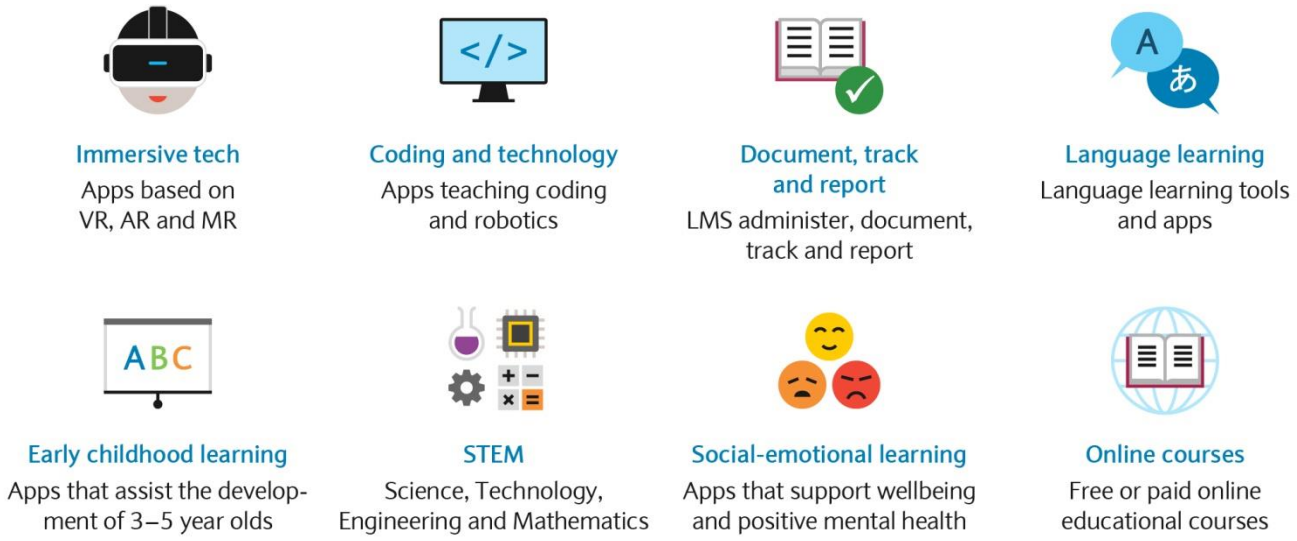


Source: Barclays Research, Webanywhere (*infographic*)

EdTech is more than just digital books…

We urge readers to think beyond the digitalisation of traditional textbooks or the use of iPads in a classroom; it is the application of digital technology to transform education delivery and provide a new form of learning architecture. It has the potential to redefine the learning experience to one that is adaptive and democratised, through offerings such as video content, gamification and immersion. The key product categories (Figure 8) include immersive technology, learning management systems, language learning, STEM, social-emotional learning and online courses. EdTech has become increasingly data-driven and thus the use of artificial intelligence to enhance analytics has proven popular.

FIGURE 8
8 key categories within the EdTech product landscape…



Source: Barclays Research, *Medium* – Understanding the EdTech Product Landscape – *April 2018*

…and not just limited to classrooms

When the term education technology was first coined, it implied the use of technology as a visual aid or transmitter for lesson content (TV is a good example). However, the name has taken on a different meaning in recent years and now looks at education in a much broader sense. This means there are now several different types of e-learning providers as well as various buyer segments within the education market. We believe there are two key business models, Business-to-Business (B2B) and Business-to-Consumer (B2C), and four customer types: schools, higher education, consumer and corporate. Refer to Appendix 1 for further detail.

Historically, EdTech was primarily configured for schools and higher education, however in recent years the market has now shifted to leverage consumer and corporate demand driven by the global learning crisis and the rise of the modern learner.

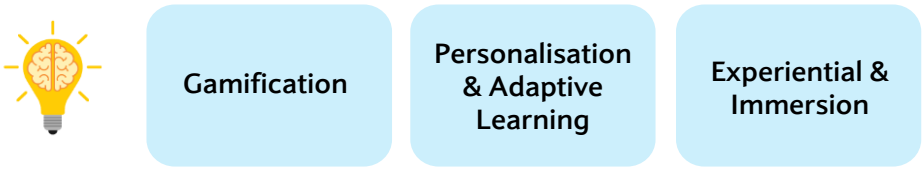
FIGURE 9
EdTech has four key customer types…

Source: Barclays Research – Refer to Appendix 1 for an explanation of the B2B/B2C business models within EdTech.

Product innovation: gamification, personalisation, immersion

Based on our discussions with the EdTech community, we believe there are three key trends at the forefront of product innovation: i) Gamification, ii) Personalisation & Adaptive Learning and iii) Experiential & Immersion.

FIGURE 10
EdTech product innovation



Source: Barclays Research

Gamification

One of the key takeaways from our thematic deep dives on *Generation Z: Step aside Millennials* (28 June 2018) and *Smartphone Addiction: the need for digital detox* (19 September 2018) was the widespread popularity of online/mobile gaming amongst the younger cohort. Therefore it comes as no surprise that many EdTech companies are introducing new and innovative methods to implement gamification in the form of rewards and game mechanics to connect and engage with learners. Gamification has been proven to improve interaction, retention and comprehension rates by appealing to the human desire for reward and self-expression (Figure 11).

It also has the potential to teach valuable SEL (social-emotional learning) and collaboration skills, by motivating individual participation both intrinsically and extrinsically. Microsoft's acquisition of Minecraft (world-building game) in 2014 was an attempt to capitalise on this trend, which was immediately followed by the launch of the education edition, which is now commonly used in many classrooms in the US.

FIGURE 11
Gamification: 80% of learners say that engaging in a gamified context makes them more productive…

Source: Barclays Research, TalentLMS (*2018*)

Personalisation & Adaptive Learning

EdTech companies now have far greater access to data on individual achievements and progress, which is allowing them to implement adaptive learning (Figure 12). Knowledge gaps can be identified which allows EdTech providers to develop personalised learning programmes that are specific to the learner's speed, ability and interests. At its best, it will allow content to be delivered more successfully to cater for unconventional learners or pupils with special educational needs.

According to a study by McGraw-Hill Education of colleges employing adaptive learning technology, student retention improved by as much as 20 percentage points, and pass rates as much as 13 percentage points (*2016*). It also allowed instructors to engage with students

more as coaches, mentors and leaders, spending 72% less time on administrative tasks and 90% more time on active learning experiences. Separately, the industry is also keen to adopt biometric technology to test the effectiveness of eye tracking in lessons to help teachers understand how students are absorbing and understanding content.

FIGURE 12
Personalisation & Adaptive Learning: Education is never a one-size-fits-all solution…

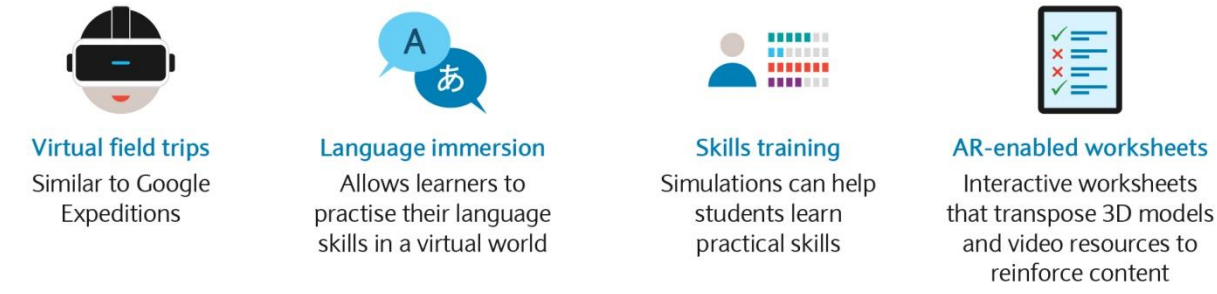
Source: Barclays Research

Experiential & Immersion

While AR/VR technology and mixed reality is still nascent in regards to adoption, the EdTech industry is exploring ways to gradually incorporate this into products to allow learners to experience concepts in real-life settings (Figure 13). Virtual field trips have become one of the most popular applications of VR technology, with many schools already using Google Expeditions, where teachers can attach low-cost cardboard headsets onto a smartphone to facilitate virtual journeys. Given the higher costs associated with VR technology, we see augmented reality becoming more readily available as many students have access to smartphones.

Lab experiments and demonstrations are a key growth area within AR EdTech, including Anatomy 4D, where students can see a 3D model of the human body, or Experience Chemistry, which enables virtual chemical reactions. Beyond classrooms, we are seeing the application of such technology by corporates for field and industrial workers such as mining, oil & gas and medicine.

FIGURE 13
Experiential & Immersion: AR & VR to become commonplace…



Source: Barclays Research

What do education stakeholders want from EdTech?

Education is an ecosystem where there are a broad range of players across the public and private domain that need to be considered, including students, teachers, parents, schools, governments, education providers and policy makers. To help develop a strategic view on EdTech within the broader education market, we have mapped what we believe are the key considerations across each stakeholder in Figure 14.

FIGURE 14

A better understanding of the stakeholders will lead to successful EdTech implementation…

	Why is EdTech beneficial?	What are the concerns?	Product considerations
Students 	• Social & collaborative • Customized content / adaptive learning • Access to new topics e.g. coding • Gamification • Supplemental learning experiences. e.g. 3D, VR	• Accessibility • Additional screen time • Promotes inequality • Invites distraction	• Price • Ease of use • Innovative pedagogy
Teachers 	• Experiments with pedagogy and innovative teaching practices e.g. voting polls, quiz questions • Automation of administrative tasks. e.g. grading, homework sheets • Enhanced lesson planning	• Lack of face-to-face interaction • Requires technological awareness	• Technological unemployment • Training & support
Parents 	• Improved awareness of child's curriculum • Ability to help with homework • Can support children more • Access to additional tutoring in-house	• Possible distraction • Promotes inequality	• Online childhood safety • Price • Professional accreditation
Schools 	• Competitive advantage • Improved performance • Productivity & efficiency gains	• Expensive to implement • Possibility of cheating • Cultural inertia • Student inequality • Training costs & maintenance	• Competitive positioning • Funding & unit economics • Infrastructure & implementation • Training & support
Education providers 	• Software orientated solutions • Large/long-dated contracts • Competitive advantage	• Timelines/go-to-market	• Lack of innovation • Cost of new equipment & training
Policy makers 	• Less pressure on teacher shortages • Solution to lifelong learning • Global competitive advantage	• Expensive to implement • Student inequality	• Stakeholder mapping • Funding & unit economics • Infrastructure & implementation
Corporate 	• Encourages employee re-skilling • Improved retention • Talent management	• Competitive positioning	• Funding & unit economics • Infrastructure & implementation

Source: Barclays Research

EdTech in 2050: Then, Now and the Future...

To help conceptualise the extent to which we think EdTech will transform global education, we propose a two-stage timeline through to 2050 (Figure 15).

Stage one – Monetization & Scale (2015-2030): Our thematic view on EdTech and global education characterizes the period up until 2030 as enablement. That is, EdTech will enable education systems and institutions to improve what they do without attempting to completely replace what they do. We expect it to be a long rising tide as public-private partnerships are formed, allowing the industry to deliver both scale and monetization.

Stage two – Disrupting Incumbents (2030-2050): As the sector matures, we characterize the period from 2030 onwards as a period of disruption where the traditional career path is likely to be challenged by alternative models as lifelong learning becomes essential within a multi-stage life cycle.

FIGURE 15
EdTech: Then, Now and the Future

	Then	Now	Future
	2000 - 2015	2015 - 2030	2030 - 2050
	Democratising Access	Monetisation & Scale	Disrupting Incumbents
Sector positioning	Viewed as a replacement	Viewed as a supplement	Viewed as a disruptor
Sector procurement	Public	Public-private partnerships	Private
Target customer	Schools	Schools, Consumers and Corporate	Schools, Consumers and Corporate
Regional footprint	US	Regional	Global
Product focus	Access-led	Innovation-led	Disruption-led

Source Barclays Research

Now: Expanding addressable market, leading to monetisation and scale

Replacement to Supplement: We believe EdTech was often viewed in the past as having the potential to replace teachers. However, it is now viewed as a supplement to traditional education with the capability to enhance the role of the teacher. We believe university education and the concept of a degree will continue to be questioned in the West given the rising costs, though we remain sceptical of claims that it will be displaced before 2030. We believe EdTech may help to provide an alternative route in the form of lifelong learning and online degrees for some, but for the majority, the growth in EdTech and the rise of the modern learner is more likely to drive rationalisation, particularly in markets such as the US.

Public to Private: The EdTech ecosystem has grown to include a large number of start-ups and unicorns, some of which are now 5-10 years old. Through partnerships, we have seen the sector's traditional gatekeepers (schools, local districts and governments) become more open to collaboration with private providers given ongoing pressure on funding and resources. We believe we will increasingly see public-private partnerships being formed. From 2030 onwards, private players as leaders within the education sphere will be the new norm.

Schools to Consumer & Corporate: The EdTech opportunity was historically confined to the classroom. However, our understanding of the global learning crisis and the rise of the modern learner suggests that the addressable market is much broader, with consumer- and corporate-facing EdTech gaining popularity. One of the key catalysts behind this market shift has been the rapid growth in EdTech start-ups, which are challenging the way society views education by developing B2C business models.

US to Global: We argue the market opportunity is now a global one, led by the emerging markets such as China and India thanks to their rising middle class. In 2018, VC investments in China accounted for 63% of total investments. We discuss VC investments in more detail in EdTech Market Opportunity (page 20).

Access to Innovation: We have seen the ecosystem increasingly become innovation-led, with products that are focusing on personalisation, gamification and immersion being key differentiators. We believe this will continue as investments in artificial intelligence grow, making access-led solutions more commoditised, in our view.

Future: Disruption to the traditional career path

Compared to the speed at which technology has disrupted payments and online delivery, we expect the pace of EdTech adoption to be slower given the various stakeholders involved. We believe the period 2030-2050 will be one of disruption, where we see the potential for specific areas within the education value chain, as well as the traditional career path to be severely altered. We summarise the likelihood of some scenarios in Figure 16.

FIGURE 16
EdTech in the Future – Scenario analysis

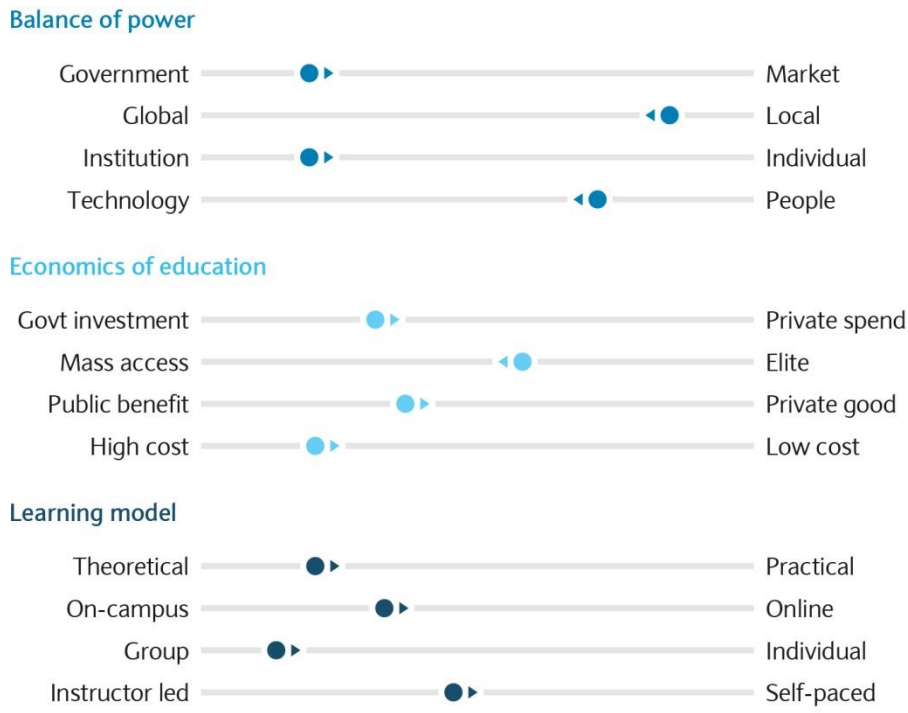
The future of...	What could EdTech offer?	Leading to...	Likelihood
 Universities & traditional degrees	Online degree programs Customized, on-demand education Omni-channel education (online/campus) Employer sponsored degree programmes Alternative credentials (badges, nanodegrees)	Resumes based on skills, not degrees End of traditional lectures Specialization & consolidation of institutions Degree & skills rationalization Midlife career changes Shorter courses	**High**
 School curriculums	Enhanced STEAM education Emerging skills / skills for tomorrow Individual educational plans Social and emotional learning Virtual classrooms Use of biometrics	Flipped learning Improved practical application Personalized learning Collaborative learning Resurgence in creativity & arts	**High**
 Tutoring	Uber for tutors (matching students with teachers) Virtual learning communities	On-demand education Additional lifelong learning business models	**Medium**

Source: Barclays Research

Now vs. Future

We summarise how we view the balance of power, the economics of education and the learning model within education shifting between Stage 1(2015-2030) and Stage 2 (2030-2050) in Figure 17. We envisage global education brands focusing on lifelong learning to emerge, personalised at the individual level by leveraging advanced technologies such as artificial intelligence and VR/AR. The consumerization of education more broadly, will lead to value being placed on alternative credentials within the CV of the future, making education-on-demand essential as society transitions towards a multi-stage life cycle.

FIGURE 17
EdTech - Now vs. Future



Source: Barclays Research

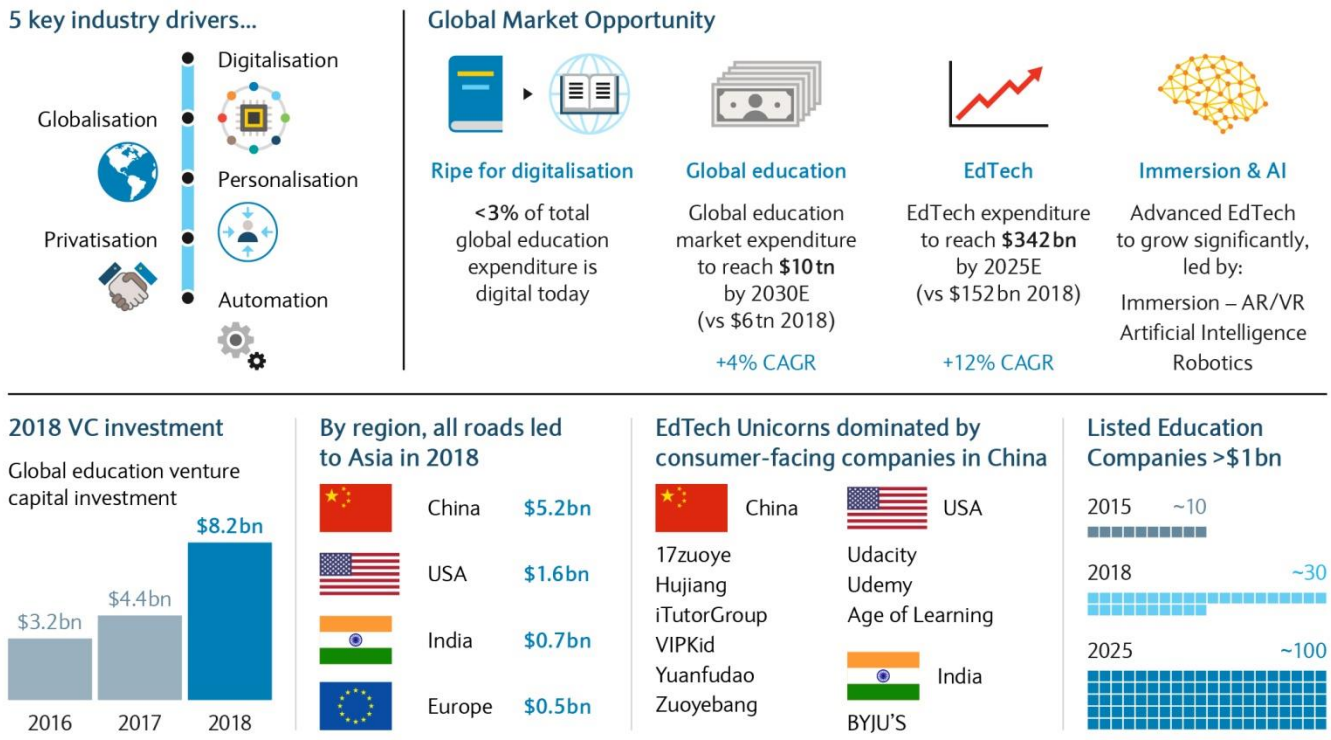
EDTECH MARKET OPPORTUNITY

Today less than 3% of total global education expenditure is digital. That suggests significant potential for transformation in a market expected to reach $10tn by 2030[1] (vs. $6tn in 2018/4% CAGR). There are five long-term trends driving positive transformation in the education and training industry: digitalisation, globalisation, personalisation, privatisation and automation. The combination of them all, in our view makes global education, and EdTech within this, a strong multi-year opportunity (Figure 18).

Compared with 5-10 years ago, when EdTech investments were primarily confined to the US classroom – the opportunity today is much broader. By region, we are seeing the growth opportunity extend to Asia as the increase in disposable income and the quest for international learning drives an explosion of VC funding in China and India. By customer, we are witnessing the demand from schools and higher education establishments extend to corporates investing in their workforce, as well as a burgeoning B2C approach where modern learners are seeking out EdTech solutions. By product, the industry is successfully using software to gain scale as advanced technologies (AR/VR and AI) and mobile-based apps gain popularity.

In this chapter, we outline the size of the global education market and highlight the growth and position of EdTech within this. We analyse, by region and product, how EdTech investments have developed in recent years, before introducing our EdTech country profiles to further understand the opportunity in the US, China and India.

FIGURE 18
EdTech Global Market Opportunity



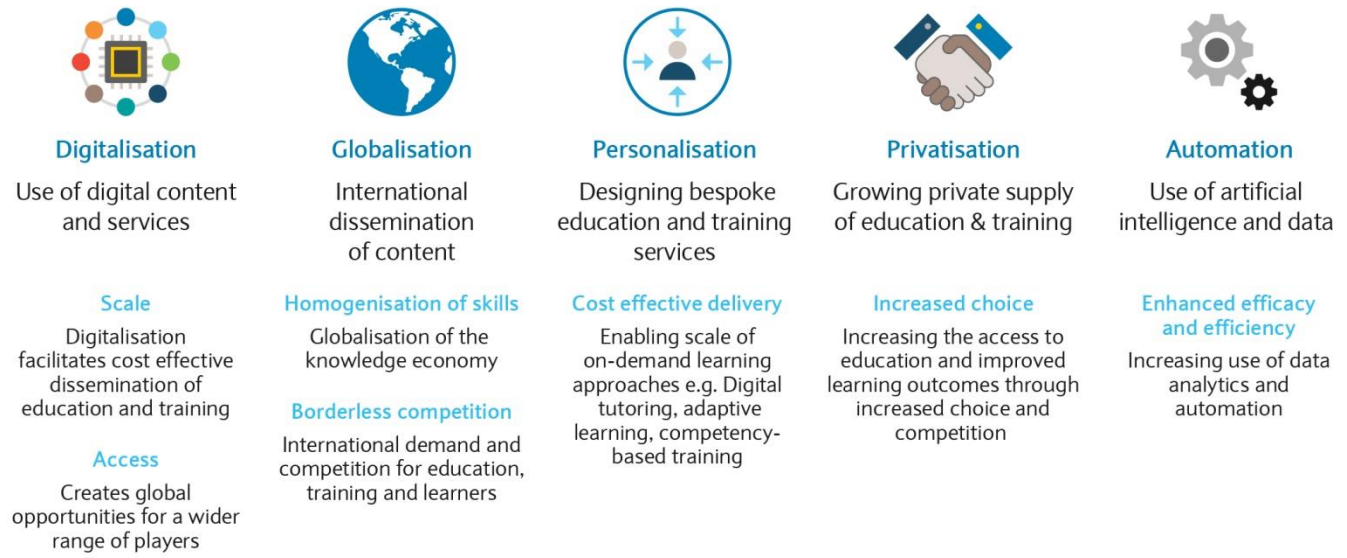
Source: Barclays Research, HolonIQ - Smart Estimates January 2019

[1] According to HolonIQ

5 key industry drivers

EdTechX Holdings, a listed special-purpose acquisition company targeting the sector, identifies five long-term trends that are driving transformation in the education and training industry and accelerating value-creation in EdTech (Figure 19): digitalisation, globalisation, personalisation, privatisation and automation.

FIGURE 19
5 key industry drivers…

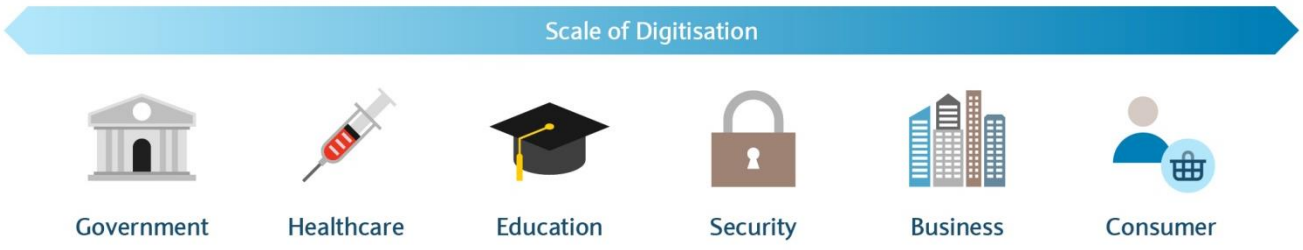


Source: Barclays Research, EdTechX Holdings – IPO prospectus (2018)

Today less than 3% of the education spend is digital…

We see a large addressable market for EdTech given that less than 3% of the global education market is currently digital. This compares with an estimated 35% in the entertainment and content industries (EdTechXGlobal/IBIS – Global EdTech Report 2016). The CEO of EdTechX Holdings – Benjamin Vedrenne-Cloquette – expects a long rising tide rather than an avalanche, estimating the speed of digitalisation in education will take place at about a fifth of the speed seen in other sectors, due primarily to the various number of stakeholders involved.

FIGURE 20
EdTech has significant potential to digitalise vs. other industries



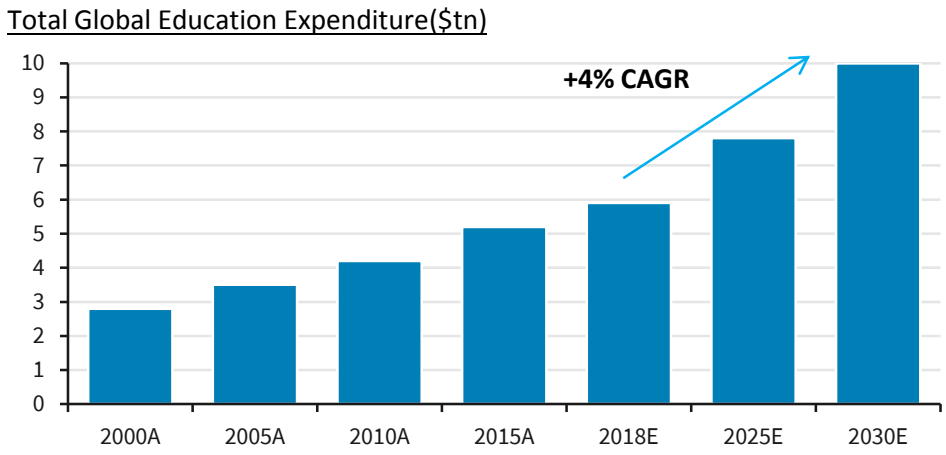
Source: Barclays Research, EdTechXGlobal/IBIS – Global EdTech Report 2016

Global education market to reach $10tn by 2030

HolonIQ estimates that global education and training expenditure will reach at least $10tn in the next 11 years, driven by population growth in developing markets and advances in digital technology. This is driving unprecedented re-skilling and up-skilling in developed economies. HolonIQ estimates that there will be almost 300 million additional post-secondary school graduates and a further 600 million K-12 graduates over the next decade – we note Asia and Africa are driving the expansion. They estimate the world needs to add an average of 1.5 million teachers per year, to reach a total of c.100m by 2030, just to keep pace with the substantial changes ahead in global education.

FIGURE 21

Education is a $6tn industry growing to $10tn by 2030



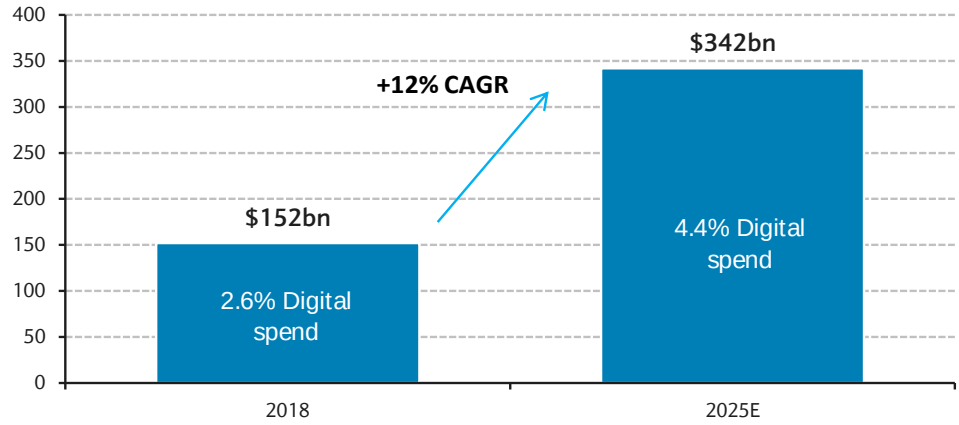
Source: Barclays Research, HolonIQ - Smart Estimates January 2019

EdTech is growing at a +12% CAGR

According to HolonIQ, EdTech expenditure is estimated to grow at a +12% CAGR to $342bn by 2025 (Figure 22). While this is still less than 5% of overall expenditure on global education and training, it is expected this growth will occur alongside an increased integration of technology into existing teaching techniques as well as by the adoption of new models within the sector.

FIGURE 22

Even in 2025, only 4.4% of global education expenditure will be digital



Source: Barclays Research, HolonIQ - Smart Estimates January 2019

2018 was a record year for EdTech investments

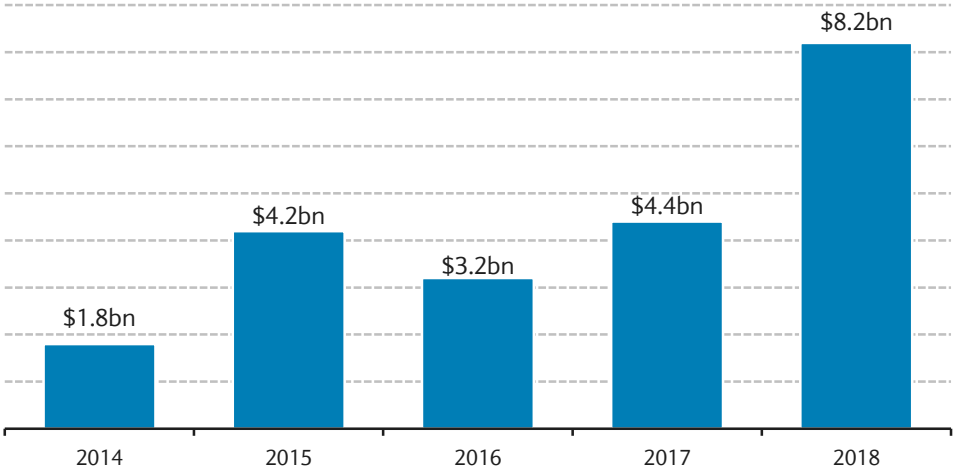
EdTech as an investment opportunity has existed for many years. However, the combination of connected technology and a broader addressable market are now enabling "real" businesses to be developed. Our discussions with venture capitalists indicate that investor sentiment towards EdTech has surged as the focus has shifted to developing business models with a path to scalability and monetisation. As such, 2018 was a record year for EdTech investments (Figure 23).

$8bn of venture capital investments went into global education

Last year saw more than 1000 education-related transactions, with $8.2bn of venture capital invested in the sector[2]. That is almost twice 2017's total. There were 27 deals valued at more than $50m during 2018, accounting for close to half of all VC investments. HolonIQ expects momentum to be carried into 2019, with as many as ten funding rounds of at least $100m and another five EdTech Unicorns to emerge (September 2018 – Global Education Insights).

FIGURE 23

VC investment in global education nearly doubled in 2018…



Source: HolonIQ

Thoughts on investor sentiment: Michael Staton – Partner at Learn Capital (EdTech VC)

"*An emerging private capital ecosystem has been 'game-changing' within the world of education, creating a positive flow of financing available to education businesses. Sentiment within EdTech has moved towards a greater focus on developing business models and technology platforms that can scale.*

Across the industry, we have seen a surge in demand from self-motivated learners wanting new, easy, convenient, and affordable learning pathways – creating a new B2C audience (direct to consumer) – as well as corporates who are willing to invest in their learning & development programs to boost employee retention.

Companies that are scaling have a competitive brand advantage; trust is very important given aspirational brands within education have demonstrated strong lock-in amongst the end-user. This brand advantage can turn into a profitability advantage through what I like to call a 'more-for-more' effect - consumers are almost irrationally committed to wanting the best at premium prices, particularly within the emerging markets where a cultural premium is placed on education."

[2] HolonIQ

Three key observations within 2018 investments

In recent years, we have seen the dimensions of EdTech's addressable market expand. We believe that there are three key trends driving this, all of which were visible in the 2018 investments: i) regional expansion, ii) customer expansion and iii) product expansion.

FIGURE 24
A wider addressable market driven by…

Source: Barclays Research

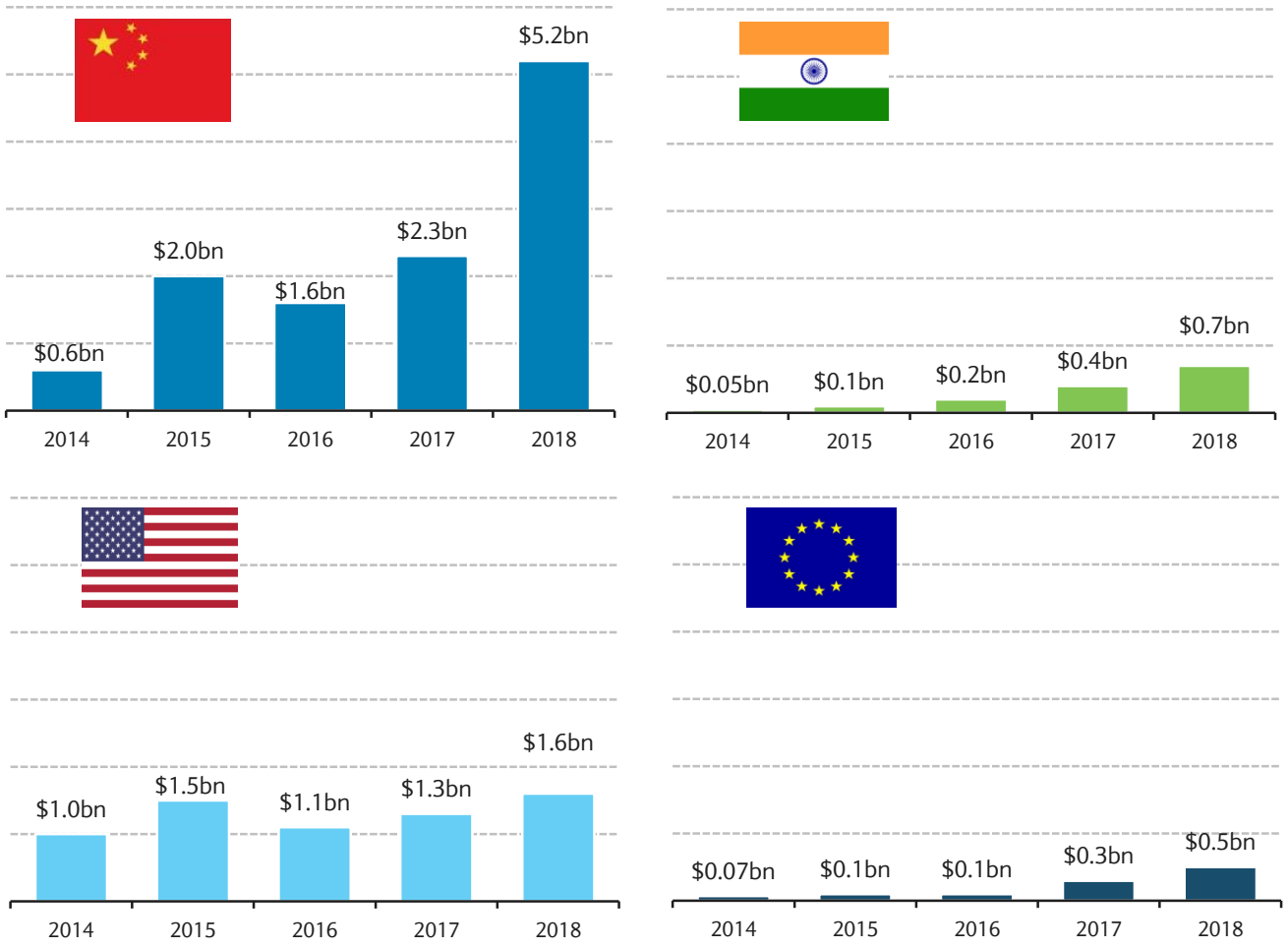
Observation 1: Regional expansion – All roads lead to Asia

The US has historically set the trends and pace of the market, being home to a large EdTech community. However, in recent years we have seen a profound shift towards the East, with investments in China exceeding the US after several large funding rounds in 2018: $500m to VIPKid in June, $350m to Zuoyebang in July and $300m to Yuanfudao in December. In 2018, China accounted for 63% of global investments (Figure 25). This means the US has moved from driving 75% of global deal value and volume just a few years ago to more like 25% now, according to HolonIQ. India is also beginning to hit its stride with 50% of its $0.7bn VC investments in 2018 going to a learning app called BYJU'S (see company profile – page 38).

We expect Asia to remain a credible challenger market driven by its expanding middle class, increasing spend on education and a high propensity to use mobile technology in daily life. Compared to the US and Asia (primarily China & India today), Europe remains largely underinvested, held back by the fragmented nature of the individual markets and heavy regulation (the UK, the Nordics and France are notable exceptions). We dig deeper into the regional trends in the next chapter, including country profiles for China, India, United States and the UK on page 27.

FIGURE 25

China has led VC EdTech investment over the past five years…with a large spike in 2018



Source: HolonIQ, Barclays Research

Observation 2: Customer expansion – Led by corporate and B2C demand

We are seeing EdTech extend beyond the traditional classroom towards corporate clients, lifelong learning and B2C demand thanks to the rise of the modern learner and the global learning crisis. By mix, HolonIQ estimates Corporate Training and Pre-K will grow the fastest within their 2030 outlook (Figure 26).

FIGURE 26

By customer, corporate training and Pre-K are leading the pack…

Education expenditure ($m)	2018E	Share	2025E	Growth (2018-25E)	Share	2030E	Growth (2025-30E)	Share
Pre-K	184	3.1%	424	12.7%	5.4%	683	10.0%	6.9%
K-12	2,653	44.6%	3,291	3.1%	42.2%	4,200	5.0%	42.5%
Post Secondary	2,208	37.1%	2,500	1.8%	32.0%	2,680	1.4%	27.1%
Corporate Training	905	15.2%	1,590	8.4%	20.4%	2,315	7.8%	23.4%
Total	**5,950**		**7,805**	**4.0%**		**9,878**	**4.8%**	

Source: HolonIQ, Barclays Research

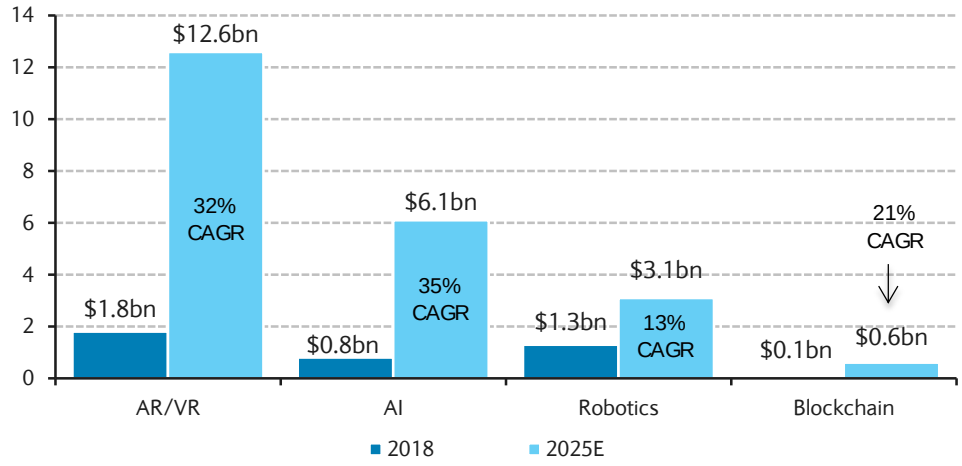
Observation 3: Product expansion – Consumer & Advanced EdTech

Consumer-facing EdTech companies have essentially created an alternative distribution channel that bypasses the traditional educational system. We believe there are certain product areas that lend themselves well to "retail education," with several categories emerging from the analysis of 2018 investments including: after-school, tutoring & language learning (11 transactions totalling $1.85bn), online learning (5 deals spread across India, France, China and US totalling $846m), Q&A content platforms and up-skilling.

Looking ahead, another key product trend is the shift towards advanced technology as it begins to make a direct impact on learners and learning outcomes. HolonIQ estimates the market for advanced technologies in education could reach $22bn in 2025, with artificial intelligence and immersion (AR/VR) leading growth (Figure 27). Product features including video-based AI now evaluate learner comprehension, concentration and confusion; voice-based AI interfaces directly with learners; robotics in the classroom assist with STEM education; and AR/VR is being deployed in corporate and institutional learning contexts.

FIGURE 27

Immersion (AR/VR) and Artificial Intelligence revolutionizing education delivery…



Source: HolonIQ, Barclays Research

UNLOCKING REGIONAL GROWTH

The regional shifts within EdTech illustrate the various supply and demand factors that are influencing its investment opportunity. While the US was historically the champion in EdTech, investment data suggests significant amounts of capital are now being directed towards Asia, specifically China and India. Our EdTech Country Profiles focus our regional discussion on the US, China, India and the UK, highlighting the dominant cities in line with Navitas' EdTech Index.

China: Cultural premium on education drives private tutoring

The EdTech ecosystem in China is vibrant, driven by the rising middle class placing a cultural emphasis on education as a path to success. Though formal education is predominantly state-run, the after-school education market in China is booming. More than 60% of primary schools pupils in China are tutored outside the classroom in key subjects such as English, Literature and Maths (*South China Morning Post – 2018*). Furthermore, the widespread adoption of mobile technology has not only improved access but also proven that students are willing to spend the time and effort to learn via online learning/mobile apps.

Home-grown start-ups understand the cultural context and domestic needs of local customers and have hence proven popular, offering the scale to support the emergence of various EdTech unicorns and enable Chinese EdTech IPOs. VC investment in Chinese EdTech remains robust, accounting for over 60% of 2018 global investment. We summarise the various supply and demand factors influencing the Chinese EdTech growth opportunity in Figure 28.

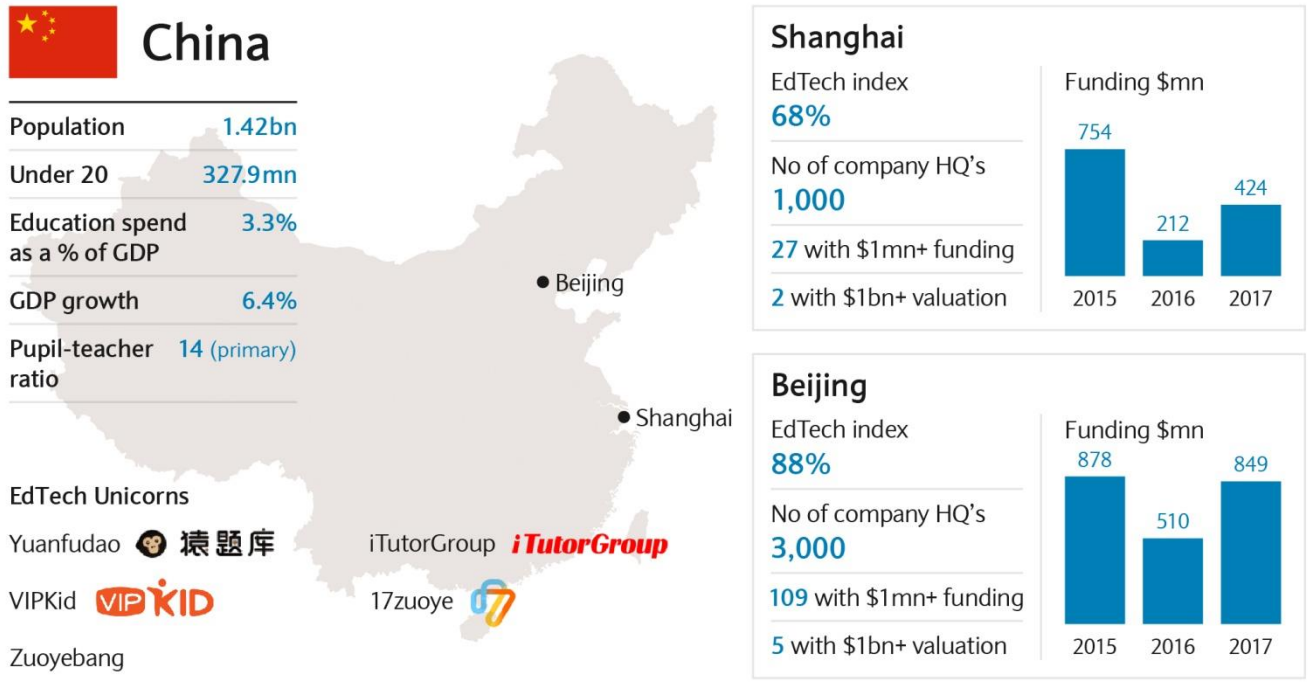
Cultural premium placed on education….

Chinese societies place an extremely high value on education, with families willing to invest up to 30% of their income on their children's education (Figure 29). For example, parents in Hong Kong currently spend the highest amount on their children's education, at $132k from primary school to undergraduate level, followed by the UAE, almost 25% lower, at $99.4k and Singapore at $70.9k. The US spends an average of $58.5k, less than half of that in Hong Kong. Taiwan ($56.4k) and Mainland China ($42.9k) round off the top 6, while the UK comes in significantly lower at $24.9k.

As China's middle class continues to grow in number and affluence, the private education market is experiencing rapid growth. The demand is primarily for after-school tutoring, and more specifically English-language learning given native-English teachers have been difficult to find in sufficient quantities.

> "Chinese families are willing to spend up to 30% of their income on education in Beijing and Shanghai" - CTO, TAL Education Group

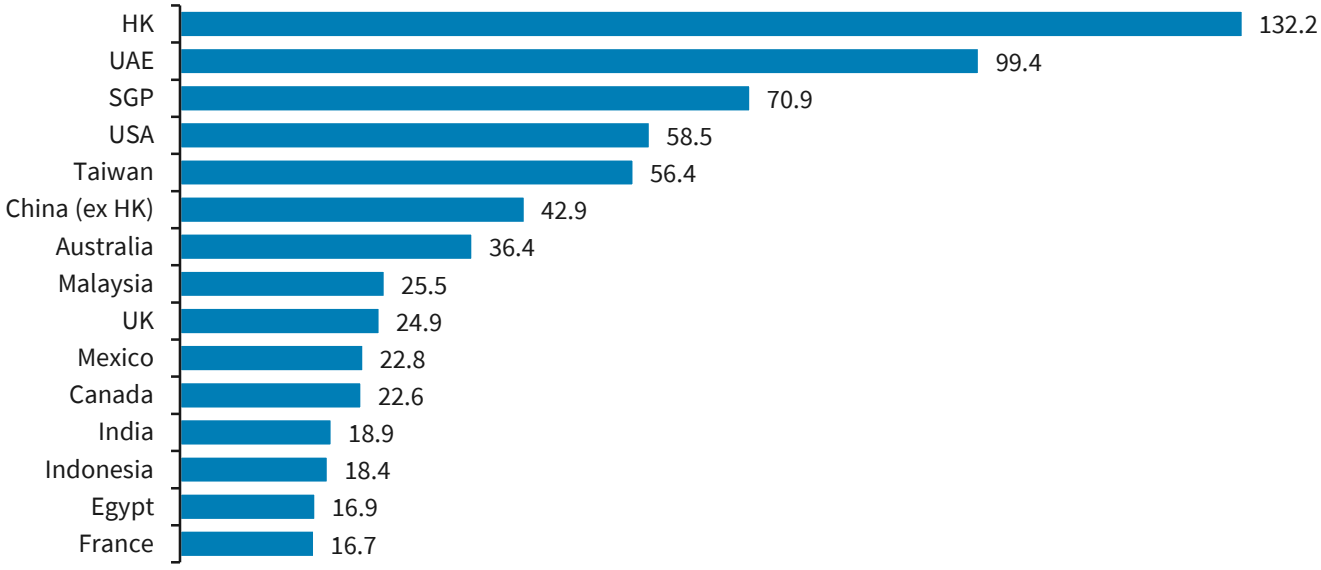
FIGURE 28
EdTech Country Profile - China



Demand	Supply
Increasing young population	Increased government spending on education & STEM
Growing middle class and cultural importance on education	Growing EdTech ecosystem: startups, VCs, Chinese IPOs, unicorns
Current undersupply of educational resources	Increased smartphone penetration and data usage
Strong demand for international learning and after-school tutoring	Regulation over excessively profit-driven education

Source: Barclays Research, Population: UN, Education % of GDP: UNESCO, Pupil-teacher ratio: The World Bank, EdTech Index 2017 - Navitas (refer to Appendix 2)

FIGURE 29 **Parents' expenditure on their child's education by country from primary school to undergraduate level ($000's)**



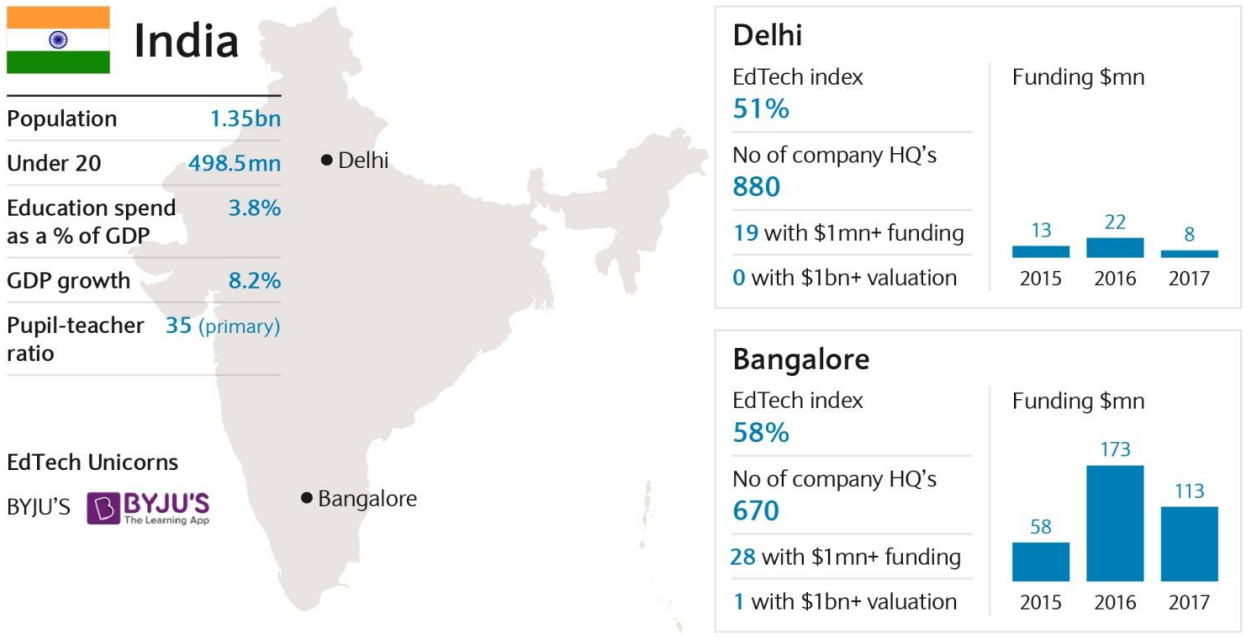
Source: HSBC/Statista

India: Digitalisation improving access to mobile learning

The emerging middle class, expanding younger demographic and the hunger for international learning through mobile apps have highlighted India's burgeoning appetite for EdTech. Market adoption suggests China is further along the digital enablement curve than India. However, the demand for modern learning methods is likely to grow as Government initiatives including Digital India, Operation Digital Board and the upcoming New Education Policy will help to ensure that internet penetration and digitalisation remain a priority in the country.

According to HolonIQ, parents and teachers are changing their approach to education and are accepting that digital learning is a legitimate alternative to more traditional models. Mobile learning remains the dominant medium, with the B2C market proving disruptive across K-12 and the professional environment. The latter is predominantly driven by a healthy adoption rate amongst India's vast population of IT professionals. In 2018, India's EdTech VC investments were in essence monopolised by BYJU'S, which received $540m in December. That funding round left the company valued at $3.6bn, making the platform the world's largest EdTech start-up. We summarise the various supply and demand factors influencing the Indian EdTech growth opportunity in Figure 30.

FIGURE 30
EdTech Country Profile - India



Demand	Supply
Increasing young population	Favorable investment regulation
Growing middle class and disposable income	Increased annual budget for interest free education loans
Urbanization and increased internet penetration	Increased smartphone penetration and data usage
Increased popularity in technical certifications	Growing interest and investment from VCs
Strong demand for international learning and after-school tutoring	

Source: Barclays Research, Population: UN, Education % of GDP: UNESCO, Pupil-teacher ratio: The World Bank, EdTech Index 2017 - Navitas (refer to Appendix 2)

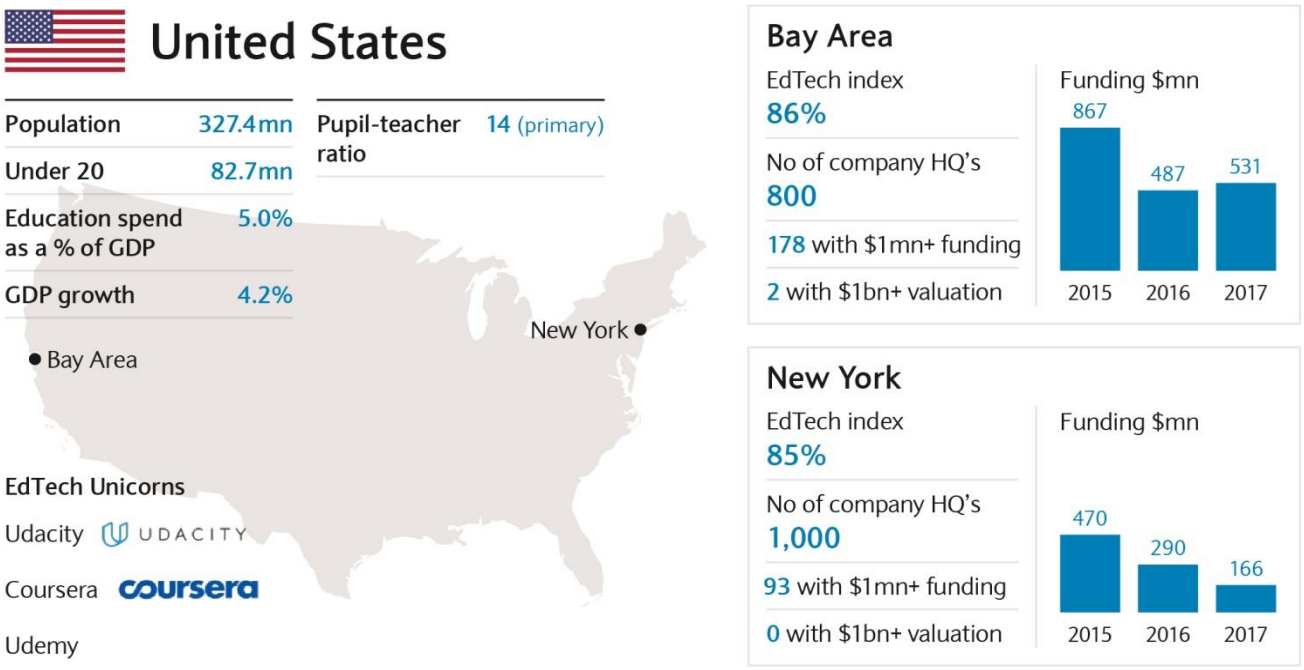
US: Strong classroom presence, burgeoning B2C opportunity

While we have recently seen a shift in momentum away from the US towards Asia, that does not mean the US EdTech market is ex-growth. It is still growing and, given its size and diversity, has opportunities for further market penetration. It is home to a large EdTech community (both public and private), with the tech giants (Google, Apple and Microsoft) also having a strong presence in US classrooms.

What makes the US EdTech market unique, in our view, is not just the strong appetite for EdTech from higher education and K-12 (B2B), but also from consumers themselves. This is increasingly putting pressure on the higher-education segment given the ongoing funding challenges and pressure to deliver non-degree programmes to prove graduates are job-ready. The US is home to three of the largest global 'massive open online course' providers (MOOCs) including Coursera and Udacity and thus could be the testing ground for higher education 2.0.

We summarise the various supply and demand factors influencing the US EdTech growth opportunity in Figure 31.

FIGURE 31
EdTech Country Profile – US



Demand	Supply
Reskilling and upskilling the workforce of the future	Increased government spending on education
Preference for online learning (e.g. through YouTube etc)	Growing interest and investment from VCs
Pressure on schools to adopt emerging technology	
Current undersupply of educational resources	
Increasing competition for attracting international university students	

Source: Barclays Research, Population: UN, Education % of GDP: UNESCO, Pupil-teacher ratio: The World Bank, EdTech Index 2017 - Navitas (refer to Appendix 2)

Europe: Fragmented and underinvested

Relative to Asia and the US, investments in Europe have been small compared to its overall market size; held back by the fragmented nature of the individual markets, heavy regulation and a generally under-privatised sector, according to HolonIQ. We believe the UK and the Nordics are notable exceptions, as well as France.

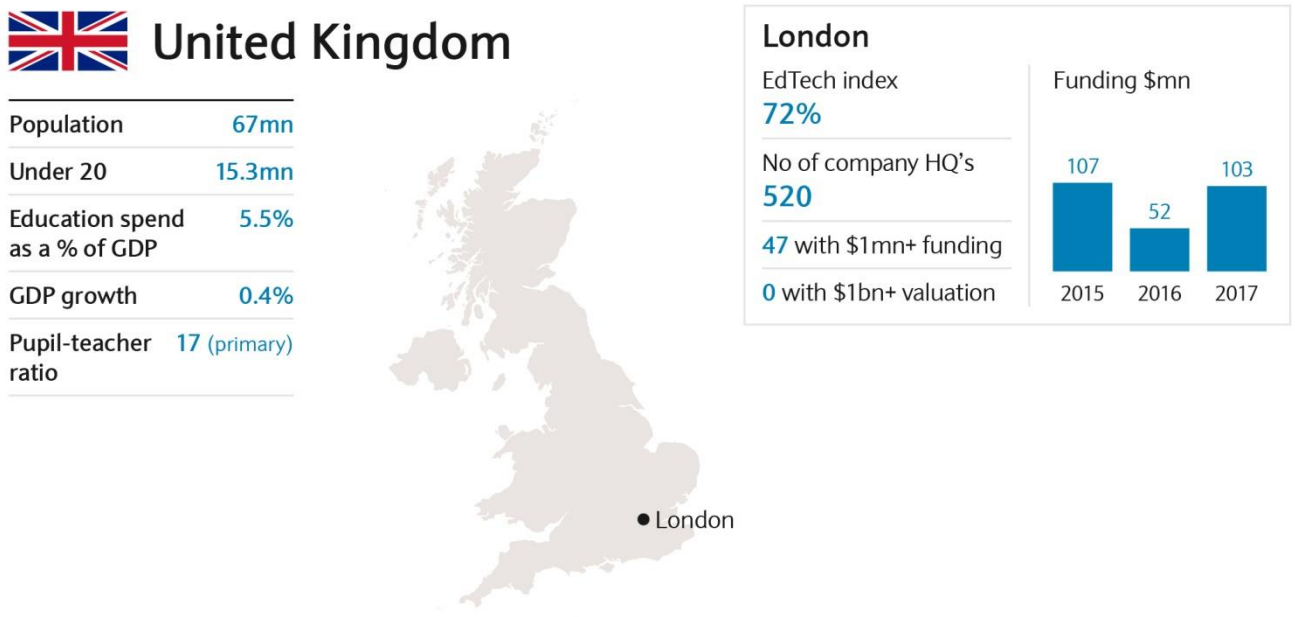
UK EdTech remains constrained by cultural inertia and funding challenges

In 2018, the UK's EdTech sector attracted over $500m in investment including at least 11 rounds between $5m and $10m and at least 5 rounds between $10m and $20m - HolonIQ. According to Benoit Wirz (investment partner at Brighteye Ventures – *April 2018*), there are three reasons the UK is leading Europe in EdTech: i) a large school and university market with high digital penetration, ii) key local industry partners (Pearson, Oxford University Press), and iii) portability to the US, Europe & Commonwealth.

Across the education system, funding has been the main topic of conversation. Education spending is the second-largest element of public-service spending in the UK, representing c. 4.3% of national income according to The Institute for Fiscal Studies (*2018*) behind only the health sector. While the level of spending rose significantly in real terms from the late 1990s through to the late 2000s, funding has since fallen as budget cuts began to take effect from 2010 onwards. This has created several different pressure points within the education system, including teacher shortages and narrowed curriculums. The Institute for Fiscal Studies has estimated that funding per pupil in England fell by 8% between 2010 and 2018, with 66,000 more children in state schools this year than the year before but with 5,000 fewer teachers. With UK teacher applications having fallen by a third in 2017, a recent survey by the National Education Union found that 81% of teachers have considered leaving the profession because the administrative workload was too high.

We summarise the various supply and demand factors influencing the UK EdTech growth opportunity in Figure 32.

FIGURE 32
EdTech Country Profile - UK



Demand	Supply
Reskilling and upskilling the workforce of the future	Positioned well for AI development
Preference for online learning (e.g. through YouTube etc)	Growing interest and investment from VCs
Insufficient resources putting increasing pressure on teachers	
Increased competition for university from international students	

Source: Barclays Research, Population: UN, Education % of GDP: UNESCO, Pupil-teacher ratio: The World Bank, EdTech Index 2017 - Navitas (refer to Appendix 2)

The Nordics won the education game a long time ago

The Nordics are widely accredited for their stellar schooling system, ranking at the top of global league tables. The schools are embracing technology not only to assist traditional learning methods but to develop social and emotional skills. The sentiment behind education in these countries is less around achieving the highest possible grades and more around fun and collaboration. This early adoption of technology combined with a strong ecosystem (government support, start-ups, strong education infrastructure) leaves the Nordics well placed to cultivate the European EdTech community.

The rest of Europe is starting to recognise the EdTech trend

While the UK and the Nordics continue to dominate the European EdTech news flow, other countries are starting to recognise the EdTech trend. France is one such place and is now home to more than 300 EdTech start-ups. By product, extra-curricular learning looks more promising than the K-12 market for EdTech solutions. This is because France's school system does not allow start-ups to sell to public education institutions mainly due to the lack of budget. The outlook for corporate and lifelong learning remains favourable in France. It is estimated that 14m French citizens remain barely engaged with the digital world. Kokoroe (an online platform training people up with digital and "21st century" skills) has signed a partnership agreement with the French employment office to give job seekers free access to their platform.

EdTech is rapidly becoming the 21st century's answer to the textbooks and night courses of old. With university fees rising and the publishing industry in a state of decline, now is the time to start looking at the companies promising to revolutionise education through everyday technology.

We acknowledge EdTech was previously viewed as a difficult market to enter because of concerns regarding monetisation and the willingness of education systems to adapt to this new architecture. However, in recent years, its addressable market has expanded by region, by customer and by product, which has provided the sector with additional opportunities to gain scale. Consequently, our discussions with the VC community and EdTech start-ups suggests investor sentiment has improved following the wave of IPO and M&A activity the sector has delivered in recent years.

In this chapter, we put forward healthcare as a comparable peer before arguing that the EdTech investment opportunity is different to what it may have been historically, given the underlying market shift. We outline four ways in which investors can obtain exposure to EdTech (Figure 34) and provide a sample of companies in our EdTech landscape (Figure 35), including listed and private companies.

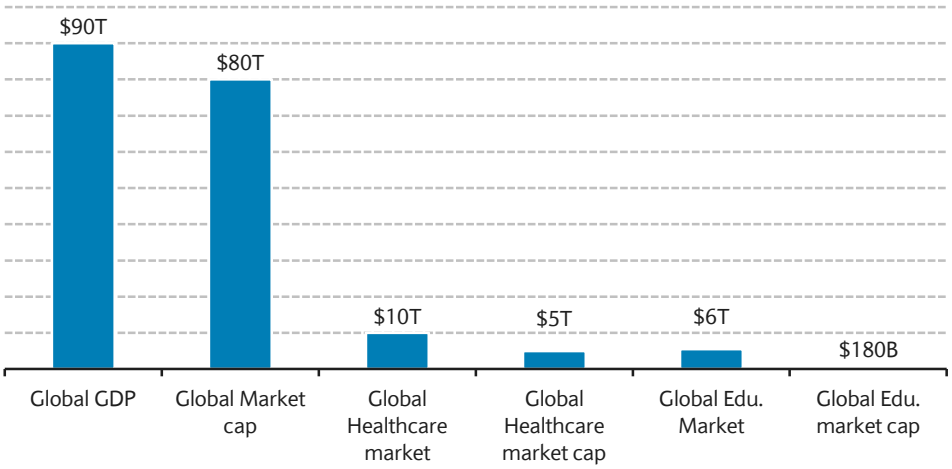
Healthcare vs. Education – Putting things into perspective

We believe healthcare is an appropriate comparable in justifying our view that education should be considered a multi-year opportunity for investors. Both are heavily financed by the public purse and decision-making has proven difficult, driven by many stakeholders with conflicting interests. The adoption of emerging technologies has been limited to date, although rising costs and constraints on traditional resources are powering an increasing willingness to seek out technological solutions.

Thus we view both education and healthcare as ripe for digital disruption and although we anticipate healthcare will remain ahead in this journey, education still remains heavily underinvested today (Figure 33).

FIGURE 33

Globally education market cap is 3% of global expenditure vs. 50% in healthcare…

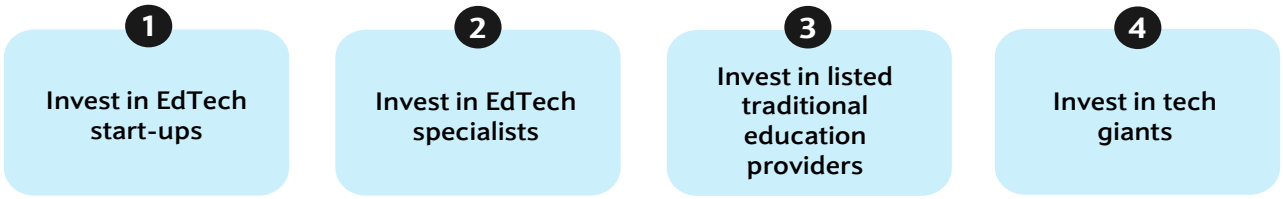


Source: Barclays Research, HolonIQ, World Health Organization, Goldman Sachs, Standard & Poors

Four ways to invest in EdTech

Based on our understanding of the EdTech market, we believe there are four entry points for investors who are keen to obtain exposure to EdTech today (Figure 34). We believe exposure to "pure-play" EdTech companies is preferable and thus view 1) Invest in EdTech start-ups and 2) Invest in listed EdTech specialists as the most credible route for entry. We expect M&A activity to continue as the industry consolidates, with a handful of IPOs expected by the EdTech community in the near future.

FIGURE 34 **EdTech Investor – four entry points…**



Source: Barclays Research

- **Invest in EdTech Start-ups – Several unicorns are expected to IPO in the near future:** The number of education start-ups is now increasing at an exponential rate, with several EdTech unicorns having emerged in recent years. There are currently 10 EdTech unicorns spread among the US, China and India, according to HolonIQ. We envisage the number of M&A deals to increase in both quantity and size as the market consolidates, with the buyers split between strategic acquirers and private equity investors. As the companies mature and gain scale, more EdTech companies will get ready to go public, based on our discussions with the VC community. Public declarations have been made by several EdTech unicorns including iTutorGroup (*Bloomberg – 2018*) and Udacity (*Reuters – 2018*).

- **Invest in listed EdTech Specialists – Primarily based in Asia and the US:** There are over 250 listed education companies globally, within which EdTech specialists are the minority. The majority of the EdTech specialists are based in China (though listed in the US), including TAL Education Group and New Oriental Education, as well as US companies such as 2U Inc. and Pluralsight.

- **Invest in Traditional Education Providers – Undergoing digital transformation:** Several traditional education providers (content & publishing) have attempted to digitalise their product offering in recent years with mixed results. Compared to the EdTech start-ups, the traditional education providers have been slow to adapt, driving them to either make acquisitions or enter joint-venture agreements to gain exposure to EdTech. Companies include Pearson and Scholastic.

- **Invest in Tech Giants – Strategic value in Education:** For many years the tech giants have concentrated their efforts towards the more traditional clientele (e.g. schools) by focusing on hardware infrastructure. With the push towards more immersive technology, such as virtual reality and classroom management capabilities, the focus has since become more software-led. Nonetheless, the strategic value of the tech giants being in education remains the same. That is, they are less interested in generating revenue (at the group level this would be negligible), yet keen to become the household name within classrooms to achieve lifetime brand loyalty.

We summarise which companies we believe are the main players in our EdTech landscape, including listed and private companies and relevant venture capitalists in Figure 35.

FIGURE 35
Barclays – EdTech Landscape

		Asia		US		EMEA
Private	EdTech Start-ups	BYJU'S	Yuanfudao	Age of Learning	General Assembly	Bridge U
		Hujiang	Zuoyebang	Brainly	Knewton	Firefly
		iTutorGroup	17zuoye	Coursera	Udacity	Kahoot!
		VIPKid		Duolingo	Udemy	Kano
						Seneca
Public	EdTech Specialists	Ambow	New Oriental	2U	K12 Inc	
		China Distance Education	Puxin	Instructure	Pluralsight	
		China Online Education	Sunlands Online Education			
		LAIX	TAL			
		Liulishuo	Tarena			
	Traditional Education	Bright Scholar	Hailiang Education Group	Adtalem Global Education	Grand Canyon	Bloomsbury Publishing
		China Education Group	Maple Leaf Education	Barnes & Noble Education	Houghton Mifflin Harcourt	Lagardere
		China Xinhua Education	OneSmart	Bright Horizons	Laureate Education	Learning Technologies
		China YuHua Education	Virscend	Career Education Corp	Wiley	Pearson
				Chegg	Scholastic	
				Graham Holdings	Strategic Education	
	Tech giants & Internet	Baidu	Tencent	Amazon	Google	Naspers
		Alibaba	NetEase	Apple	Microsoft	
				Facebook		
	Investment Vehicle	EduLab		GSV Capital		EdTechX

Investment firms & VCs

500 start-ups: Udemy, Brilliant	**Rethink Education:** BrightBytes, Pluralsight, 2U	**New Enterprise Associates:** Coursera, Zuoyebang, Duolingo
Sequoia Capital: Zuoyebang	**Insight Venture Partners:** BrightBytes, Pluralsight, Udemy, Chegg	**Learn Capital:** Coursera, Varsity Tutors, Udemy, VIPKid, Edmodo
Reach Capital: Nearpod, Epic!		

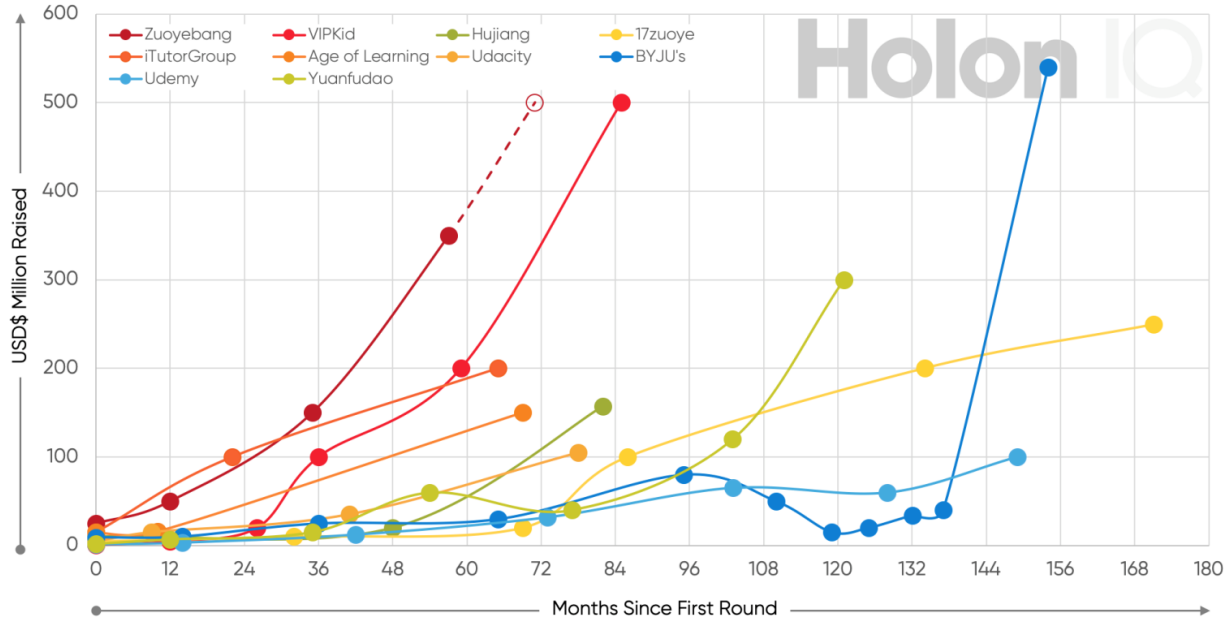
Source: Barclays Research

1) Invest in EdTech start-ups

Vibrant EdTech start-up community with 10 EdTech unicorns

The education sector has reached its era of start-up disruption as growing demand and increased technological innovation underpins a burgeoning start-up community. There are currently over 25,000 EdTech start-ups globally; 10 of which are unicorns, with the majority based in China, according to HolonIQ. According to the Global Start-up Ecosystem Report (*2018*), EdTech represented 2.8% of the global share of start-ups (vs. average 4.3%/FinTech 7.1%), growing on average at 7.4% between 2008-2016 (vs. global start-up average of 4.5% and FinTech 6.8%). Figure 36 maps 62 rounds of VC funding across the 10 EdTech Unicorns, totalling $5.2bn as of February 2019.

FIGURE 36
EdTech Unicorn Funding Rounds in USD millions



Source: HolonIQ. Zuoyebang – dashed red line: October 2018 funding round yet to be confirmed by the company or Softbank.

Asian unicorns now looking for US acquisitions

Our understanding of the EdTech market opportunity suggests the market will experience a wave of consolidation as the large EdTech players seek scale and international presence. Encouragingly, Asian EdTech companies are investing abroad to find fresh ideas and tools that can be incorporated into their local markets as well as to strengthen their international position. For example, TAL (a Chinese company listed in the US) has directly funded a handful of US EdTech start-ups including Knewton in 2016 and the acquisition of Israel's CodeMonkey for $20m in December 2018 (*EdSurge – 2018*).

BYJU'S - India's largest EdTech start-up, valued at $3.6bn - is believed to be in talks with four or five US-based EdTech companies as they seek out products that have a global offering (*Nikkei Asian Review – 2019*). In January 2019 BYJU'S acquired Osmo, a US-based learning platform, for $120m. Osmo produces augmented reality games targeted at children for iPads and iPhones (refer to page 38 for a detailed company profile of BYJU'S).

Start-up directory

Based on region and product category, we summarise a range of EdTech start-ups in Figure 37 followed by company profiles on pages 38 – 43.

FIGURE 37

EdTech Start-up directory

Company	Country HQ	Founded	EdTech product	Description	Valuation	Date of last funding	Round	Notable investors	No. of Funding Rounds	Total Funding Amount
BYJU'S		2011	Mobile learning	A mobile app that provides students with supplementary learning in the K-12 and test prep segment	$3.6B	Dec - 18 ($540m)	PE Round	General Atlantic, Naspers, CPPIB, Tencent, Chan Zuckerberg Initiative, Sequoia Capital	8	$784m
Yuanfudao		2012	Online tutoring	An online tutoring platform including live courses, an exam question database and a homework help app	$3.0B	Dec - 18 ($300m)	Series F	Tencent, Warburg Pincus, IDG Capital, Matrix Partners China	7	$544m
VIPKid		2013	Language	An online platform providing English classes to students by connecting them to highly qualified teachers in North America	$3.0B	Apr - 18 ($500m)	Series D	Tencent, Coatue Management, Sequoia Capital	7	$825m
17zuoye		2007	Online tutoring	K-12 online learning platform for students, parents and teachers, focusing on English and math	$1.0B	Mar - 18 ($250m)	Series E	Temasek Holdings, Tiger Global Management	7	$585m
Udemy		2009	Online teaching & courses	Online learning platform aimed at professional adults using content from online content creators	$1.0B	Jun - 16 ($65m)	Series D	Naspers, Insight Ventures, Learn Capital, Stripes Group	8	$173m
Age of Learning		2007	Early learning academy	Subscription-based early learning academy for children ages 2-8, targeting US schools	$1.0B	May - 16 ($150m)	Series A	Chan Zuckerberg Initiative, ICONIQ Capital	3	$182m
iTutorGroup		1998	Language	Online English language learning platform	>$1.0B	Nov-15 ($200m)	Series C	Temasek Holdings, Goldman Sachs, GIC	3	$315m
Udacity		2011	Online learning platform	Platform offering nanodegreee programmes, focusing on AI, Data Science and Programming	$1B	Nov- 15 ($105m)	Series D	Bertelsmann, Google Ventures	4	$160m
Coursera		2012	Online learning platform	Online courses and credentials from top universities and corporations including Yale, Stanford, Google and IBM	$800m	Jun-17 ($64m)	Series D	GSV Asset Management, Learn Capital	8	$210m
Hujiang		2001	Online learning platform	Digital education platform for online language learning and communication	-	Oct-15 ($157m)	Series D	Baidu, China Minsheng Investment Group	4	$187m
Zuoyebang		2014	Homework Help	Online platform that enables students to seek answers to study-related problems	$1.bn	Jul-18 ($350m)	Series D	Sequoia Capital, Coatue Management, Goldman Sachs	4	$585m
Duolingo		2011	Language	A freemium model, science-based language learning app and website	$700m	Jul-17 ($25m)	Series E	Drive Capital, Ashton Kutcher, Google Capital, Union Square Ventures	5	$108m
Kano		2013	Coding	An online platform to learn how to code and make your own technology	-	Feb - 18 ($28m)	Series B	Index Ventures, Sesame Ventures, Thames Trust	6	$44.5m
Memrise		2010	Language	A user generated platform for language learning	-	Jun - 18 ($15.5m)	Series B	Octopus Ventures, Korelya Capital	6	$22m

Source: Barclays Research, Funding data obtained from Crunchbase as of 08/01/2019, Company data

BYJU'S – India's $3.6bn EdTech start-up

Based in Bangalore, BYJU'S is a learning app founded by Byju Raveendran (*CEO profile*). The app launched in 2015, offering comprehensive learning programs in STEM subjects for students in the 4th to 12th grade by providing video tutorial and educational games. It also offers test prep courses for national examinations as well as international exams including the GRE and GMAT. BYJU'S focus is to make learning engaging and effective through technology; using the smartphone as a learning device and the app as a medium.

This year BYJU'S is focusing on expanding within India. It is also in the process of building a product for international markets and the kindergarten to grade three (K-3) market. BYJU'S has been open to M&A as it seeks to bolster its product capabilities and global reach, and recently acquired US- based learning app Osmo for $120m.

Performance metrics: BYJU'S has over 30 million registered users and 2 million annual paid subscriptions. The annual retention rate is 85%, with students spending on average 64 minutes on the app each day. Users are present in more than 1700 cities, with more than 75% of BYJU'S students coming from non-metro, Tier II and Tier III cities. According to the latest feedback, 93% of parents reported an overall increase in their children's grade after using BYJU'S.

Funding: In 2016, BYJU'S reputation outside of India grew considerable when the company received a $50m investment from the Chan Zuckerberg initiative, which was then followed by $40m from Tencent. More recently, in December 2018 BYJU'S raised $540m to fuel international expansion, led by Naspers Ventures and Canada Pension Plan Investment Board. BYJU'S has now raised a total $784m from investors taking the company's valuation to $3.6bn, which makes it one of the most valuable EdTech companies in the world (*Crunchbase profile*).

Osmo acquisition: US-based Osmo produces AR games targeted at children in the age group of 3-8 years. It will remain a separate entity with its own learning content, but will also help market BYJU'S products in the US and internationally. Osmo has more than 1 million families in the US and over 25,000 schools subscribing to its product. It also has a smaller presence in Australia, Canada and the UK, and generates revenue of $30m a year.

Financial performance: BYJU'S follows a freemium business model, though there are other paid for packages for offline coaching as well. The company has had strong growth, growing at 100% annually for the last three years. BYJU'S reported net sales of INR520 crore for FY2017/18 ($72M) and is looking to achieve a revenue target of INR1,400 crore ($196m) in FY2018/19 (March).

Yuanfudao – China's homework assistant app worth $3bn

Based in Beijing and founded in 2012, Yuanfudao ("ape tutor" in Mandarin) is a homework-help app that provides live courses and tutoring. The app uses artificial intelligence to instantly solve problems with a single photo.

Performance metrics: Yuanfudao has over 200m users, with more than one million paying users (0.5%). Yuanfudao derives the majority of its revenues from selling live courses. Pricing depends on the course structure, and ranges from 3 Yuan ($1) for a one-time lecture to 999 Yuan ($150) for a 15-week tutoring course for Junior Secondary Mathematics. It hopes to encourage free riders to start paying by focusing its efforts on value-adding solutions like smart learning and AI.

Funding: In December 2018, Yuanfudao raised $300m in a round led by existing investors Tencent and Warburg Pincus, Matrix Partners China and IDG Capital. It will use the capital to further invest in developing smart learning technologies and the user experience. The latest funding round takes the valuation of the six-year-old start-up to over $3bn, up from c. $1bn at its previous $120m round in 2017.

Financial performance: Yuanfudao is said to have generated CNY700m ($101m) in revenue in 2017, doubling to CNY1.5bn ($216m) in 2018, according to Chinese media (*EJ Insight – 2018*).

VIPKid – Online English tutoring

Founded in 2013 and formally launched in 2014, VIPKid connects students who want to learn English after-school in the comfort of their homes with teachers in North America, via live streaming. In addition to international expansion, VIPKid is focusing on the quality of its service and advanced technologies including AI and facial recognition. VIPKid has opened partnerships with strategic players including Scholastic and Microsoft, with the aim to bolster its product portfolio.

Performance metrics: The platform has over 500,000 students and 65,000 teachers, with teachers being able to earn up to $22/hour plus referrals and bonuses. This is 30-40% more than they would make through offline tutoring, on average, according to VIPKid CEO Cindy Mi. The platform is accessible to the average Chinese family, with people paying c.10,000 RMB per year ($1500) to learn with VIPKid, Mi told CNBC (*2018*). The platform has a 95% student-retention rate.

Funding: In June 2018, VIPKid raised $500m in its Series D financing led by Coatue Management, Tencent and Sequoia Capital. This implies a valuation over CNY20 billion Yuan ($3bn) pre-money.

Financial performance: In 2017, VIPKid's 25-minute-long classes were forecast to bring in $760 million in revenue, up from $300 million the previous year (*Fast Company*).

iTutorGroup – Data analytics & algorithmic-derived personalisation

Founded in 1998, but only transitioning to an online platform in 2004, iTutorGroup provides a personalized learning experience by analysing students using more than 128 different metrics (ranging from their hobbies to the way they pay their bills). It uses this data to tag a student and then match them with other registered students/teachers to deliver a more impactful learning experience. The company has historically focused on languages but will soon be diversifying into maths, coding and programming.

Performance metrics: iTutorGroup employs over 20,000 teaching consultants in 135 countries. It has c300k registered students with c80% based in China and Taiwan.

Funding: According to Bloomberg (*2018*), iTutorGroup is hoping to raise $300m at a valuation of $2bn through an IPO in 2019, most likely in Hong Kong or the US.

Financial performance: When speaking to the company, it was keen to highlight that the gross margins are much higher than competitors, at 80% vs. an average of 30-40% elsewhere.

Udacity – Online degrees and corporate up-skilling

Founded in 2011, Udacity is an online learning platform focused on technology. The firm has partnered with Google, AT&T, Facebook and Amazon to tailor courses that teach the specific skills employees are looking for. The name – Udacity – is a combination of "audacity" and "university" aiming to give professionals the knowledge they need to get a new job or advance their career. While it originally focused on offering university-style courses, it now focuses more on vocational courses for professionals, focusing on skills such as artificial intelligence, data science, and programming.

Performance metrics: Udacity generates most of its revenue from tuition, which ranges from $1k-2.5k a course. In December 2018, Udacity announced that 50,000 students have now graduated from its revenue-generating "Nanodegree" programmes. In 2018, Udacity had over 10 million learners enrolled across its free and paid courses (vs. 8m 2017/5m 2016) – Tech Crunch (*2018*).

Funding: Udacity raised $105m in a 2015 Series D round led by Bertelsmann, Baillie Gifford and Google Ventures, valuing the company at $1bn, Tech Crunch reported (*2015*). In February 2018, then-CEO Vishal Makhijani said in an interview that the company aspires to IPO, though this was then followed by a global restructuring plan and the eventual departure of the CEO in 2H 18.

Financial performance: In 2017, Udacity generated $70m in revenues from $29m the prior year, though the company is not yet profitable. It was expected Udacity would grow revenue by 25% in revenue in 2018 (*Class Central – 2018*).

Coursera – Universal access to the world's best education

Founded in 2014 by Stanford professors, Coursera is an online learning platform that features partnerships with top universities and educational institutions worldwide. Compared with Udacity (see page 40), Coursera's content is more broad-based. It includes social sciences, arts and humanities, life science and language learning. Every course is taught by highly-qualified instructors in a format that may include recorded video lectures, graded assignments, quizzes, discussion forums, and peer-to-peer/peer-to-instructor learning. In 2016, Coursera launched an enterprise product and a monthly subscription model.

Performance metrics: According to Coursera, the platform boasts 35m learners, 150 university partners, 2,700 courses, 250+ specialisations and 4+ online degrees. Companies that have collaborated with Coursera include L'Oreal, Air France and PayPal.

Funding: In July 2017, Coursera raised $64m in Series D funding led by GSV Asset Management, New Enterprise Associates and Learn Capital valuing the company at $800m, according to TechCrunch (*2017*). Funds were used to develop AI-derived personalisation, to expand its full online degrees and to continue targeting corporate businesses.

Financial performance: According to Forbes, Coursera's revenue for 2018 was $140m, up from $100 million in 2017.

Udemy – Democratisation of content

Founded in 2010, Udemy provides a platform aimed at students, allowing instructors to build online courses on topics of their choosing and upload videos/live content to create classes. Compared with Coursera, Udemy takes a slightly different approach based on the assumption that the world's best teachers aren't always found in classrooms. It encourages individuals to develop courses, with a focus on skills rather than certification or degrees. Udemy also offers 'Udemy for Business', enabling businesses access to a targeted suite of courses on topics from digital marketing to office productivity. In 2017, the top 10 instructors made more than $17m in total revenue.

Performance metrics: Udemy's platform has 30 million students, over 100k courses from 42k instructors and 190 million course enrolments. The platform now holds 22 million minutes of video and provides training in over 50 languages.

Funding: In June 2016, Udemy raised $60m from Naspers and has now completed 8 rounds of funding worth $173m in total. Udemy CEO Kevin Johnson, appointed in 2017, is known for preparing companies for IPO, according to a company press release.

Zuoyebang – Homework help via photos & personalised mentoring

Founded in 2014 by tech giant Baidu, Zuoyebang (translates to "homework help") is an online platform that enables students to upload homework questions for others to assist with. The company runs independently from Baidu, targeting K-12 students. Students upload a photo that the platform will analyse and match to questions in its database. For questions without solutions, students can opt to pay for virtual one-on-one sessions with teachers that partner with Zuoyebang. It has now expanded into delivering live streaming online courses and one-to-one tutoring for kids and is keen to develop further AI-derived capabilities.

Performance metrics: According to a company statement published in April 2018, Zuoyebang has accumulated 300 million registered users, "meaning that two in three primary and middle school students online is using the company's products." Zuoyebang currently cooperates with 113 educational organizations and 370,000 primary schools and high schools in China, according to *Crunchbase*. It currently has 165m homework problems in its database, increasing by 2 million every month, Technode reported (*2018*).

Funding: Zuoyebang completed its latest funding round in July 2018, raising $350m in its Series D financing led by Coatue Management alongside Goldman Sachs and Sequoia as participating investors. To date it has raised a total of $585m over four funding rounds, with an implied valuation of $1bn, according to China Money Network (*2018*). In October 2018 there was speculation that Softbank planned to invest $500m in the start-up, according to EJ Insight (*2018*).

17zuoye – Homework data and AI-derived personalisation

Founded in 2011, 17zuoye (also known as Homework Together) is a Beijing-based brand of Sunny Education, offering online Maths and English exercises and assessments for K-12 students. The platform aims to serve students, teachers/schools and parents to facilitate the educational experience, offering class preparation as well as personalised learning solutions by utilising big data and AI technology on students' daily homework. It synchronizes students' progress in school and provides STEM content that matches the learner's ability.

Performance metrics: Compared to its competitors, 17zuoye produces in-school services for free, and in return it gets users and their data. The company then offers premium services to the end users: students and parents. Since Series D in 2015, 17zuoye has implemented two main monetisation models, which are intelligent supplementary textbooks and live-stream tutoring. By March 2018, it had entered 31 provinces, 363 cities, and nearly 120,000 schools, with over 600 million registered users (including 1.9 million teachers, 20 million parents, and 40 million students).

Funding: In March 2018, 17zuoye raised $250m in a Series E funding round led by Temasek, implying a valuation of $1bn. The company will use the money for market expansion and to improve its content and technology. To date it has raised $585m over seven funding rounds.

Duolingo – Language learning app, hoping to IPO in 2020

Founded in 2011, Duolingo is a freemium language learning platform providing over 81 different courses in 37 languages. It has introduced gamification techniques to engage users – these include "streak count" which records how many days in a row you spend on a language; "hearts" which are lost when you answer questions incorrectly; "in-lesson grading" and a "read, listen, speak" function which provides various tasks and challenges during the course.

Performance metrics: As of October 2018, over 7 billion exercises are completed each month by its user base of over 300 million. In 2018 the company pushed to boost revenue from its three main sources; ads that run in the app, $9.99 per month premium subscriptions that let users avoid seeing ads, and English proficiency tests for non-native speakers (which costs $49 and are administered via a separate desktop program).

Funding: In July 2017, Duolingo raised $250m in Series E funding in a round led by Drive Capital, bringing its valuation to $700m. To date Duolingo has raised c$108m over five rounds of funding. Key investors include Google Capital, Ashton Kutcher and Union Square Ventures.

Financial performance: In 2017 the company claims revenue grew by 1300% to $13 million through a mix of ads, in-app purchases and subscription features. Duolingo projected that 2018 revenue would reach between $30-40 million and the company anticipates an IPO in 2020, according to Inc (*2018*)

2) Invest in listed EdTech specialists

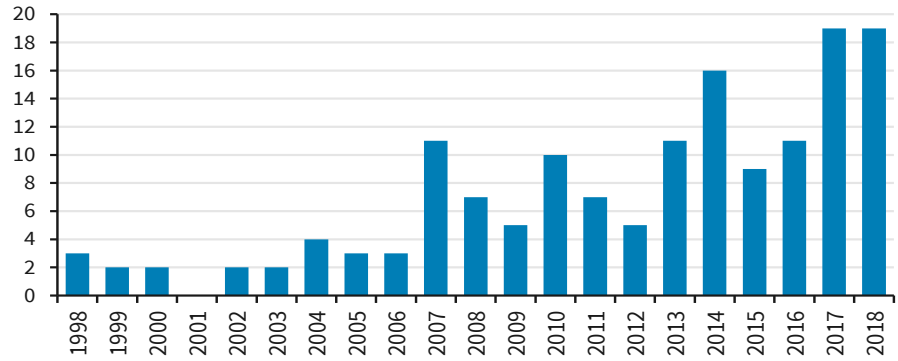
The education IPO market remains warm

Education IPOs are at an all-time high with over 30 companies listing in the last 2 years. That is more than one every month, with a strong pipeline of at least 10 companies lining up to list in the US and Hong Kong over the next 12 months, according to HolonIQ. Though we do not have a view on the likelihood of an IPO happening, we observed 19 education IPO listings in 2018, including Pluralsight *($2bn valuation, US – May 2018*) and Sunlands Online Education (*March 2018*), which suggests that the appetite for listed EdTech specialists is growing.

Several EdTech unicorns have explicitly expressed their desire to go public in the near future, including iTutorGroup (*Bloomberg – 2018*), Udacity (*Reuters – 2018*) and Duolingo (*Inc – 2018*). By region, a significant proportion of this growth can be attributed to Chinese companies listing outside of mainland China (mainly in the US or HK) to take advantage of increasing international investor interest in a private education sector destined for strong fundamental growth. Of the 19 education IPOs in 2018, 11 were Chinese companies.

FIGURE 38

No. of global education IPOs over time: 19 IPOs in 2018, 11 of which were Chinese



2018 Global Education IPOs

2018 IPOs	Country	Sector	IPO Data	Exchange
Sunlands Online Education	China	Digital	Feb-18	NYSE
VR education	Ireland	K-12	Mar-18	LSE
OneSmart	China	K-12	Mar-18	NYSE
China Xinhua Education	China	Post-Secondary	Mar-18	HKEX
Pluralsight	USA	Digital	Apr-18	NASDAQ
Bright Scholar	China	K-12	Apr-18	NYSE
Top Education	Australia	Post-Secondary	Apr-18	HKEX
Kingsley Education	Malaysia	Post-Secondary	Apr-18	HKEX
Ambow	China	K-12	May-18	NYSE
China 21st Century Education	China	K12/Post-Sec	May-18	HKEX
Puxin	China	K-12	May-18	NYSE
Bexcellent Group Holdings	Hong Kong	K-12	Jun-18	HKEX
Tianli Education International	China	K-12	Jun-18	HKEX
Bojun Education	China	K-12	Jun-18	HKEX
Hope Education	China	Post-Secondary	Jul-18	HKEX
Arco	Brazil	Digital	Sep-18	NASDAQ
Liulishuo	China	Digital	Sep-18	NYSE
EdTechX Holdings	UK	Investment	Oct-18	NASDAQ
EduLab	Japan	Investment	Dec-18	TSE

Source: HolonIQ, Barclays Research

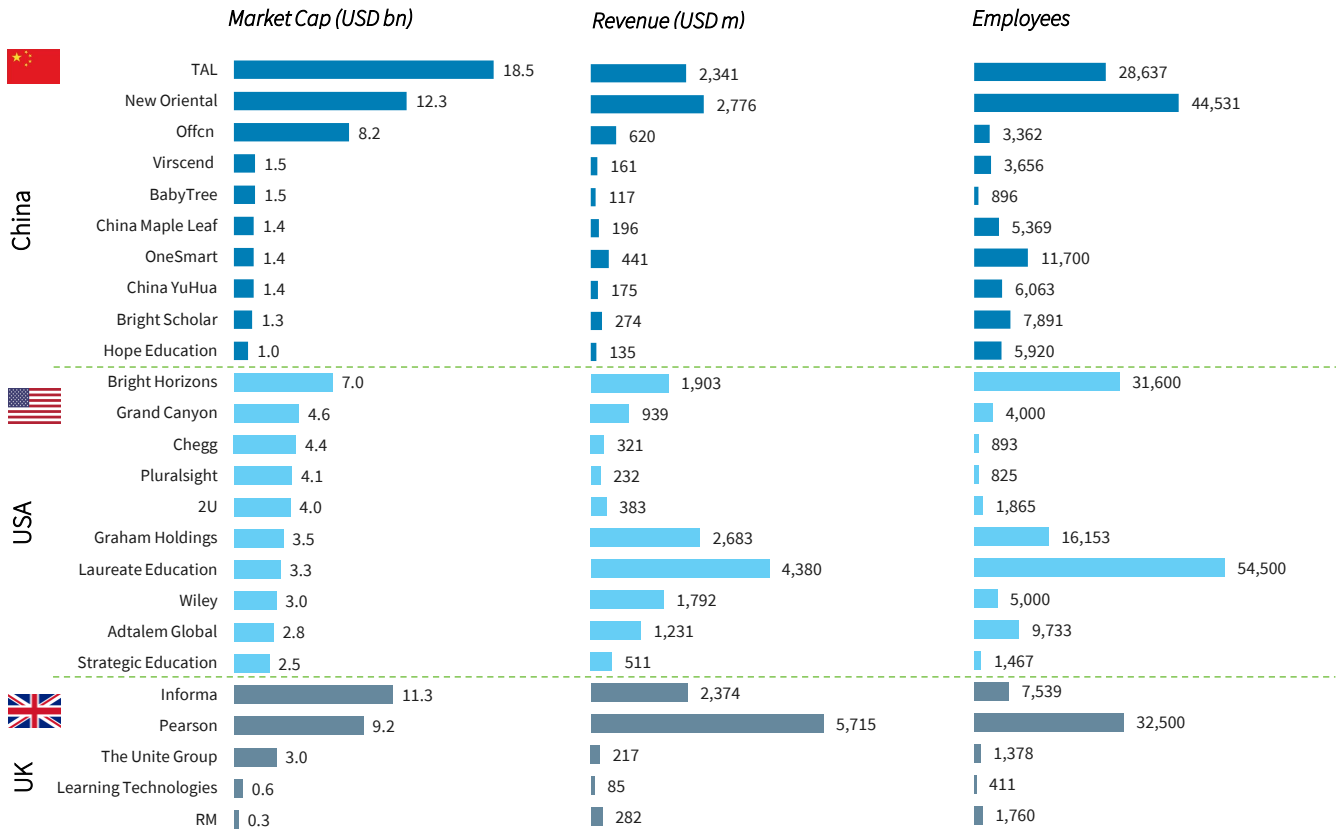
Global education market cap of $180bn

There were more than 250 publicly traded education companies totalling $180bn in market cap as of 31 January 2019, according to HolonIQ. By region, China and US-headquartered companies make up almost 60% of the total global education market cap. The UK accounted for c.15%. We summarise the largest companies in China, the US and UK in Figure 39 and the global view in Figure 40. Refer to Appendix 3 for a list of the 100 largest publicly traded education companies.

While it is hard to quantify what percentage of this could be classified as "pure" EdTech specialists, we highlight eight companies in Figure 41, including Chinese companies (TAL, New Oriental, Tarena International and Puxin) and companies in the US (2U, Pluralsight, Instructure, K12 Inc).

FIGURE 39

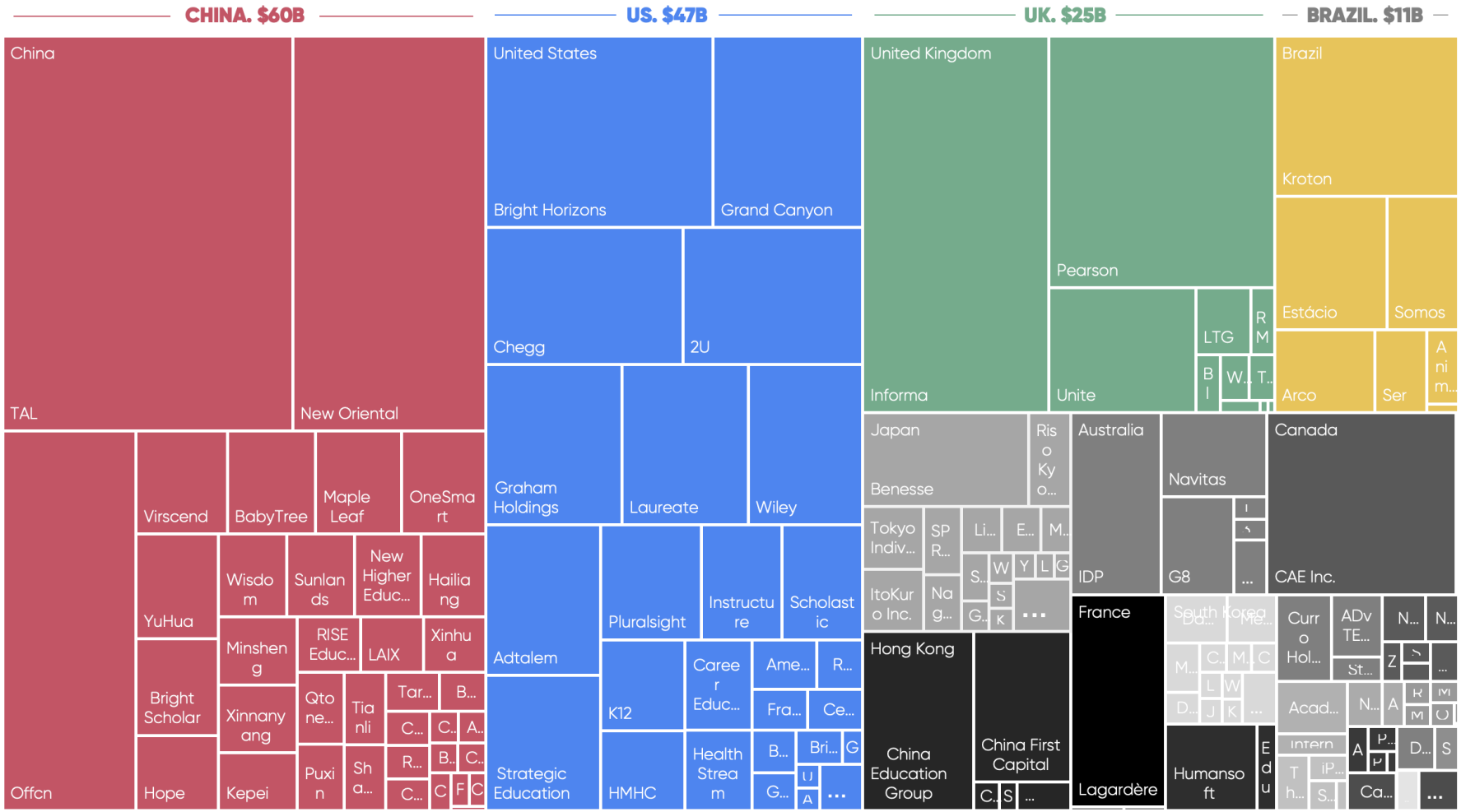
By country, China and the United States lead the pack…



Source: Barclays Research, HolonIQ, Market Cap as at 31 January 2019

Refer to Sector Implications – page 53 – for more detailed write-ups on individual companies from our sector analysts.

FIGURE 40
Global Education Market Cap $180bn



Source: HolonIQ - Market Cap as at 31 January 2019

FIGURE 41
Listed EdTech Specialist

China	TAL	New Oriental	Tarena International	Puxin
Founded/IPO listing	2003/2010	1993/2006	2002/2014	2014/2018
Company Description	Chinese K-12 after-school tutoring provider through 3 formats: small classes, personalized premium services & online courses	Private educational services in China - language training, test preparation, after-school tutoring and education content for both children and adults	A platform combining live distance teaching, classroom tutoring and online learning courses. Its core strength is in IT professional education services.	After-school tutoring in China through K-12 and international tutoring programs - aimed towards helping students pass international admission tests and applications for higher education within China and abroad.
Notable investments & partnerships	Acquired: - Codemonkey (2018) - Dr Panda (2018) - First Leap (2015) Invested: - Knewton (2016)	Acquired: Several domestic Chinese education companies	Acquired: - Wuhan Haoxiaozi Robot (2018)	Acquired: 48 Chinese education companies acquired
Ticker	TAL:US	EDU:US	TEDU.O	NEW
United States	**2U**	**Pluralsight**	**Instructure**	**K12 Inc**
Founded/IPO listing	2008/2014	2004/2018	2008/2015	2000/2007
Company Description	Provider of cloud-based SaaS solutions that enable universities to offer online degree programs	Offers online tech training courses for software developers, IT administrators and creative professionals, serving individuals, businesses and government sectors	Cloud-based learning management software for educational institutions and companies	Provider of online learning for virtual public school and homeschooling
Notable investments & partnerships	Acquired: - Critiquelt (2018) - GetSmarter (2017)	Acquired: - Train Simple (2016) - HackHands (2015) - Code School (2015) - Smarterer (2014)	Acquired: - Practice (2017)	Acquired: - LTS Education Systems (2016) - LearnBop (2014)
Ticker	TWOU:US	PS:US	INST:US	LRN: US

Source: Barclays Research, Company data

3) Invest in traditional education providers

Per our Barclays EdTech Landscape (Figure 35), there are a large number of listed traditional education providers. Many of these legacy players benefit from a robust reputation and strong brand presence today, but are progressively under pressure as new business models emerge. They have consequently attempted to adapt their strategies by pursuing digitalisation programmes and investments. We categorise these traditional players in four broad groups: i) Content & publishing, ii) Childcare providers iii) Higher education/universities and IV) International and private schools.

Content & Publishing (Pearson)

The largest market is easily the US, where Pearson is the market leader in college textbooks, Cengage Learning is second and McGraw-Hill Education is third. Other smaller players included Wiley and Macmillan. Pearson recently announced the sale of its school textbook business - a market where Houghton Mifflin Harcourt is the market leader and McGraw-Hill also plays.

Around the world, textbooks and educational content is often a fairly local market. Pearson is a leading player in the UK, Italy, Australia and Brazil. Lagardere is a key player in France, Germany is dominated by local players and Sanoma has a business in several European countries. The majority of publishing is located in Europe, followed by the US, all of which have aggressive M&A agendas to divest dead weight and make room to acquire improved digital capabilities and new customers.

In general, textbooks face structural challenges related to new business models and price points, or they face challenges related to government spending (or changing policy). Pearson has invested in digital and moved into some adjacencies over the years but challenges from its core business have become more intense in the past five years and we expect many of these challenges to persist.

Childcare providers (Bright Horizons)

We think that US-based childcare providers are well positioned given: 1) the increase in women working fulltime (68m today vs. c.25m in the 1980s); 2) more households with dual incomes (60%+ today); and 3) an increase in childcare as a perk for employees amid tighter labour markets and a push from corporations to make working more flexible, particularly for working mothers.

With that in mind, Bright Horizons is one of the highest quality public companies in the childcare space, focused specifically on employer-sponsored daycare, where employers provide space or services for Bright Horizons in return for access to childcare for its employees. Bright Horizons is the leader in the attractive employer-sponsored childcare market, led primarily through its 'Full Service' center offering (83% of revenue). These centers provide high-quality care, feature state-of-the-art facilities, low student-to-faculty ratios and accreditation by the National Association for the Education of Young Children (NAEYC) in the US. Due in part to these factors, Bright Horizons achieves more than 95% parent satisfaction rates and 94% renewal rates for employers.

In recognition of a more digital consumer experience in general, Bright Horizons has been investing recently in improving the user interface and experience side. The company is moving away from traditional reservation call centers towards digital and app-based services that provide instant care-confirmation. While there are other digital platforms capable of matching caregivers and parents, with Care.com (CRCM; not rated) being the largest public player, we think Bright Horizons is differentiated given its employer-sponsored focus (with care typically subsidized by the parent's company) and access to highest quality of care.

Higher Education/Universities (Laureate)

While the publically traded, for-profit education space has changed dramatically over the last decade, there remain a few bigger players, including the largest higher-education provider, Laureate. While Laureate pitched itself as a global higher-education provider at the time of its IPO (Feb 2017), the company has since undergone a large-scale divestiture of its smaller markets. Today, Laureate has physical universities in Latin America, with large positions in Mexico, Brazil, Chile and Peru. However, it also owns/operates Walden University, a large online university focused primarily on graduate students (c85% of Walden's enrolments), gravitating to healthcare and education degrees (c50%/c20% of enrolments).

Laureate's tech initiatives have been focused on getting more of its classes taught online (the proportion has increased from c.10% to 20%+ in just a few short years). The company views investments in the digital classroom and distance learning centres (particularly in Brazil) as key areas of growth for the future. Note that Laureate did briefly play in the learning management system space, competing with players like 2U, but has moved away from that to focus on core higher-education verticals. For more on Laureate's for-profit competitors in the US, see our initiation "*Well managed but a lot to learn; EW,*" from 2/27/17.

Tech examples in the higher education space

Some examples of tech innovation in the higher education space include:

- *Laureate & IBM* recently partnered to develop a curriculum focused on AI and machine learning (in three different languages) that will be available to all of Laureate's c.1m students worldwide (August 2018 launch date).
- *2U & Syracuse* launched Engineering@Syracuse to bolster the university's Engineering and Computer Science online graduate programs in areas such as AI, data mining and cyber security.
- A "*third wave* of EdTech innovation with top-tier universities offering full courses online." As *Technavio* noted "Increasing popularity of adaptive training is a key trend in the global machine learning courses market."

Importantly, AI & machine learning can be used to improve outcomes and create adaptive learning techniques.

- Pearson and Microsoft Research Asia signed a three-year partnership to integrate AI capabilities into Pearson's English learning program (Longman Welcome to English) in an app that will utilize speech evaluation and natural language processing to help accelerate learning.
- Universities are using AI to help with the *admission processes*, much like companies are starting to do with hiring.
- Even within the K-12 market, IBM, Microsoft and Google are helping not only classroom efficiency but the learning experience as well, with the biggest potential to create *adaptive learning* features. Textbook companies like McGraw-Hill Education and Houghton Mifflin Harcourt have been launching such adaptive learning features for several years now (while struggling to stem decline in its core print markets).

Refer to Sector Implications – page 53 – for more detailed write-ups on individual companies from our sector analysts.

4) Invest in tech giants

Classroom wars with the potential for B2C opportunities in the future

In our view, the tech giants' presence in education is of strategic value, but it is not expected to be a driver of share performance or revenues at the group-level. For many years, Apple, Google and Microsoft have competed to dominate US classrooms by focusing on affordable hardware and enterprise software. We anticipate that the rivalry will continue as additional software capabilities focusing on immersion (AR/VR) are introduced into the K-12 market. The desire to be considered a reputable brand in the classroom, in our view, stems from wanting to connect to younger generations in schools as early as possible to develop lifelong loyalty. Asia's tech behemoths have taken a different approach; rather than focusing on schools they have been actively acquiring or investing in B2C EdTech start-ups within the non-accredited space (e.g. after-school, language learning).

As consumer interest in education and the demand for EdTech grows, we believe there is potential for the tech giants to leverage their existing platforms and brand equity by either developing their own education content (e.g. Swift coding by Apple, Workbench by Google) or by entering the B2C market (e.g. Microsoft/LinkedIn). We also see the additional opportunity for the tech giants to expand their consumer offering by targeting adults and lifelong learning.

Additionally, we view the presence of tech giants in education as a positive thing for the EdTech investment opportunity, especially for start-ups and specialists. If the tech giants are competing to improve internet connectivity and lower hardware pricing, it makes it easier for disruptors with more niche offerings to enter, especially if they are willing to enter into strategic distribution partnerships.

Refer to Sector Implications – page 53 – for more detailed write-ups on individual companies from our sector analysts.

FIGURE 42

The technology giants are eager in education… US (B2B) vs. Asia (B2C)

Apple	Google	Microsoft	Amazon
Services/Focus	**Services/Focus**	**Services/Focus**	**Services/Focus**
Apple Classroom	Chromebooks	LinkedIn Learning	Alexa
iPad	G-Suite for Education	FlipGrid	EdStart
SchoolWork		Minecraft	
Notable acquisitions:	**Investments in Capital G:**	**Notable acquisitions:**	
LearnSprout (2016)	Duolingo (2015)	Minecraft (2014)	
	Cuemath (2017)	LinkedIn (2016)	
		Flipgrid (2016)	
		DataSense (2019)	

Facebook	Alibaba	Baidu	Tencent
Services/Focus	**Services/Focus**	**Services/Focus**	**Services/Focus**
Summit	Alipay	EdTech Investments	WeChat
Digital literacy & libraries	EdTech Investments	(Zuoyebang)	EdTech Investments
			(BYJU'S, Yuanfudao)

Source: Barclays Research, HolonIQ

Investor Question Bank

We have put together a list of questions to help investment managers assess how well positioned the various stakeholders are for the rise in EdTech, as well as ongoing digitalisation of the global education system.

Questions for EdTech start-ups

- **Solution assessment:** How do you know your proposed solution solves the problem? How does your solution differ from others?
- **Implementation:** How much time does it take to learn how to use and implement it? Do you provide on-site training? Do you arrange for ongoing professional development and support? If so, is there an additional cost?
- **Unit economics:** What are your pricing and financing models? What are the direct and indirect revenue streams? How do they balance out with your cost structure in terms of development, delivery and marketing?
- **Scaling:** How will you expand in terms of customer base, revenues, products, profits, headcount and geographic presence? What drive and strategy will your leadership bring to the table? Who are your partners in this scale stage, and what's in it for them?
- **Competitive positioning:** Who are your direct competitors today? As markets and regulation change, who could be your indirect and direct competitors tomorrow?
- **The role of the teacher:** Why should a teacher use your product over one that is similar? How will your product/service make a teacher's life easier? How does your product/service serve a real and valuable purpose in the classroom?
- **Data:** How do you store and protect student data?
- **Market size:** What quantitative measures do you have for market size? What are the qualitative factors underlying these market dynamics? What are your estimates for TAM (Total Addressable Market), SAM (Segmented Addressable Market), and SOM (Serviceable Obtainable Market)?
- **Pricing:** What is your pricing strategy? Is it a top-down or bottom-up approach? Are your products offered via distribution partners? What is the composition of your average total cost of ownership?

Questions for tech giants investing in EdTech

- **Strategic priority:** How much is education as a % of sales? Is there a part of the EdTech ecosystem that the company is particularly focusing on (e.g. B2B vs. B2C)? What is your view on the long-term growth opportunity? What makes the education market attractive? How are you hoping to leverage your position in the industry to scale?
- **Competitive positioning:** Are there areas within your education portfolio that need additional investment?
- **M&A:** Is the company looking to acquire external assets? If so, what type of asset are you looking for?

Questions for traditional education providers

- **Opportunity or threat:** Is EdTech a threat or a growth opportunity for your business? Does this vary by region and by product/division? Is there a risk to the underlying business model if EdTech becomes more mainstream?
- **Digital transformation:** Does the company have an innovation/digital agenda? What business areas does it include and over what time frame? Is this being managed by the CTO?
- **Technology:** How are the following technologies being used by the business: artificial intelligence (machine learning, computer vision), augmented reality and virtual reality?
- **Acquisition vs. Investment:** Is the company looking to acquire external assets? If so, what type of asset are you looking for? If not, how much of the R&D and capex budget will be allocated towards innovation/digitalisation?

BARCLAYS – SECTOR IMPLICATIONS

In collaboration with our sector analysts, we aim to assess the implications that our discussion on EdTech could have on individual companies and their respective industry outlooks. We focus our analysis by region and by sub-sector based on companies currently under Barclays' coverage. We provide analysis for the following companies: Pearson, Naspers, Bright Horizons, Laureate Education, Pluralsight, Microsoft, Alphabet, Amazon, Tencent, Alibaba, Baidu and NetEase.

For a broader view on education and the EdTech opportunity, both public/private and globally, we recommend readers to view our EdTech Landscape in the Investor Guidebook - Figure 35.

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Pearson is one of the world's largest education companies with expertise in publishing, software development and testing. Since CEO John Fallon joined in 2013, the company has divested assets that are outside education or considered tangential to the publisher's digital transformation strategy, including the sale of iconic brands such as the Financial Times (2015) and Pearson's stakes in The Economist (2015) and (partially) Penguin Random House (2017). The divestments have also included digital education assets such as PowerSchool (student information system) and Fronter (learning management system) in 2015. They have more recently announced the sale of their K-12 Courseware business in the US.

The company has struggled for two main reasons: 1) the US higher education business has faced structural headwinds from rents models and free content, as well as declining student enrolments; and 2) they have been hit by regulatory change/government spending changes in US K-12 state testing, UK testing (BTECs), Brazil (spending on public sistemas) and South Africa.

Pearson – Looking to use digital models to evolve its business, in a troubled education content sector

The changes in Pearson's core business have been around delivery and business model: it is offering some titles on a rental only basis and are partnering with universities to offer deals where all students get textbooks at a low per-book cost. They have used machine learning in the area of "homework help" software like MyLabs, which selects questions to ask students based on their previous answers. They have partnered with IBM to use the Watson capabilities to enable students to have "natural language" interactions with this type of offering.

They are also key players in the Online Program Management sector, offering online-only degrees (typically graduate degrees) in partnership with universities. This involves a technology platform for managing the course and brings in Pearson's content and testing. While not especially high-tech, this is an offering that uses technology to solve an education industry problem: traditional higher education is not scalable.

Lastly, they have a Virtual Schools offering in the US (Connections Education), which provides curriculums, content and tools for students who are home-schooled or for school districts without a full provision of teachers (e.g. in remote areas). This is again using technology to fill a structural gap in the education system.

Could Pearson invest in EdTech?

As discussed above, Pearson has been investing in digital aspects of its business for some time. But could they invest in pure disruptive technology offerings in this space to diversify away from their core area of content?

Pearson's balance sheet is relatively under-geared following disposals, even if they do have significant lease obligations. They could in theory make acquisitions. Management has been clear, however, that they are not looking to spend on acquisitions or buybacks until their current transformation is complete, which we think means when the savings from their restructuring plan are done i.e. the end of 2020.

But ignoring the practicalities for a moment, would this be a sensible strategic approach for Pearson? Undoubtedly, the world of EdTech has more glamour than textbooks. But Pearson has the classic incumbent's problem: EdTech businesses are not cheap and they come with high risks. It would be entirely possible for Pearson to spend a meaningful amount (in the context of its excising business) on an EdTech acquisition, which then turned out to be more or less worthless, due to competition, execution or not finding the right business model. Pearson's management has always been cautious when asked about this possibility.

European Internet

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We include Naspers within our European Internet coverage. Although EdTech is a small part of the overall value of Naspers (which is dominated by the Tencent investment), it is an increasing theme for the Ventures team. The company has deployed c.$0.5bn of capital into the space in the last couple of years. As an investor, Naspers is typically very long term in its thinking. We think many of the themes pulled out in this report should help investors in Naspers appraise why deploying this capital makes sense. With $9bn of gross cash at its disposal, Naspers has the firepower to stay active. We think EdTech will be a category that receives increasing focus in the investment case in the long term.

Naspers – Five EdTech investments in three years…

Post spin-out of its pay-TV assets, Naspers is a pure play global internet group, and one of the largest technology investors in the world. It has notable investments in listed assets such as Tencent, Mail.ru, MakeMyTrip and Delivery Hero as well as a series of other investments in fintech and food delivery, and a large classifieds asset. Naspers is listed on the Johannesburg stock exchange.

While the majority of Naspers value is derived from its Tencent stake (c.80%), it has c.$9bn of gross cash at its disposal and so is an active investor in global tech. The stated focus is on food delivery, fintech and classifieds, but the Ventures team remain on the hunt for new opportunities to back high-potential internet businesses. Education is an increasing theme.

Following a recent wave of M&A activity, Naspers has developed a strong EdTech portfolio over a relatively short period of time (Figure 43). The most notable being in December 2018, when Naspers led a $540m investment into India's largest EdTech company – BYJU'S – alongside CPPIB, valuing the company at $3.6bn. The investment also highlights Naspers' commitment to India across multiple sectors: via food delivery (Swiggy), and several aspects of fintech/payments via Pay U. Historically it was also an investor in Flipkart. The management team remain bullish on India as a market long term.

"Education is a sizeable market that has not yet seen the technology impacts we have seen in other sectors, but we are now seeing dramatic innovations appearing. That makes EdTech a perfect fit for Naspers Ventures" – CEO Naspers Bob Van Dijk, 2016

FIGURE 43
Naspers – Key EdTech investments

Company	Year	Region	Product Category	Financial Details
Brainly	2016	US (SF)	Social learning network (personalized learning /student Q&A platform)	- $15m Series B (led by Naspers)
Udemy	2016	US (SF)	Global education marketplace (course library)	- $60m
Codeacademy	2016	US (NY)	Interactive coding education platform	- $30m Series C (led by Naspers) including Index Ventures, Sir Richard Branson
SoloLearn	2018	US (CA)	Online social Learning (P2P knowledge sharing)	- $5.6m (led by Naspers) including Learn Capital
BYJU'S	2018	India (Bangalore)	K-12 Learning App - (Refer to BYJU'S company profile – Page 38)	- $540m (led by Naspers) including CPPIB

Source: Barclays Research, Company website

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While the US Business Services industry historically had a number of publicly traded for-profit colleges, increased regulation in the wake of the financial crisis has dramatically altered the landscape. Today, our education coverage consists primarily of Laureate (a for-profit education provider focused on LatAm) and Bright Horizons (employer-sponsored childcare). While each name is exposed to its own themes (increasing demand for quality childcare for Bright Horizons; need for quality higher-education in underserved markets for Laureate), we think the technology angle is limited to user experience at this point.

While the opportunity exists for increased usage of many of the tech themes discussed in this report (e.g. gamification of topics for children, AI curriculum, etc), we think Bright Horizons and Laureate will be heavy users of new technology vs. pioneers in creating new kind of technology.

Bright Horizons – Solving the work/life challenge at all life stages

Bright Horizons is the leader in the attractive employer-sponsored childcare market, led primarily through its Full Service centre offering (83% of revenue). These centres provide high-quality care, feature state-of-the-art facilities, low student-to-faculty ratios and accreditation by the National Association for the Education of Young Children (NAEYC) in the US. Due in part to these factors, Bright Horizons achieves greater than 95% parent satisfaction rates and 94% renewal rates for employers.

In its centre-based business, Bright Horizons runs different operating models including Cost Plus (client-owned facility that Bright Horizons runs), Single Sponsor (client funds centre, Bright Horizons runs) and lease consortium (Bright Horizons runs the centre, supports multiple entities in one location). For more on each, including economics see Figure 44.

FIGURE 44
Bright Horizons centre-based operating models and key financials

	United States			Europe
($ in '000s)	**Cost Plus**	**Single Sponsor**	**Consortium Lease**	**Lease**
Description	• Client funds development / CAPEX / maintenance • Located on the client premises • Facility built / operated to client specifications • Bright Horizons receives management fee, and client bears financial risk • Client contract 3-5 years	• Client funds development / CAPEX / maintenance • Located on the client premises • Facility built / operated to client specifications • Client receives priority enrollment • Bright Horizons bears financial risk; client provides modest operating support through management fee and / or tuition subsidy • Client contract 3-10 years	• Bright Horizons funds development / CAPEX / maintenance • Located near office hub or residential / commuter corridor •Open to Community, Back-up customers, and consortium of employers • Bright Horizons bears financial risk • Lease 10-15 years	
% of Centers	c. 33%	c. 33%	c.33%	c.85%
Revenue / Center	$1,850	$1,500	$1,850	$1,200
Gross Margin	15-20%	17-25%	20-25%	15-25%
Average ROI	100%+	75%+	25%+	25%+
Contract Term	3-5y	3-10y	10-15y	10-15y

Source: Barclays Research, Company Reports

Supplemented by fast-growing adjacent services (Backup care, Advisory)…

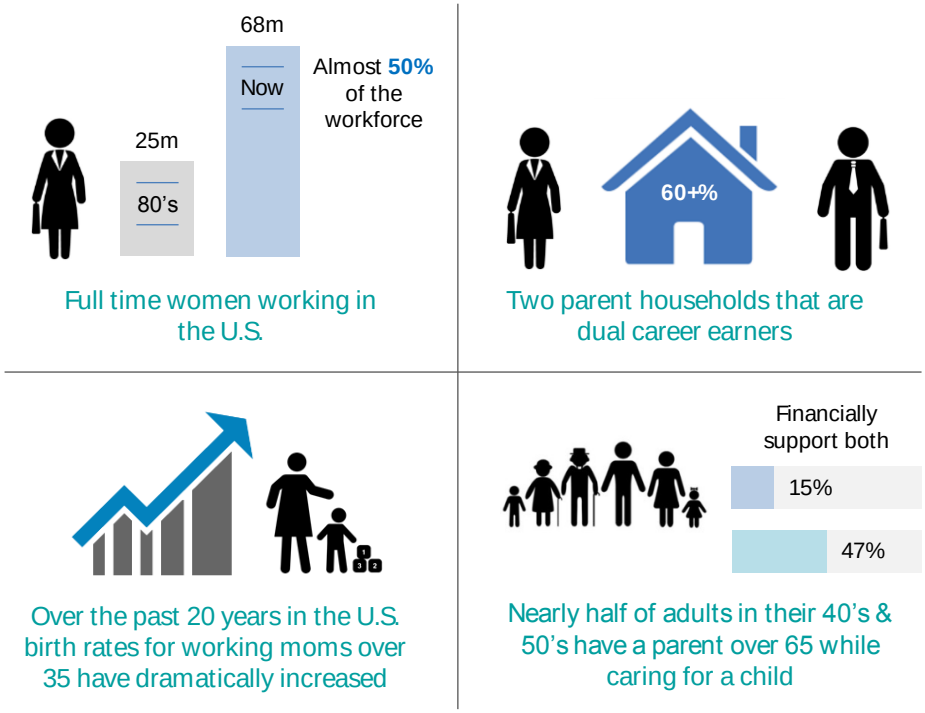
Bright Horizons has added several faster-growth, higher-margin offerings over the years to develop a more complete offering to its clients. We discuss these below:

Back-Up Dependent Care: In addition to full-service centres, Bright Horizons provides employer-sponsored back-up care either on-site or at dedicated back-up centres. Back-up contracts range from 2-5 years in length (with average annual value of c.$50k to $4m), and clients typically purchase a "basket of uses" that are centre-based or in-home. This back-up model allows parents to utilize back-up care centres on short notice, and as a result, increases workforce productivity and enhances employee retention.

Educational Advisory Services: The Educational Advisory services business represents an opportunity for Bright Horizons to cross sell its EdAssist and CollegeCoach (acquired in 2006) services to existing customers. The EdAssist business is designed to manage an employer's tuition assistance program by eliminating wasteful spending and expediting degree completion for employees. The CollegeCoach service helps employees and their families manage key educational decisions, including college selection, financing and preparation. Interestingly, current CEO Stephen Kramer came to Bright Horizons through the CollegeCoach acquisition, where he was the co-founder and President.

FIGURE 45

Demographic tailwinds support Bright Horizons' service offerings…



Source: Barclays Research, Bright Horizons – Investor Presentation – (*November 2018*)

Laureate Education – Not your typical for-profit education company

Since the term "for-profit education" can carry an understandable stigma for investors, it is important to explain how Laureate is not necessarily typical of U.S. for-profit higher education companies. To be clear, we are not comparing Laureate to Ivy League universities, but to affordable (c.$4k/year revenue per student) and accessible schools catering globally to the emerging middle class. Former CEO Doug Becker *once said*: "We don't have universities that are bad universities. I think we have worked too hard and established too strong of a reputation for anyone to say that is the case. But we do have universities that are intended to be affordable and accessible."

Figure 46 below lays out some of the key differences between Laureate and the typical U.S. education names.

FIGURE 46

Comparing US higher education with Laureate's international college business

	United States Higher Ed Industry	International / LAUR Characteristics
Revenue Source	- Significant reliance on government loans and grants - c.75% of revenues from Title IV funds	- Predominantly private pay (75% of LAUR revenue) - Title IV revenue largely comes from Walden University (76%)
Vocational (Associate Degrees/Certification)	- Mostly served by community colleges - But a strong presence by the for-profit sector	- Fragmented & dominated by unregulated/low quality local co's - Attractive only in very few countries where vocation credentials are valued
Traditional (Bachelor & Post-graduate)	- Largely served by public and non-profit universities - Subsidized - Strong brands	- Primarily served by free or low-cost public universities - Often insufficient capacity in key areas & lack of innovation - Identified in 1999 as Laureate's focus area
Working Adult & Distance Learning	- Strong presence by for-profit sector - Significant online & hybrid offerings - Public and non-profit institutions taking share	- An opportunity as middle classes expand & broadband penetration increases - Laureate leverages technology (at Walden), existing brands, content, accreditations and facilities
Cohort default rate (CDR)	- Average national CDR at all US institutions = 2015: 10.8%; 2014: 11.5%; 2013: 11.3%	- Walden University CDR = 2015: 7.3%; 2014: 7.5%; 2013: 6.7%

Source: Barclays Research, Company Reports

Laureate is one of the largest for-profit educators in the world (based on enrolments), albeit in a market that remains vastly underpenetrated (i.e. even with c.850k students, Laureate still represents <1% of the international higher-ed population). There are currently c.200m higher-education students worldwide, nearly double the amount in 2000. We believe this is only a fraction of actual global demand, given the capacity constraints in many emerging and developed countries.

Additionally, the demand for private education continues to increase; and with further adoption of hybrid/distance learning options, Laureate thinks it can continue to gain share and expand its reach. In our view, Laureate is positioned to benefit from this large and growing addressable market (expected to grow at a 5% CAGR through 2020).

Growing middle class will drive further growth in education…

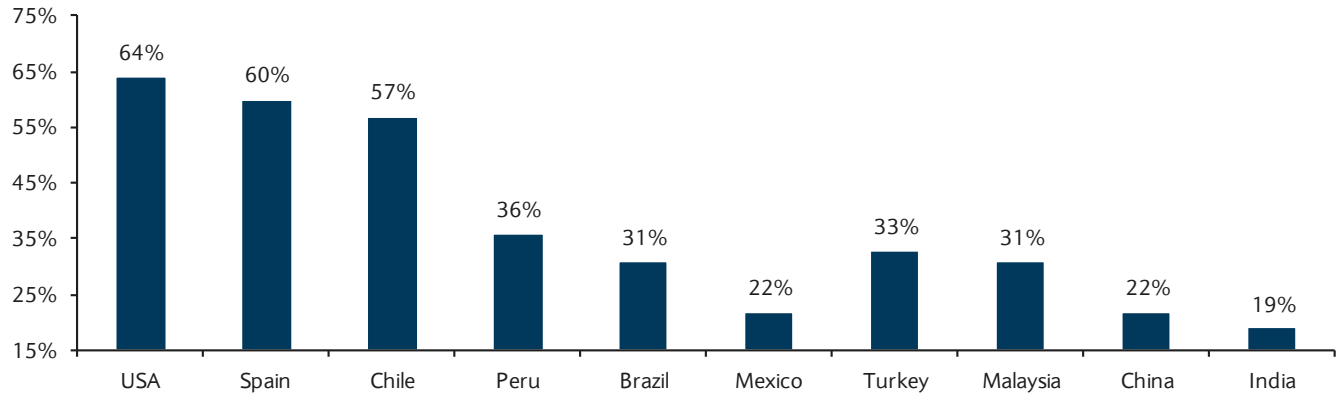
With its global network and position in international markets, Laureate Education is well placed to benefit from the increased demand for higher education as the global middle class nearly doubles in size by 2030 (we note international enrolments have doubled since 2000). Additionally, with overall revenue per student of c.$4k annually, Laureate is not focused on providing expensive degrees in niche fields that do not have a proven ROI (a frequent complaint of US for-profits). With many of the best schools in Laureate's key markets providing education for free (but with limited/no capacity to expand), Laureate is focused on providing affordable education that can offer meaningful earning power for its students.

...as participation rates remain well below developed economies.

In many of the markets that Laureate serves, the higher-ed participation rate remains well below that of developed markets. In particular, Laureate's position in LatAm should continue to benefit from improving participation rates over time.

FIGURE 47

Higher-ed participation rates internationally remain well below the US



Source: Barclays Research, Company Reports

Lack of resources has constrained the quality of supply

In many emerging markets, particularly in LatAm, governments lack the resources and/or capacity to invest in infrastructure needed to support the increased demand for education. Along with macro challenges, this has forced governments to reduce funding to education, resulting in a lack of capacity at prestigious public universities. With many governments setting goals for increased higher education participation, private institutions have played a critical role (e.g. LatAm private educators enrol 50%+ of the population). This is a positive for Laureate because any attempt to limit the for-profit industry would implicitly hinder the accessibility of higher education. While ultimately Laureate could be attractive as a LatAm-focused higher education pure-play, commentary around headwinds in key markets like Brazil & Mexico do suggest a level of macro-sensitivity that is worth monitoring.

US Software

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Pluralsight is a pure-play EdTech company in our coverage with a deep focus on enterprise IT skills and on-demand learning. We have seen a shifting market landscape in IT training away from in-person learning and towards eLearning. We think Pluralsight is well positioned to capture more of the $17-$20bn IT training estimated-TAM. While we view Pluralsight as a leader in the eLearning IT training market, and while it is clear that technology skills are in demand, there is competition. However, we think this TAM is large enough to support multiple vendors and does not have to be a "winner takes all" market.

The company has entered content partnerships with tech giants like Microsoft, Google and Amazon to promote their platforms to IT professionals. We think this is strategic because it enhances the content, and acts as a marketing/distribution platform for the large tech vendors as well. We think the company will continue to add more partners, perhaps outside of cloud computing, where leaders in a respective market are competing for mindshare.

We therefore believe Pluralsight is well positioned in global education and EdTech given the focus on corporate training, the global technology skills gap and lifelong learning. In respect to our prior discussion on "EdTech in 2050: Then, Now and the Future" (page 17), we believe the rise of alternative credentials like Pluralsight's Skill IQ scores will increasingly become a feature of employee credentials in the future.

Pluralsight is a disruptor of the $17bn-$20bn IT Training Market

Modalities are shifting towards eLearning and away from classrooms: Pluralsight's "mile deep" focus on technology skills gives the company credibility among technology professionals. It also attracts thought leaders in the respective tech areas to teach on the platform because of their royalty model and large paying audience; this creates a flywheel effect and is a competitive advantage, in our view. For example, an author of salesforce.com content is running the largest deployment of salesforce.com at Google, and therefore a sought after opinion leader/teacher for CRM.

Traditionally, businesses would send a few employees to costly conferences and hope they would disseminate the skills upon their return, but had no real way to measure outcomes. Pluralsight's enterprise tools enable IT managers to see a high-level view of where skills lie in the organization, where the teams needs to upskill, and to deploy personnel on projects to set them up for success from the start.

Strong customer list with accelerating international growth. With a customer list representing c.70% of the Fortune 500 and with users in over 180 countries, Pluralsight's expansion strategy has been successful, adding 40+ Fortune 500 companies in 2018. Expansion within its customer base continues to be strong, with a dollar-based net retention rate of 128%, up from 117% in FY17.

Its top-25 customers' billings increased 20-fold in 2018 over their initial purchase year, in large part due to increased seat coverage. Pluralsight is seeing accelerating growth across all regions, but its "Other foreign locations" segment (which excludes the US, and UK) has seen the largest acceleration in growth, to c.46% in FY18 up from c.22% in FY17, which shows technology skills are language agnostic and an essential driver of both developing and developed economies. One example of success is in India, where Pluralsight has partnered with Google in an effort to produce 1 million certified Android developers, with payment to Pluralsight based on outcomes of Skill IQ scores.

Skill IQ and Role IQ scores allow organizations to optimally deploy IT personnel. Pluralsight's Skill IQ score provides learners a score based on a specific technology skill. A more recent addition is Role IQ, which provides a score based on a grouping of individual skills needed to succeed in a particular role. Training in technology skills is critical in today's enterprise as more companies look to digitalise. This has led the majority of IT professionals to be concerned about their current skill set becoming obsolete.

It is estimated that technology skills have a 2-year half-life, making Pluralsight a critical tool for IT professionals to stay current and confident in their roles. Skill IQ and Role IQ create a standardized score on specific tech topics so that IT professionals can market themselves, IT managers can identify their best talent, and Pluralsight can customize learning based on those scores.

Corporate partnerships allow Pluralsight to proliferate tech skills for tech giants. Pluralsight has partnerships with the largest cloud providers: Microsoft, Google, and Amazon. The economics of each partnership is slightly different, but the goal of the tech giants is the same: increase awareness and promote their solutions to increase consumption of the platform (i.e. of Azure, GCP, and AWS). The companies partner with Pluralsight to present content to developers and IT professionals so more users are trained on their platforms. Microsoft pays Pluralsight to create Azure content for the platform, while Google and Amazon provide Pluralsight the content without exchanging hard dollars. Regardless, these vendors clearly see an advantage to using Pluralsight as a way to educate users on their cloud platforms.

Pluralsight sees education as a social mission as it strives to close the skills gap. Through its philanthropic initiative, Pluralsight One supports non-profit organizations to equip all people with technology skills. Pluralsight has committed 1% of product, time, and profits to enable this mission. Products for non-profits recently launched and within the first 8 weeks 34 non-profits across 5 countries began using Pluralsight One.

US Software

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Microsoft is a core player in the Education market due to the wide adoption of the Windows operating system and Office productivity suite. Microsoft's main focus in the area now is to provide the infrastructure to drive the digitalisation of Education. Azure, Microsoft's public cloud unit, provides the platform services that IT administrators, teachers and students need to access material. Given the early stage of this evolution, Microsoft has made a series of acquisitions and has developed in-house applications to spur digitalisation.

We summarise below the major services Microsoft provides in the EdTech sector.

Microsoft targeting end-to-end suite of technology services for education

Azure: As mentioned above, Azure allows schools and enterprises to quickly transition to this new world without having to invest in infrastructure to host and store applications and data. Microsoft acts as the backbone (datacenter with servers etc.), thereby freeing up IT administrators to cater to students and professionals as opposed to focusing on infrastructure and technology roadmaps. Microsoft recently purchased DataSense, an iPaas (integration platform as a service) solution catering to school districts, and provides a technology stack that includes cloud-based data management and security.

Office 365: Office productivity suite provides the core set of applications (Word, Excel, PowerPoint, Teams) that students and teachers need for word processing and communications. This brings content and conversations between teacher and students or working professionals to one common virtual "blackboard". We believe Microsoft's core pitch within education is towards enterprise-scale deployment. These tools are universal, and are not specifically designed with students in mind.

K-12 Education: Microsoft has been an early adopter of the gamification of education. Microsoft has redesigned its Minecraft game to an "education edition." The game provides a Minecraft-type gaming interactivity to learn Math, Science etc. More importantly, the game also provides teacher lessons and training videos for educators to develop individualized plans. Other applications include coding, language learning, and productivity tools designed specifically for students in the K-12 segment.

Enterprise Education: The more interesting play for Microsoft in education in our view is the steps taken to further their presence in the enterprise area, particularly following its $26bn acquisition of LinkedIn in 2016, and LinkedIn's acquisition of Lynda.com in 2015. That tie-up has now been branded as **LinkedIn Learning**, which offers video courses taught by industry experts in software, business and creative industries. With the growth in alternative credentials, partnering with EdTech companies going forward could help further Microsoft's presence in professional and business environments.

US Internet

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Our discussion on US classroom wars (page 50) indicated that Google has taken a significant share of the K-12 market by appealing to schools with its low cost Chrome books from education stalwarts Apple and Microsoft, combined with their G-Suite bundle of applications custom for the education space. In our view, the tech giants' presence in education is of strategic value to develop lifelong loyalty and not a driver of share performance or revenues at the group-level. As consumer interest in education and the demand for EdTech grows, there is the potential for the tech giants' to leverage their existing platforms and brand equity by either developing their own education content (e.g. Swift coding by Apple, Workbench by Google) or by entering the B2C market (e.g. lifelong learning, Microsoft/LinkedIn).

Within our coverage, we believe Google is well positioned, given the focus on affordable hardware and classroom software.

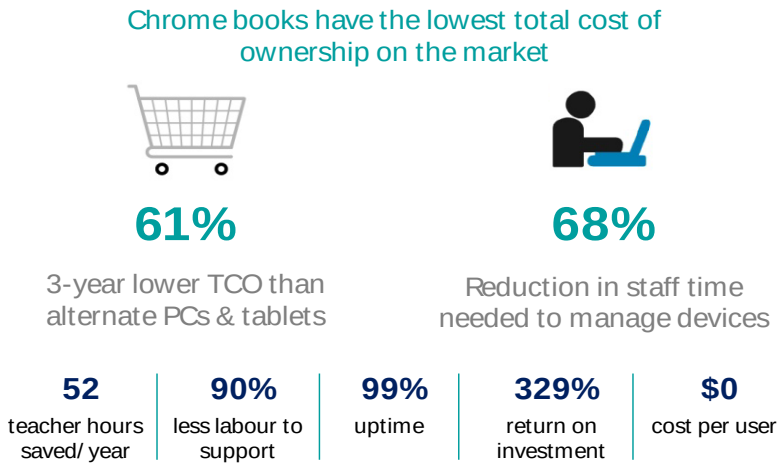
Google leads in Education

Google has had a ton of success selling into the education sector, particularly K-12. The company bundles Chromebook and its G-Suite for Education software suite to offer a holistic solution. Google Classroom is the company's custom software for administrators and teachers to better manage assignments and projects. Google has over 20m students worldwide using Chromebook and G-Suite and is the leading classroom solution in the US. The value proposition for educators is a lower total cost of ownership compared to other hardware-software bundled solutions in the space.

YouTube also has some optionality in terms of its growing "how-to" and education categories of content and viewership. Separately, Google is also very close to the emerging EdTech space, with Sebastian Thrun having worked at Google X and Waymo prior to Udacity. The company also has a number of venture investments in EdTech.

In terms of overall impact to Google share price and valuation, EdTech is immaterial relative to the company's $139B+ gross revenue in 2018. Chromebook and G-Suite for Education are nice but small drivers inside the Licensing and Other revenue line ($21B in 2018), alongside Google Play, Google Cloud and Hardware.

FIGURE 48
Google: 'Great value for schools'



Source: Barclays Research, Google

Looking forward, if education is becoming more consumer-facing, we do believe there is a role for YouTube to play within online education. Our thematic deep dive on Generation Z (*Step aside Millennials – 28 June 2018*) suggests the younger demographic prefers learning from YouTube, albeit for free at the moment. There is the potential for improved monetisation given the rise of the modern learner and their willingness to pay to learn new skills. The question is whether the instructional videos posted online can substitute formal technical education given the concerns regarding accuracy and validation. YouTube's launch of YouTube EDU – its "Classroom of the world" – in 2009 potentially provides a credible access point.

Amazon the missing tech giant in education technology

Amazon is newer to the education market, but is in theory a credible player given they can offer cloud-based storage and analytics through AWS. It has already impacted education (indirectly) as a provider of books and a supplier of classroom material for parents, yet the company has not addressed teachers or schools directly. It is clear that direct education in this respect has not been a big focus for Amazon, especially following the 2018 closure of its EdTech offering TenMarks, a mathematics and writing software start-up purchased in 2013.

We question the fit that US classroom-based education has with Amazon's approach, which has relied on self-service at scale within eCommerce. Therefore, if we were to see Amazon further its efforts in education, we would envisage it pursuing the B2C opportunity by targeting parents with solutions related to reading and voice technology. We think there is clear product alignment in that space with Amazon Kindle and Alexa respectively.

Chinese Internet

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In line with the growth opportunity in Asia, the Chinese tech giants – Baidu, Alibaba and Tencent – have focused their efforts on the B2C market by investing or partnering with disruptive start-ups to either gain access to education or improve their EdTech offering. For example, Tencent has invested in several EdTech start-ups including India's BYJU'S (*2017*) and China's Yuanfudao (*2018*). While online/offline education is not a core business for any of the BAT group, their world-leading AI technology and cloud capabilities create substantial potential synergies for EdTech entities. For instance, Baidu's investment in Zuoyebang, which operates in the K-12 sector, utilizes AI for it Optical Character Recognition (OCR), the mechanical or electronic conversion of images of typed, handwritten or printed text into machine-encoded text.

Among the Chinese technology giants, Tencent has invested the most in education, in our view, based on the number of deals. Starting from its social network business, traffic has always been Tencent's focus and competitive advantage. From QQ and WeChat, to online gaming and music, Tencent's traffic-heavy ecosystem can deliver significant leads to online education platforms it invests in. At the same time, online education platforms can also enrich the content of Tencent's ecosystem. Tencent's experience in online value-add and subscription services, using its WeChat payment system, can be utilized in the monetization of those platforms.

Tencent – Best positioned in the China EdTech industry

Tencent has the greatest exposure to education among the Chinese tech giants. Since 2017, Tencent has invested in at least 22 businesses within online education, twice that of Alibaba and Baidu's investments combined. Tencent has coverage distributed across investment phases in pre-school, K-12, higher education and adult exam preparation. Among its 22 investments, six were pre-A round investments; nine were A-C round investments, while seven businesses were at C+ rounds.

Distinct from Alibaba and Baidu's focus on childhood education, Tencent has invested in *Koolearn* and *Kaochong English*, which offer exam preparation for adults. Tencent has also invested in public-focused knowledge-sharing platforms such as *Baicizhan*, an English vocabulary memorization app, *zhihu*, a question-and-answer website, and *Wei Reading*, an e-book reading app derived from *Weixin* (WeChat).

FIGURE 49
Tencent's major investments in the education industry

Date	Investment	Round	Amount	Description
05/09/2018	Kaochong English	D round	USD 55mn	Higher Education-exam preparation
08/08/2018	Zhihu	E round	USD 270mn	Knowledge sharing platform
25/06/2018	Baiduzhan	C+ round	-	Vocabulary app
21/06/2018	VIPKid	D+ round	USD 500mn	Children English
17/05/2018	Koolearn	A round	USD 50.88mn	Higher Education-exam preparation
20/03/2018	Baby English	B round	CNY 150mn	Pre-school English
05/03/2018	Kaochong English	C round	USD 20mn	Higher Education-exam preparation
28/02/2018	Onion Maths	C round	CNY 120mn	K12
08/01/2018	VIP peilian	B round	CNY multi-mn	All-round development
30/10/2017	Dashdot	C round	USD 410mn	Pre-school Education
25/09/2017	Luojisiwei	C round	CNY 960mn	Knowledge sharing
23/08/2017	VIPKid	D round	USD 200mn	Children English
04/08/2017	Leju Robot	Strategic investment	CNY 50mn	Childhood Education
26/07/2017	BYJU'S	Strategic investment	CNY 40mn	K12
05/07/2017	Qqikid	Pre-A round	CNY multi-mn	Pre-school Education
05/07/2017	Qing class	A round	CNY 33mn	Knowledge sharing platform
31/05/2017	Yuantiku	E round	USD 120mn	K12
30/03/2017	xhzapp	A round	CNY multi-mn	Pre-school Education
12/01/2017	Zhihu	D round	USD 100mn	Knowledge sharing platform
29/11/2016	Qqikid	Strategic investment	CNY multi-mn	Pre-school Education
01/02/2016	Koolearn	Strategic investment	CNY 320mn	Higher Education-exam preparation
05/11/2015	Zhihu	C round	USD 55mn	Knowledge sharing platform

Source: Company report and Barclays Research

Alibaba – Quickly catching up in EdTech

Alibaba has completed eight investments in education since 2017. The company does not invest directly in education, yet all investment in education were made by YunFeng (YF) Capital, a VC/PE firm founded by Jack Ma, specialising in early stage and industry consolidation. Unlike Baidu Ventures, YF Capital's investments have concentrated on C or later rounds with greater dollar investments. YF Capital also has a greater focus on early childhood education, while also having invested in VIPKid and Babytree. For online education platforms like VIPKid and Babytree, user acquisition is one of the main costs. Therefore, Taobao and Tmall's high internet traffic is a clear advantage for these YF Capital-invested businesses. Alibaba's educational investment could also fall under the Alibaba ecosystem's concept of "consumption upgrade," whereby consumers use the platform to better their lifestyle.

FIGURE 50
Alibaba's major investments in education industry

Date	Investment	Round	Amount	Alibaba's investor	Description
25/09/2018	YXT	C round	USD 50mn	YF Capital	Business training
21/06/2018	VIPKid	D+ round	USD 500mn	YF Capital	English language
23/08/2017	VIPKid	D round	USD 200mn	YF Capital	English language
03/08/2016	VIPKid	C round	USD 100mn	YF Capital	English language
04/06/2018	Babytree	Strategic investment	CNY multi-million	YF Capital	Early childhood education
07/02/2018	Kids'R'Kids	A round	CNY multi-million	YF Capital	Early childhood education (Kindergarden)
01/02/2018	Knowbox	C round	USD 100mn	YF Capital	K12

Source: Company report and Barclays Research

Baidu – AI Driven technology to differentiate services

Compared with Alibaba and Tencent, Baidu's investment is relatively smaller, but it remains a very important player in China's EdTech industry. Since 2017, Baidu has completed three investments through Baidu Ventures, including two companies concentrating on childhood education, Haitun Siwei (formerly Yixiu Math and Bestcode) and Knowbox, which focuses on K-12. Baidu also co-founded Zuoyebang in 2014 (see our start-up directory on page 42 for a detailed write up). At the end of 2015, Baidu established its own educational service platform by leveraging internal resources. Similar to Baidu's core investment strategy, Baidu Ventures tends to invest in earlier rounds. Baidu has focused more on K-12 and early childhood education.

FIGURE 51
Baidu's major investments in education industry

Date	Investment	Round	Amount	Baidu's investor	Description
09/08/2018	Haitun siwei (former Yixiu Maths)	Angel round	CNY 10mn	Baidu Venture	Childhood education
10/07/2018	Bestcode	Angel round	CNY multi-mn	Baidu Venture	Childhood education
12/10/2017	Knowbox	B+ round	CNY 200mn	Baidu Venture	K12
02/09/2015	Zuoyebang	A round	USD multi-mn	Baidu Venture	K12

Source: Company report and Barclays Research

NetEase – EdTech steps up as a strategic focus

In our coverage space, NetEase is also making education a key focus for its next phase of strategic growth. NetEase's influence and reach in online education grew substantially in 2018 due to its strong background in Internet and AI technology. NetEase subsidiary Youdao's online courses more than doubled gross sales from 2017, making this vertical the largest revenue contributor.

In 2018 and early 2019, NetEase launched several educational apps supported by its AI technology. The products were tailored towards K-12 users to make studying online more personalized. The dual-teacher mode NetEase provided also yielded high renewal rates for the company's K-12 courses. While NetEase's online education offers both K-12 education and higher education, the company expect its K-12 offerings to be a bigger growth driver.

Key regulatory risks

In 2018, the State Council General Office announced tighter scrutiny and regulation of after-school training institutions, including those providing extracurricular classes or off-campus training. Specifically, institutions must be authorized by local education departments before they are able to apply for registration certificates or business licenses. Unlicensed training institutions and those offering unauthorized programs could be banned or potentially have their licenses revoked.

The regulations have had a negative impact on some providers as teachers working in public schools are not allowed to establish or work for profit-led private schools. Meanwhile, established non-profit private schools are now required to be approved by authorities.

By the end of 2018, China's Ministry of Education had examined 401,050 after-school training institutions as part of a national campaign targeting unlicensed and unauthorized extracurricular programs. Nearly half were required to complete recertification by the end of November 2018. A number were found to have taught courses that were too advanced and placed children under too much pressure, causing unnecessary competition among students, according to the Ministry of Education.

The Ministry also announced that an online management platform would soon be launched to tighten scrutiny of after-school training institutions, posing potential regulatory risks for online educational platforms. Education authorities nationwide would be able to blacklist poorly managed institutions and accept public complaints about training programs via the monitoring platform.

APPENDIX 1: EDTECH 101

Global learning crisis in detail

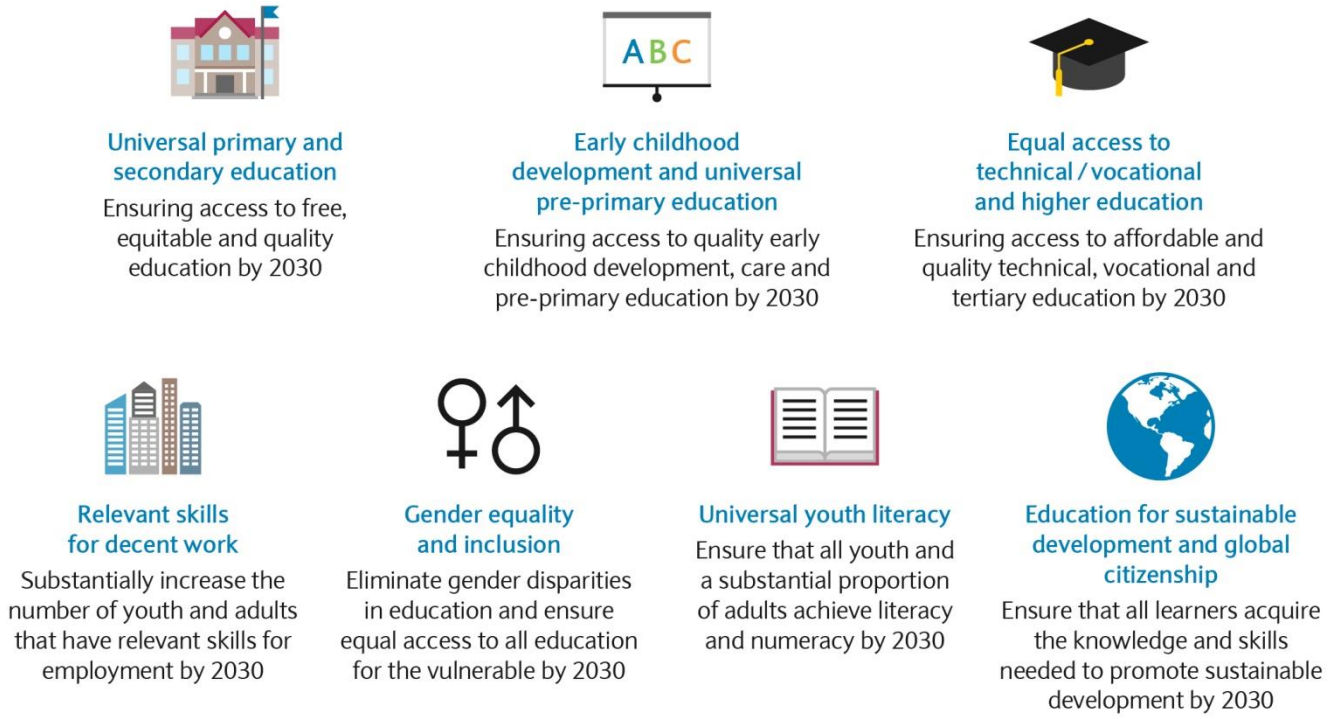
To support Figure 5, we outline below each of the global and regional factors behind our discussion on the global learning crisis.

Global factors

Democratised access to drive inclusive and equitable quality education: Education is by no means globally ubiquitous, it is estimated that 264m primary- and secondary-age children were out of school in 2015 according to UNESCO. The report also found less than one-in-five countries can guarantee 12 years of free and compulsory education. In 2015, the United Nations released the 2030 Agenda for Sustainable Development, which included 17 Sustainable Development Goals (SDGs). SDG4 commits to ensuring "inclusive and equitable quality education" and "lifelong learning opportunities" for all. If we break down SDG 4 further, some of the targets include: substantially increasing the number of youth and adults with relevant skills, eliminating gender disparities in education to ensure equal access and upgrading education facilities to provide effective learning environments for all (Figure 52).

In 2018 an update on the SDG-4 stated that disparities in education along the lines of gender, urban-rural locations and other dimensions still run deep, and more investments in education and infrastructure are required, particularly in the least-developed countries.

FIGURE 52
Sustainable Development Goal 4 – Education 2030



Source: Division for Sustainable for Development Goals (DESA) – United Nations, Barclays Research

Funding shortages driving the need for improved efficiency: One of the key factors hindering innovation in education is the lack of financial resources and the ability to invest more efficiently. While the ideal situation would be new levels of standardisation at a global level, we are left today with an educational system fragmented by regional disparities in respect to domestic funding. In the western world, school budgets in absolute terms have either stagnated or in relative terms declined adjusting for inflation, rising labour costs and a rise in student numbers. In the UK, funding shortages have led to head teachers reducing the length of lunch breaks, dropping minority subjects and asking for parent donations. According to UNESCO's 2017-18 Global Education Monitoring Report, an additional $39bn per year is needed to improve the quality of the world's schools and give the world's 2.2bn children equal access to learning.

Internet & rise of 5G allowing technology to scale: The continued development of the internet and 5G will help to increase access to multimedia learning, artificial intelligence and connected technologies. It is also believed 5G will allow for increased device capacity, faster network speed and lower latency. It will also add new types of engaging content (AR, VR) using tools whose bandwidth requirements are currently beyond commercially-available WiFi technology. Over the last 24 months we have seen various communication companies invest in research to assess how 5G can be used in education, including Verizon.

Lifelong learning & skills revolution: The need to enhance employee skills either via reskilling or upskilling is growing in nature thanks to the rise in automation and machine learning. As the type of skills needed in the labour market change rapidly, individual workers will have to engage in lifelong learning if they are to achieve fulfilling and rewarding careers, according to the World Economic Forum. The WEF highlighted the need to supplement the knowledge-based approach of the last 200 years, with one that emphasises teaching children soft skills like independent thinking, values and team-work.

Case study: World Economic Forum – Towards a reskilling revolution

The WEF report asked a key question: *How do key stakeholders such as employees, employers and governments work to ensure that our workforce remains sufficiently skilled in a rapidly changing labour market?*

As the world becomes increasingly tech-driven, it is becoming harder for individuals to feel secure in their jobs as priority is given to those with niche skill sets and knowledge, making the workforce even more polarized. The rise of advanced technologies such as AI is also reducing the value of human expertise in some markets; the focus has shifted to those who can successfully complement the machines. A 2016 report by the WEF found that by 2020, on average a third of the core skills needed to perform most jobs will be made up of skills not yet considered crucial to the same job today.

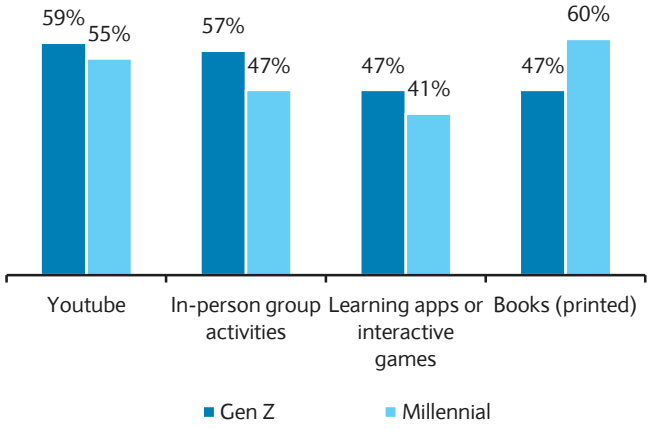
In the report, *Towards a Reskilling Revolution*, in collaboration with The Boston Consulting Group and Burning Glass Technologies, the WEF outlines a new data-driven approach to identifying reskilling opportunities using conventional labour market information systems as well as online job postings. The methodology aims to provide one key building block for workers struggling to find stability as well as helping corporations and governments to build more successful business models and thriving economies. The aim is to identify solutions for job disruptions and re-skilling opportunities that may have been less obvious to individuals without it.

Skills gap & AI talent wars: Closely linked to this, is the AI talent shortage, which is considered to be one of the largest barriers to AI adoption, alongside data capture and company culture. In 2018, a report by Tencent Research Institute stated there are just 300,000 "AI researchers and practitioners" worldwide, but the "market demand" is for millions of roles. This is leading to talent wars between the US and China, who are both competing to attract AI graduates to become the global AI leader. Excluding AI, the skills gap is also relevant because the traditional education system today hasn't been able to keep

up with the pace at which job roles and technology are evolving. The WEF estimates that by 2025, 65% of today's primary school students will have jobs that do not yet exist.

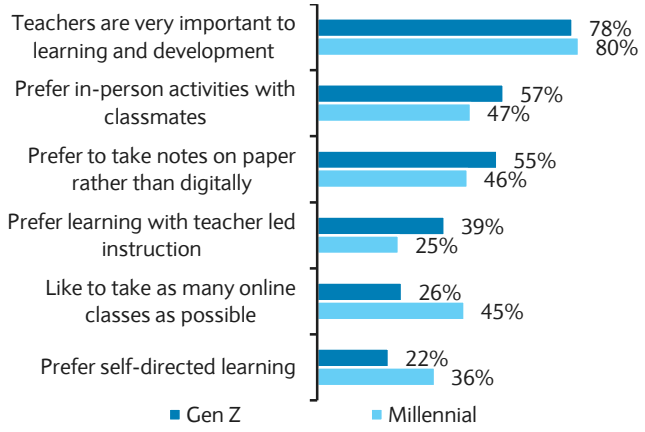
Gen Z love social learning environments with a DIY flair: One of the key characteristics we identified in our thematic deep dive on Generation Z – *Step aside Millennials (28 June 2018)* – was the preference for self-teaching/DIY and collaborative, social learning environments. It thus came as no surprise that Generation Z ranked YouTube and video as preferred methods of learning by significant margins over Millennials. In fact, YouTube was second only to teachers as a learning tool, and ranked well ahead of lectures, in-person activities with classmates, learning applications and books. The study found Generation Z expects experiences both inside and outside the classroom that are more rewarding, more engaging and less time consuming. Both Generation Z and Millennials continue to place value on higher education; however the concept of traditional degrees and universities is being questioned thanks to the growth in YouTube lecturers, virtual schools, online degrees and mid-life universities.

FIGURE 53
Preference for YouTube, apps & video learning



Source: Pearson – Beyond Millennials: The next generation of learners (*2018*), Barclays Research

FIGURE 54
Though Gen Z embraces technology, they still value "traditional" methods of instruction



Source: Pearson – Beyond Millennials: The next generation of learners, Barclays Research

Regional factors

Asia – emerging middle class: Empowered by an expanding middle class with growing disposable incomes, Asia as a region is attracting a lot of interest within the EdTech community. While the sheer difference in size is the clearest advantage, it is also the region's willingness to embrace new technologies and the cultural emphasis that is placed on education that makes countries like China and India very uniquely segmented markets.

Asia – gender inequality & female empowerment: Gender equality is inextricably linked to the right for education for all; however, girls and women from disadvantaged backgrounds continue to lag behind in education in Asia-Pacific compared to the West. Local governments are keen to resolve this, with a basket of policies encouraging higher education and labour-force participation. Within this, EdTech has already been seen to have made education more accessible to a broader population. In India, it has helped to battle various social prejudices associated with being a homemaker and a mother with the concept of being self-employed more widely accepted (particularly in rural India).

West – cost & relevancy of higher education: While we acknowledge Gen Z prefer social learning environments, there is a concern especially at the higher-education level that traditional players e.g. universities are unable to evolve offerings as rapidly as the underlying job market requires. Furthermore, the cost of education continues to increase, which is

making students more rational in their approach e.g. what is the likelihood of obtaining a full-time job once I graduate and is it worth the overall cost? In Western education there has also been a decline in the teaching of Science, Technology, Engineering and Maths (STEM), compared with the likes of China, India, Singapore and Japan, who have historically excelled in such areas. This is estimated to be costing UK businesses c.£1.5bn a year in recruitment and staffing costs (*STEM learning - May 2018*).

Think beyond the classroom

When the term – education technology – was first coined, it implied the use of technology as a visual aid or the transmitter of lesson content (TV is a good example). However, the concept has taken on a different meaning in recent years, and now looks at education in a much wider sense. This means there are several different types of e-learning providers as well as various buyer segments within the education market. We believe there are two key business models (B2B and B2C) and four target customer types: Consumers, Corporate, Higher Education and Schools (Pre-K12/K12).

B2B: The B2B model involves EdTech companies selling their products/services to corporate companies and governments. This would largely be to schools or universities, as highlighted in Figure 55, as well as corporations, which are investing in training for the purpose of up-skilling and re-skilling employees. The B2B model allows EdTech companies to reach a much larger group of customers (by supplying to a school, all the students automatically have access to their products) and to employ long-term contracts.

B2C: The B2C model requires EdTech providers to sell directly to the user (i.e. students, parents and adults) for personal use. These types of EdTech usually include e-learning apps, online assessments, tutoring and gamification apps. Selling directly to the end user removes the element of bureaucracy and enables product personalisation. On the other hand, the B2C model requires a lower price point and carries the risk of reduced customer retention as users are not tied in to long-term obligations.

FIGURE 55
B2B vs. B2C

	School (Pre-K12/K12)	Higher Education	Lifelong Learning (Consumers/Corporate)	Advantages	Disadvantages
B2B	Selling to schools	Selling to universities	Selling to corporations	1. Large market size 2. Large contract sizes 3. Long term commitments 4. Sticky customers	1. Risk that customer and end user needs aren't aligned 2. Limit to personalization 3. Schools/universities late adopters of advanced EdTech 4. Procurement process
B2C	Selling to parents	Selling to students	Selling to adults	1. Product more aligned with customer needs 2. Easier sale	1. Fragmented, more competitive 2. Lower price point required 3. Customer retention is harder

Source: Barclays Research

APPENDIX 2: EDTECH CITY INDEX

Navitas' EdTech index is calculated using five key variables, as depicted in Figure 56. According to Navitas, each dimension contributes to an effective environment for EdTech development; from funding intensity to the level of government support. Each dimension is then weighted to reflect the underlying importance, to then identify the leading global cities. The categories with the most weighting include Companies and Funding.

The '**Companies' dimension** indicates the ***"breadth and depth of the EdTech landscape"*** meaning the companies headquartered in the city. This is scored out of 30. Beijing is home to over 3,000 EdTech companies, followed by the Bay Area and New York, hence their high Companies score.

The '**Funding' dimension** highlights ***"EdTech capital availability and investor coverage."*** Navitas claims that this is the most concentrated metric, with the five cities measured in the US and China representing 86% of total funding between 2015-2017. Beijing, the Bay Area, Shanghai, New York and Boston received 29%, 24%, 18%, 12% and 2% of funding respectively. Navitas highlights five stages of funding (Seed, Series A, Series B, Series C+, Other), where more than 50% of funding was given to Series C+ rounds and 82% of these rounds involved companies originating in Beijing, the Bay Area, Shanghai, New York and Bangalore.

The '**Community' dimension** reflects ***"the frequency and maturity of EdTech activity in the city."*** The cities with the highest community rating are ones which offer significant opportunity for EdTech start-ups, including incubator/accelerator options, the chance to interact with other sector participants and an internationally recognised events schedule.

The '**Support' dimension** highlights ***"the support available to EdTech entrepreneurs from government and the traditional education sector."*** This is where the education sector plays an active role; cities that have strong interconnectivity with their local education sectors are better placed to serve start-ups. In terms of government support, Navitas found that the level of direct government support for EdTech development was very different among the 20 cities analysed.

The '**Test Bed'** dimension indicates ***"the breadth, quality and accessibility of the local education sector."*** This focuses on which cities have high quality education systems as well as a high concentration of schools (that are open to innovation) and the collaboration between universities and the industry.

FIGURE 56
Five key variables underpinning the Navitas' EdTech index

Source: Barclays Research, Navitas

Global EdTech Index

Navitas focused their efforts on 20 diverse cities, which it felt represented the full breadth of maturity and diversity that exists across the global EdTech ecosystem today. The 20 cities are not necessarily those with the largest EdTech ecosystems, given this would naturally have been dominated by the US and China, reducing the diversity of the study. Navitas also excluded many large diversified incumbent education companies such as TAL, New Oriental and Pearson, or diversified companies with education arms (such as SEEK and ROOBO) though they acknowledge they play an important role in EdTech.

The 20 cities analysed are estimated to be worth 40% of the global EdTech sector, operating at different levels of maturity (Figure 57).

FIGURE 57
Navitas – City Scores

			Companies	Funding	Community	Support	Test bed	Index
		Weighting (maximum score)	30	30	15	15	10	100
Global leaders	1	Beijing	30	26	14	13	6	88
	2	Bay Area	26	30	10	14	8	86
	3	New York	26	24	15	12	9	85
Challenger cities	4	Boston	23	17	15	14	9	76
	5	London	23	17	15	11	8	72
	6	Shanghai	21	20	10	11	7	68
Emerging cities at different stages of maturity	7	Bangalore	23	17	8	7	5	58
	8	Paris	20	12	11	9	6	58
	9	Tel Aviv	20	9	13	11	5	57
	10	Stockholm	18	9	10	14	6	56
	11	Singapore	18	8	10	11	7	54
	12	Berlin	15	12	10	10	6	53
	13	Toronto	17	11	9	9	6	51
	14	Delhi NCR	20	14	7	5	6	51
	15	Sydney	17	6	8	9	6	45
	16	Tokyo	11	9	7	11	6	42
	17	Kuala Lumpur	11	6	6	8	6	37
	18	Nairobi	14	6	9	5	4	37
	19	Cape Town	14	6	8	5	3	35
	20	Sao Paulo	12	6	7	5	4	33

Source: Barclays Research, Navitas

APPENDIX 3: GLOBAL EDUCATION STOCKS

FIGURE 58
HolonIQ – Top100 Education Stocks

Rank	Exchange Ticker	Name	Country
1	NYSE:TAL	TAL Education Group	China
2	NYSE:EDU	New Oriental Education & Technology Group Inc.	China
3	LSE:INF	Informa plc	United Kingdom
4	LSE:PSON	Pearson plc	United Kingdom
5	SZSE:002607	Offcn Education Technology Co., Ltd.	China
6	NYSE:BFAM	Bright Horizons Family Solutions Inc.	United States
7	TSX:CAE	CAE Inc.	Canada
8	BOVESPA:KROT3	Kroton Educacional S.A.	Brazil
9	NasdaqGS:LOPE	Grand Canyon Education, Inc.	United States
10	NYSE:CHGG	Chegg, Inc.	United States
11	NasdaqGS:TWOU	2U, Inc.	United States
12	NYSE:GHC	Graham Holdings Company	United States
13	NasdaqGS:LAUR	Laureate Education, Inc.	United States
14	ENXTPA:MMB	Lagardère SCA	France
15	SEHK:839	China Education Group Holdings Limited	Hong Kong
16	LSE:UTG	The Unite Group plc	United Kingdom
17	NYSE:JW.A	John Wiley & Sons, Inc.	United States
18	NYSE:ATGE	Adtalem Global Education Inc.	United States
19	ASX:IEL	IDP Education Limited	Australia
20	NasdaqGS:STRA	Strategic Education, Inc.	United States
21	TSE:9783	Benesse Holdings, Inc.	Japan
22	BOVESPA:ESTC3	Estácio Participações S.A.	Brazil
23	SEHK:1269	China First Capital Group Limited	Hong Kong
24	NASDAQ:PS	Pluralsight, Inc.	United States
25	BOVESPA:SEDU3	Somos Educação S.A.	Brazil
26	SEHK:1565	Virscend Education Company Limited	China
27	NYSE:INST	Instructure, Inc.	United States
28	NasdaqGS:SCHL	Scholastic Corporation	United States
29	SEHK:1761	BabyTree Group	China
30	ASX:NVT	Navitas Limited	Australia
31	SEHK:1317	China Maple Leaf Educational Systems Limited	China
32	NYSE:ONE	OneSmart International Education Group Limited	China
33	SEHK:6169	China YuHua Education Corporation Limited	China
34	NasdaqGS:ARCE	Arco Platform Limited	Brazil
35	NYSE:BEDU	Bright Scholar Education Holdings Limited	China
36	KWSE:HUMANSOFT	Humansoft Holding Company K.S.C.P.	Kuwait
37	NYSE:LRN	K12 Inc.	United States
38	ASX:GEM	G8 Education Limited	Australia
39	NasdaqGS:HMHC	Houghton Mifflin Harcourt Company	United States

Source: HolonIQ

FIGURE 58 CONT'D
HolonIQ – Top100 Education Stocks

Rank	Exchange Ticker	Name	Country
40	SEHK:1765	Hope Education Group Co., Ltd.	China
41	NasdaqGS:CECO	Career Education Corporation	United States
42	SEHK:6068	Wisdom Education International Holdings	China
43	NYSE:STG	Sunlands Online Education Group	China
44	SEHK:2001	China New Higher Education Group Limited	China
45	NasdaqGS:HSTM	HealthStream, Inc.	United States
46	NasdaqGM:HLG	Hailiang Education Group Inc.	China
47	SEHK:1569	Minsheng Education Group Company Limited	China
48	SHSE:600661	Shanghai Xinnanyang Only Education & Technology	China
49	JSE:COH	Curro Holdings Limited	South Africa
50	SEHK:1890	China Kepei Education Group Limited	China
51	BOVESPA:SEER3	Ser Educacional S.A.	Brazil
52	TSE:4714	Riso Kyoiku Co., Ltd.	Japan
53	TSE:4745	Tokyo Individualized Educational Institute, Inc.	Japan
54	TSE:6049	ItoKuro Inc.	Japan
55	OM:ACAD	AcadeMedia AB (publ)	Sweden
56	AIM:LTG	Learning Technologies Group plc	United Kingdom
57	NasdaqGM:REDU	RISE Education Cayman Ltd	China
58	NYSE:LAIX	LAIX Inc.	China
59	SEHK:2779	China Xinhua Education Group Limited	China
60	SZSE:300359	Qtone Education Group (Guangdong) Co., Ltd.	China
61	NasdaqGS:APEI	American Public Education, Inc.	United States
62	JSE:ADH	ADvTECH Limited	South Africa
63	NYSE:NEW	Puxin Limited	China
64	SEHK:1773	Tianli Education International Holdings Limited	China
65	KOSE:A019680	Daekyo Co., Ltd.	South Korea
66	SZSE:000812	Shaanxi Jinye Science Technology and Education Group Co.,Ltd	China
67	TSE:7030	SPRIX, Ltd.	Japan
68	KOSDAQ:A215200	MegaStudyEdu Co. Ltd	South Korea
69	BOVESPA:ANIM3	Anima Holding S.A.	Brazil
70	NYSE:RST	Rosetta Stone Inc.	United States
71	NYSE:FC	Franklin Covey Co.	United States
72	OTCPK:CNGO	Cengage Learning Holdings II, Inc.	United States
73	JASDAQ:9733	Nagase Brothers Inc.	Japan
74	NasdaqGS:TEDU	Tarena International, Inc.	China
75	BSE:508989	Navneet Education Limited	India
76	NYSE:BNED	Barnes & Noble Education, Inc.	United States
77	TSE:6187	LitaLico Inc.	Japan
78	CASE:CIRA	Cairo for Investment & Real Estate Development S.A.E.	Egypt

Source: HolonIQ

FIGURE 58 CONT'D
HolonIQ – Top100 Education Stocks

Rank	Exchange Ticker	Name	Country
79	TSE:4427	EduLab, Inc.	Japan
80	SEHK:3978	China Beststudy Education Group	China
81	PSE:FEU	The Far Eastern University, Incorporated	Philippines
82	KWSE:EDU	Educational Holding Group K.S.C.P.	Kuwait
83	NYSE:GPX	GP Strategies Corporation	United States
84	KOSDAQ:A067280	Multicampus Corporation	South Korea
85	GTSM:8437	Dadi Early-Childhood Education Group Limited	Cayman Islands
86	NYSE:BPI	Bridgepoint Education, Inc.	United States
87	LSE:RM.	RM plc	United Kingdom
88	SASE:4291	National Company for Learning and Education	Saudi Arabia
89	BSE:500304	NIIT Limited	India
90	OM:ENG	Internationella Engelska Skolan i Sverige Holdings II AB (publ)	Sweden
91	NYSE:DL	China Distance Education Holdings Limited	China
92	NYSE:RYB	RYB Education, Inc.	China
93	SEHK:1969	China Chunlai Education Group Co., Ltd.	China
94	LSE:BMY	Bloomsbury Publishing plc	United Kingdom
95	TSE:4668	Meiko Network Japan Co., Ltd.	Japan
96	LSE:WIL	Wilmington plc	United Kingdom
97	TSE:9795	Step Co.,Ltd.	Japan
98	JSE:SDO	Stadio Holdings Limited	South Africa
99	AIM:TRB	Tribal Group plc	United Kingdom
100	KOSDAQ:A068930	Digital Daesung Co., Ltd.	South Korea

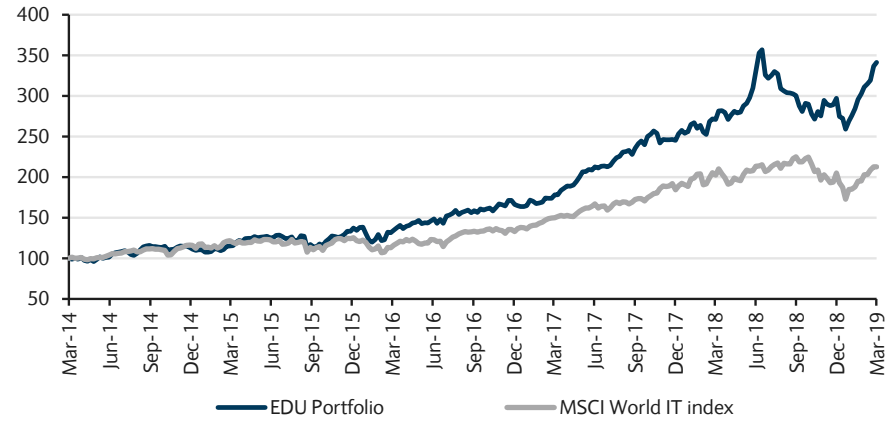
Source: HolonIQ

Education vs. MSCI World IT index

We took a deeper look at the 20 largest stocks (by market cap) in HolonIQ's list of listed global education companies, and analysed their performance over the past five years. We configured a bespoke market-weighted basket of those stocks and compared its total return since 2014 (in USD) to that of the MSCI World IT index. At its peak in June 2018, the portfolio outperformed the MSCI index by 66% (Figure 59). Below we look at the key names driving this outperformance. Investors should note that this is purely an analysis of past performance, which is not necessarily indicative of future results, and the following analysis in no way represents a recommendation.

FIGURE 59

EDU top 20 vs MSCI World IT Index (USD, Total return)

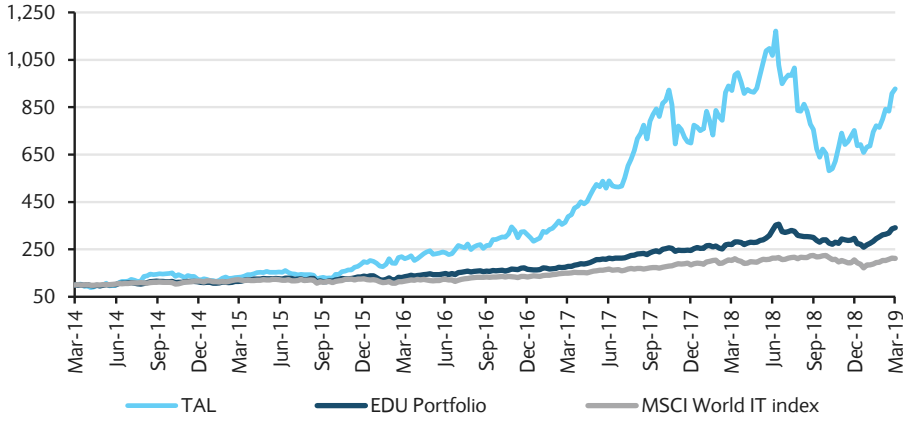


Source: Thomson Reuters Datastream, Barclays Research

This basket of names, comprising the 20 largest education stocks, has consistently outperformed the MSCI World IT index since 1Q16 (Figure 59), peaking in June 2018 and falling in 2H18. In June 2018, TAL Education Group, the largest global education player, saw its share price fall by 13% following a report by Muddy Waters accusing the company of committing fraud (Figure 60). Prior to that, TAL had been a strong performer with shares rising 126% in the 12 months prior and up 10x over the last five years as a result of its consistently strong quarterly results and rapidly increasing student enrolment. As we have previously mentioned, TAL is investing heavily in EdTech as well as alternative education business models and is a top performer within the industry.

FIGURE 60

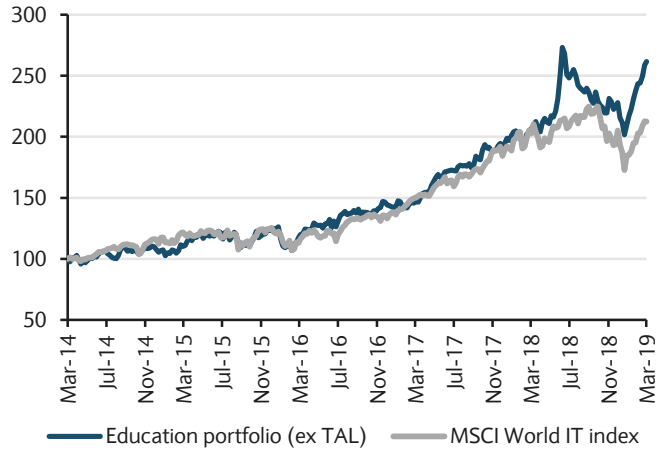
TAL vs MSCI vs EDU portfolio



Source: Thomson Reuters Datastream, Barclays Research

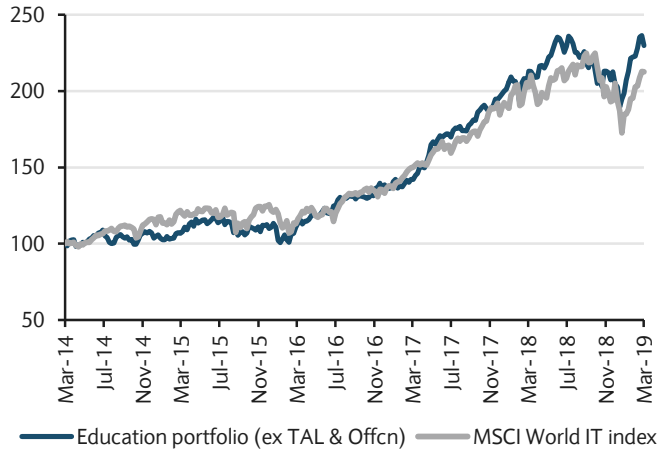
TAL is a key driver of the outperformance of this basket. If we remove TAL, the education portfolio performs relatively in line with the MSCI World IT group (Figure 61). Part of the spike in June 2018 is a result of Chinese M&A activity. **Yaxia Automobile** acquired **Offcn Education Technology** in May 2018 (officially changing its name to the latter in Feb 2019) and therefore caused a c300% surge in the share price before correcting itself. We can attribute much of the outperformance in education to these two names, and excluding them, the education portfolio performed relatively in line with the MSCI World IT index.

FIGURE 61
EDU top 20 ex TAL vs. MSCI World IT Index (USD, Total return)



Source: Thomson Reuters Datastream, Barclays Research

FIGURE 62
EDU top 20 ex Offcn & TAL vs. MSCI World IT Index (USD, Total return)

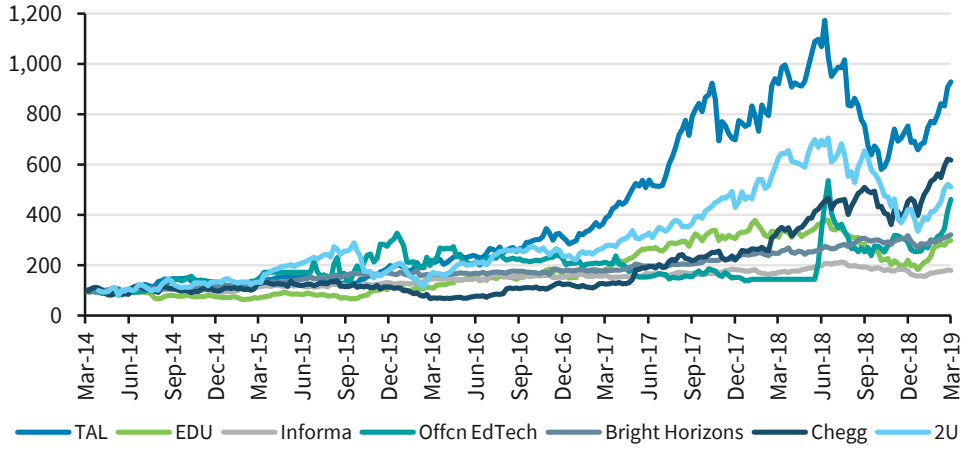


Source: Thomson Reuters Datastream, Barclays Research

Other key moves within the top 20

We note that US companies Chegg and 2U also saw large returns over the last five years, increasing by over 6x and 5x respectively. TAL's Chinese competitor, New Oriental, has also been a strong performer within the sector.

FIGURE 63
Main movers within the top 20 largest education stocks



Source: Thomson Reuters Datastream, Barclays Research

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