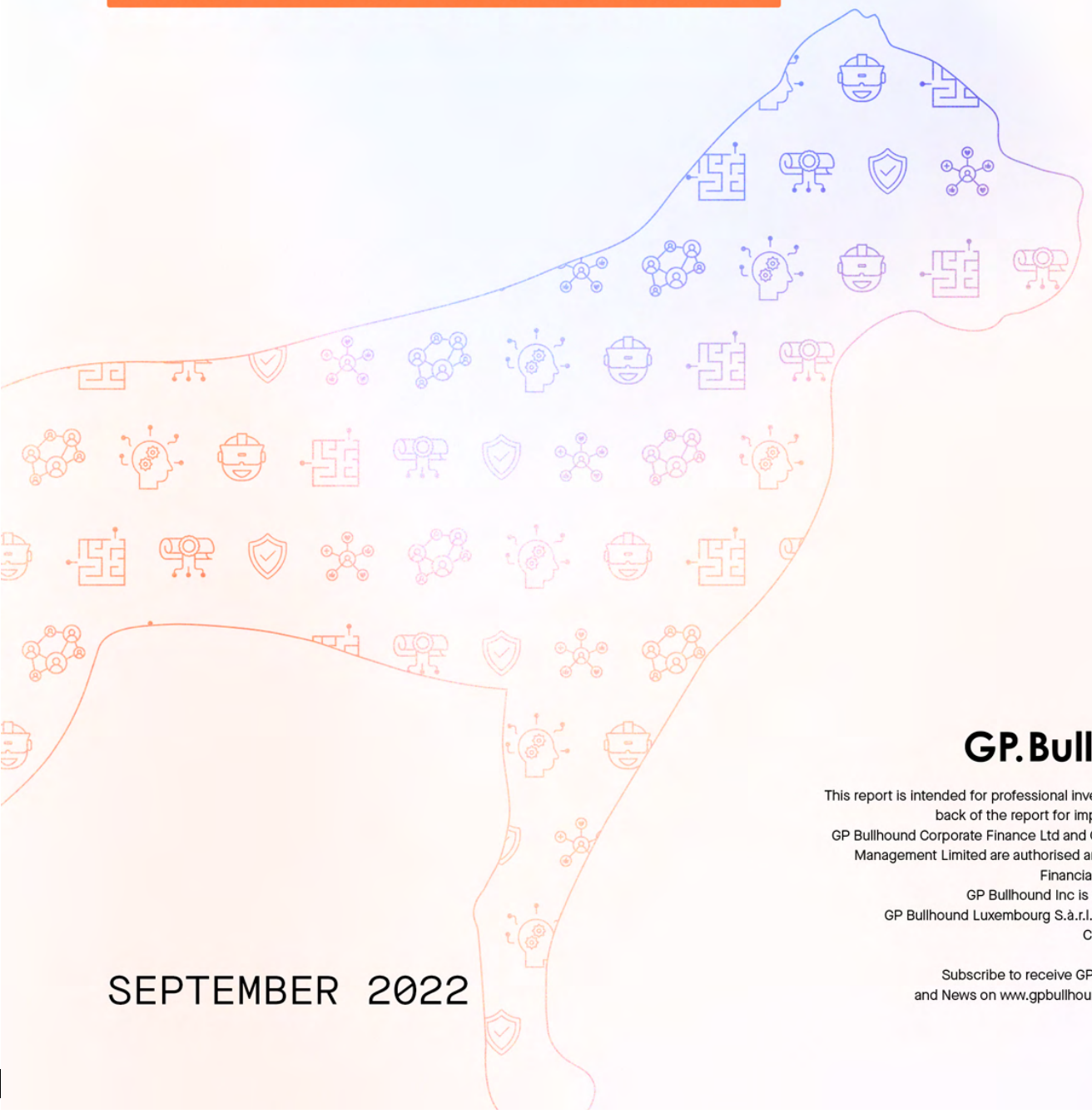
GP Bullhound Global Insights

EDUCATION TECHNOLOGY

AN INTRO TO WHAT'S MOVING THE MARKET



GP.Bullhound

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The view
FROM GP BULLHOUND

"GP Bullhound is excited to publish our inaugural education technology report. We continue to build out our US-based EdTech practice, following our success with the sale of Busuu to Chegg and Lingoda's growth investment from Summit Partners. As trusted advisors to technology entrepreneurs and founder-owned businesses, we keep a pulse on the latest trends impacting the education landscape, from early childhood to professional learning."

JASON NORDLICHT
VICE PRESIDENT

KEY TAKEAWAYS

Digital capabilities have continued to evolve and permeate the education landscape, moving the sector to redefine the learning experience, personalising instruction and student development, and better managing engagement and performance across students of all ages. Over the past two years, education technology enablers have been expanding their reach and driving digital transformation. In this report, we look at some of the major trends propelling growth in the digital learning market.

Asynchronous learning

By giving students the ability to practice self-sufficiency and time management skills, asynchronous learning allows them to adopt a more direct, hands-on role in their education.

Adaptive learning and artificial intelligence

With 99% of US educators believing that AI is crucial to an institution's competitiveness, it's no surprise that the education sector is one of the top areas where AI is driving growth and innovation.

Augmented reality, virtual reality, and immersive learning

Global education spending on AR/VR is expected to grow from $1.8bn in 2018 to $12.6bn in 2025 at a 32% CAGR. Key growth drivers include digital devices, enhanced software and demonstrable efficacy.

Gamification and game-based learning

The global game-based learning market was valued at $6.9bn in 2021 and is projected to reach $15.8bn by 2025, growing at a 23% CAGR, as educators turn to gamified and game-based tools to boost student motivation and learning achievement.

Professional licensing, upskilling, and micro-credentialing

With the education sector readjusting to increasing digitisation of learning and life post-pandemic, professionals are looking for ways to upskill and remain competitive in today's evolving professional environment.

Cybersecurity, particularly within primary and secondary schools

As schools turn to technology, devices and digitisation, their vulnerability to cybercrime grows. Secure digital infrastructure and adequate staff training will continue to develop as digital learning progresses.

Social media

Social media has strong implications for deepening education and benefitting both students and teachers due to its breadth of reach and variety of ways in which it can be utilised across the board.

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Asynchronous learning

Teaching and learning occurring independently, enabling students to participate in curricula at their own pace.

ASYNCHRONOUS LEARNING IN BRIEF

Asynchronous learning has quickly risen as a staple in formal education. After a remote setting became the only viable option during the global Covid-19 pandemic, self-paced learning was necessary for effective education. Educational institutions and stakeholders alike had to adapt and innovate to take learning outside of the classroom.

Many months of online learning during the pandemic demonstrated the feasibility and benefits that come with asynchronous learning models. Student groups can benefit from customised learning and mobile lessons, while instructors have seen higher engagement and decreased biases in learner groups.

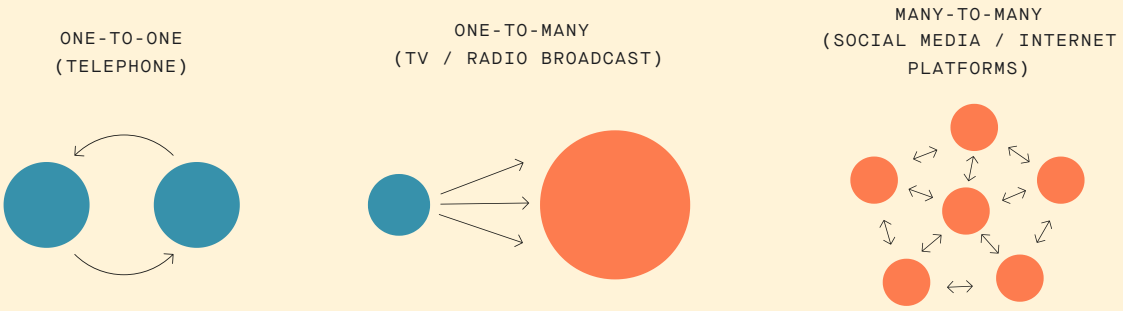
Educational institutions like schools, universities, and corporations can leverage data mining capabilities and a hybrid model of learning to improve class quality and enhance the learning experience in order to improve student outcomes. Institutions can apply the lessons learned during the remote learning period and enhance in-person classes with asynchronous modalities.

Why this technology is set to grow

As the world moves on from the effects of Covid-related lockdowns, asynchronous learning has continued to thrive and is proving beneficial to all key stakeholders. Services and tools that incorporate asynchronous learning will likely continue to expand, increasing accessibility, flexibility, and adoption.

THE EVOLUTION OF MANY-TO-MANY

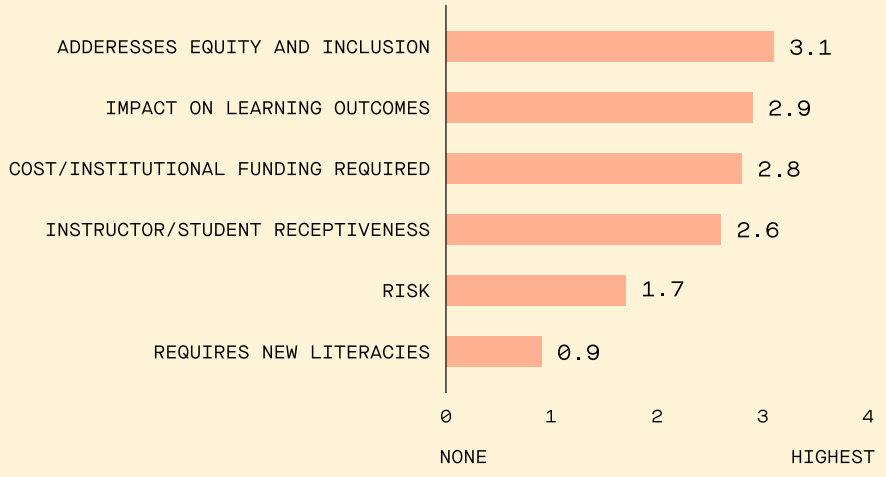
Remote learning has introduced several benefits to educational institutions and corporations that provide new and ongoing training to their workforce, allowing education to pivot from one-to-one communication (i.e., telephones) to one-to-many communication (i.e., television or radio broadcasts) and currently many-to-many through networks like social media and other internet platforms. This evolution has expanded the asynchronous options available to all key stakeholders.



LOW BARRIER TO ENTRY AND BETTER ACCESS TO EDUCATION

Asynchronous learning has already achieved an outsized impact across all levels of the educational landscape, boosted largely by the remote technologies available. A 2022 survey by EDUCAUSE, a leading non-profit US higher education technology association committed to advancing higher education, identified "mainstreaming hybrid / remote learning" as one of the six most essential technologies and practices today. Panelists found this trend to have low barriers to entry while improving education access(1).

MAINSTREAMING HYBRID / REMOTE LEARNING IMPACT ON EDUCATIONAL INSTITUTIONS



Source: EDUCAUSE

Note: eLearn Magazine, "From One-to-one to Many-to-many: Powering peer learning in open learning environments" (October 2013)

Advantages of asynchronous learning

The new form of many-to-many asynchronous learning delivers many benefits.

1 HIGHER DEGREE OF ENGAGEMENT

Student engagement is a key metric in determining educational results, as it is positively correlated with deep learning, memory recall, and material mastery. The asynchronous model offers flexibility in course design and opens the door for new incentive structures to boost student engagement.

Remote platforms can be curated around student engagement to improve their asynchronous experience. For example, splitting the course into a modular structure can create a sense of consistent progression, while also creating an organised visualisation of the interconnectedness of content.

2 CUSTOMISED LEARNING

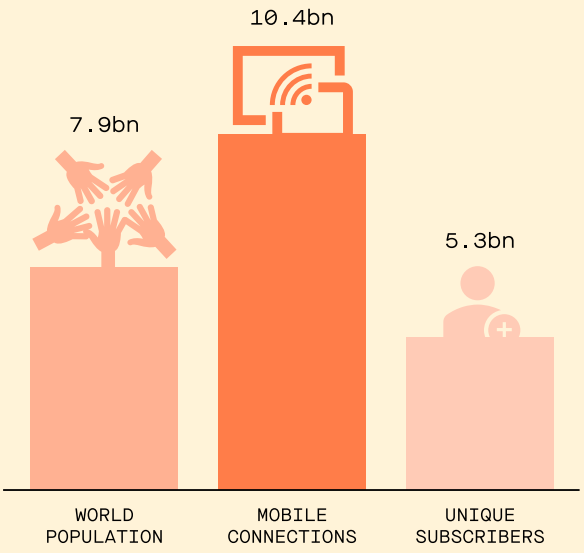
Asynchronous learning promotes more personalised learning than traditional methods. Services and tools can leverage vast amounts of user data to tailor learning to specific needs.

3 MOBILE LEARNING

Asynchronous learning can happen anywhere there is a student and a method to deliver educational content - in-person or remotely. The ubiquitous presence of mobile devices means learning content is always available at the learner's fingertips.

Several learning platforms have taken advantage of the mobile learning trend (mLearning) by creating applications tailored for cellular devices. User experience and interfaces can be utilised to create impactful learning on the go through audio, video, and graphics. Blended learning environments can incorporate polling into in-person lessons and create QR codes that students can easily capture.

GLOBAL INTERNET CONNECTIVITY(1)



Source: GSMA

4 DECREASED BIAS IN LEARNER GROUP

In-person, synchronous learning can introduce biases amongst peer groups and instructor-student relationships. As our world becomes increasingly diverse, individual biases towards those of a different gender, age, race or sexual orientation can interrupt the learning process.

The asynchronous model manages these biases as each student is given the opportunity to be accountable and take responsibility for their own learning. Collaboration channels also remain open (eg., online discussion channels and professor office hours).

5 DATA MINING

Asynchronous remote tools can gather new data points, like the timely completion of assignments, interactivities within the content, and completion of specific lessons. These data points can be used to provide a holistic evaluation of student success – in contrast to traditional methods of assessments.

Note: GSM Association, "The State of Mobile Internet Connectivity 2020" Kalvin Bahia, Anne Delaporte, et al. (September 2020)

What the future holds for this technology

We foresee the asynchronous option being widely adopted and evolved; here are some of the hurdles and future opportunities that need to be addressed.

CHALLENGES

UNKNOWN EFFECTS OF ONLINE-ONLY VIRTUAL PLATFORMS

Society is still adapting to a world where online interactions are the norm and research continues to explore its effects on the human psyche. While the digital environment has enabled growth in edtech offerings like asynchronous learning, the side-effects of virtual platforms are still being debated. These include decreased presence from instructors, human dynamics in a virtual setting, and potential tolls on critical thinking.

DISPROPORTIONATE EDUCATIONAL EQUITY

Mobile devices, access to the internet, and computer ownership have propagated in recent years, but educational equity and access to technology continue to be disproportionately distributed within different demographics. Underprivileged students who would benefit the most from self-paced learning may not have the means for a platform supporting asynchronous learning. EdWeek Research Center estimates that roughly 75% of students have adequate internet access. While the educational and internet access gaps have shrunk significantly, equity needs to be addressed if asynchronous learning is to achieve its full potential.

OPPORTUNITIES

INCREASED R&D ON LEARNING PLATFORMS

The asynchronous modality remains relatively nascent. As capabilities in the digital curriculum improve, asynchronous learning will likely become a critical part of the toolset available to educators. The nimble nature of educational software should enable creative solutions that break through cultural barriers and help students become actively engaged with the material.

STUDENT FOCUS DEMOCRATISES LEARNING

Hybrid models of in-person and remote learning have already proven to be successful in addressing many of today's educational issues. We expect this student-centred approach to enhance and democratise learning in the modern world, while also improving educational effectiveness with asynchronous options at the center of this transformation.

Expert view

MARK RANKOVIC, LEARNING EXPLORER

CEO & PRESIDENT

HOW WOULD YOU DESCRIBE THE OVERALL MARKET FOR ASYNCHRONOUS LEARNING IN EDUCATION?

Covid was a huge catalyst for asynchronous learning in education as almost every single education institution had to flip to remote teaching literally overnight, and while synchronous teaching was a part of the remote environment, a significant amount more of asynchronous teaching and learning transpired. This drove rapid bookings expansion in 2020 and 2021 for companies with online or digital learning platforms and curriculum, which in turn attracted a good deal of PE and M&A activity. Unfortunately, a lot of the solutions purchased were not implemented with fidelity due to educator and vendor capacity constraints. And now the pandemic has significantly subsided, K-12 districts are back primarily in-person and are trying to figure out how best to leverage increased asynchronous teaching and learning in a largely synchronous, in-person environment.

WHERE HAS ASYNCHRONOUS LEARNING BEEN MOST EFFECTIVE IN EDUCATION?

This could be answered from multiple angles: a grade-level perspective, socio-economic / demographic factors, particular subjects, etc. But by and large, asynchronous learning has been quite efficacious in upper elementary and middle school grades in demographics with positive socio-economic factors, which generally implies greater access to technology and supplementary teaching. However, another factor of equal or even greater importance for efficacy of asynchronous learning is the fidelity with which it is implemented. Many school districts rushed to implement Learning Management Systems (LMS) early in the pandemic, some rolling out comprehensive curriculum (i.e., instruction and assessment) while others used them as a glorified file system and application portal. Those that leveraged them with fidelity had greater success than those that rushed implementations or didn't understand how to properly utilise them for asynchronous learning. Notably, this holds true whether the asynchronous learning is happening remotely or in-person.

HOW HAS ASYNCHRONOUS LEARNING IMPACTED INSTRUCTORS AND CURRICULUMS?

Many educators have had to rapidly come to grips with digital systems to support asynchronous teaching and learning given that it had to be a large portion of the educational experience during the height of the pandemic – it simply wasn't practical to be on synchronous Zoom classes for 100% of the instructional time in every day. Unfortunately, there have been varying degrees of success given that some educators are more adept at working with digital learning systems than others. Great strides have been made with digital curriculum, both instruction and assessment, in the past few years (even pre-Covid). For example, in recent years there has been good progress in synthesising questions or "checks for understanding" into instruction as the student learns – so-called assessment as learning versus just assessment of learning. However, there is a lot more to be done in the coming years with educators and to the digital curriculum to further improve the efficacy of asynchronous learning – at least in K-12.

WHAT ARE SOME OF THE INNOVATIONS AND INTERESTING WORK BEING DONE ACROSS THE INDUSTRY TODAY?

We are finally seeing some good work in personalised learning and adaptive learning, all based on student mastery. There were grandiose ideas over the years, like AI-based digital learning, where students wouldn't need teachers, and almost all of these ideas of dramatic transformation in education have been rejected or have over-promised and under-delivered. Leveraging measurement of student mastery as it relates to learning standards or objectives and then providing digital assistance to educators to help personalise learning for students is seeing some success. The massive supply/demand imbalance in K-12 due to the limited supply of teaching (significant teacher resignations) and increased demand for learning (so-called 'learning gap' created by Covid) is a systemic issue that won't be resolved by balancing supply and demand in 2-4 years, and possibly never. Intelligent application of online systems for adaptive learning in an asynchronous modality, or to assist educators with personalised learning plans in a synchronous modality will be a crucial ingredient in the evolution of instructional strategies to 'do more (teaching) with fewer (teachers)'.

ARE THERE ANY KEY RISK FACTORS TO CONSIDER IN THIS MARKET THAT MIGHT IMPACT FUTURE GROWTH?

Yes, indeed. Educational equity is still a very large and multi-dimensional problem, including access to technology to support asynchronous learning. Actions such as the federal government investing significantly in all geographies, which is necessary, is a very blunt instrument. There are so many other factors that play into successful support of asynchronous learning for all students – many of them being human factors, specifically the dynamics associated with the educators, families and peers in a student's life. One of the other key risk factors is to ensure that educational institutions don't see asynchronous learning as a panacea. It is simply a single modality of delivering instruction and assessment.

WHAT ARE SOME OF THE WAYS THAT LEARNING EXPLORER IS HELPING TO ADDRESS THOSE CONCERNS?

While the Learning Explorer platform has supported many educators in providing an asynchronous learning experience to their students, it has and continues to provide educators with fantastic capabilities to support their synchronous instruction as well. And it has been used to do this both remote and in-person. Remember, asynchronous is not the same as remote – synchronous and asynchronous are modalities of teaching and learning, whereas remote and in-person are settings for education. Think of it like the quadrant-based chart below. Learning Explorer has functional support for educators and students in every quadrant:

	SYNCHRONOUS	ASYNCHRONOUS
IN-PERSON	• Teacher at smartboard teaching a lesson • Teacher providing small group instruction • Teacher or tutor one-on-one instruction	• Student interacting with a digital learning system in the classroom
REMOTE	• Teacher on Zoom teaching a lesson • Remote tutoring	• Student interacting with a digital learning system remotely, such as home, public library, coffee shop

WHERE DO YOU SEE THE FUTURE OF ASYNCHRONOUS LEARNING IN EDUCATION?

As you can see, asynchronous learning is just one of two teaching/learning modalities intersected with two instructional settings while there are sometimes many different instructional strategies being used. Asynchronous learning will just be a part of the toolset used by educators for students to learn and master the subjects and topics that they are either required to or desire to learn effectively and efficiently. Capabilities in the online learning platforms and digital curriculum will continue to improve to support evolution in asynchronous learning – but the key is going to be ensuring asynchronous teaching/learning is appropriately used in both in-person and remote settings as well as alongside synchronous teaching and learning.

WHAT'S NEXT FOR LEARNING EXPLORER AND WHERE DO YOU WANT TO TAKE THE BUSINESS? WHAT DOES SUCCESS LOOK LIKE OVER THE NEXT FIVE YEARS?

At Learning Explorer, we believe that personalised learning and adaptive learning strategies are going to be crucial to ensure students can learn and master the subjects and topics that matter to them while we all deal with the massive supply/demand imbalance between teaching capacity and learning demand that now exists on the tail-end of the Covid pandemic, which is going to last for many years. Our plan is to start introducing adaptive learning capabilities into our platform to complement our existing support for personalised learning. Success for us is when Learning Explorer is used by many educators and students who wish to support personalised and adaptive learning across the spectrum of the four quadrants in the chart above.

Adaptive learning and artificial intelligence

Delivery of custom learning experiences that address unique individual needs through real-time feedback, pathways, and resources.

ADAPTIVE LEARNING AND AI TECHNOLOGY IN BRIEF

Adaptive learning technology uses a data-driven approach to adjust the path and pace of learning, enabling the delivery of personalised learning at scale. It contrasts with a one-size-fits-all learning experience that is not tailored to students' specific needs. Adaptive learning has a set of tools to collect an array of information from students and then can modify the learning experience to better suit the individual's needs, based on their unique behaviours and answers.

Artificial intelligence (AI) leverages machine learning (ML) and other techniques to enhance and expand adaptive learning across the educational landscape. AI-based learning systems can collect, process, and analyse vast sets of data from students' learning activities much faster than humans.

The data's insights can detect patterns and build predictive models that help identify individual student needs now and in the future, while also adapting for each learner. Students receive content, prompts, and interventions that continuously and in real-time customise to their individual needs and abilities, augmenting the current learning environment.

HOW LEARNERS BENEFIT FROM ADAPTIVE TECHNOLOGY SOLUTIONS

- Intelligent adjustment of content, questions, and answer choices based on performance
- Self-paced study
- Optimal, individualised learning pathways
- Immediate feedback and remediation
- An orientation toward knowledge and skill mastery

Why this technology is set to grow

AI products in the education space have continued to scale, and the next decade will see continued, rapid growth, expanding the market to new heights.

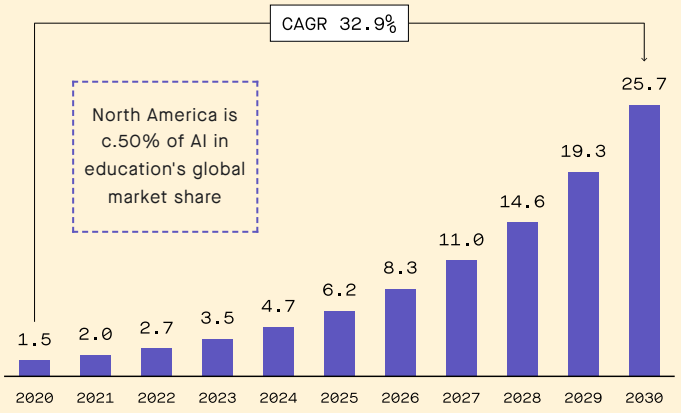
GLOBAL AI IN EDUCATION MARKET TO SURPASS $25BN+ BY 2030E

According to Prescient & Strategic Intelligence's AI in education market research, the key drivers for growth include the increasing demand for real-time learning monitoring and analysis as well as the rising need for adaptive learning solutions(1).

North America makes up 46% of the sector, says PS Intelligence, due to its highly developed educational infrastructure, focus on reducing administrative tasks, more EdTech spend, need for personalised learning, and demand to improve student engagement and the learning system at large.

The competitive mix is quite fragmented. However, software's scalability and competitiveness are likely to push the AI industry to consolidate over time. AI has been most widely used at the university level but is growing the fastest within the corporate learning segment.

GLOBAL MARKET
AI PRODUCTS IN THE EDUCATION SPACE (REVENUE $BN)



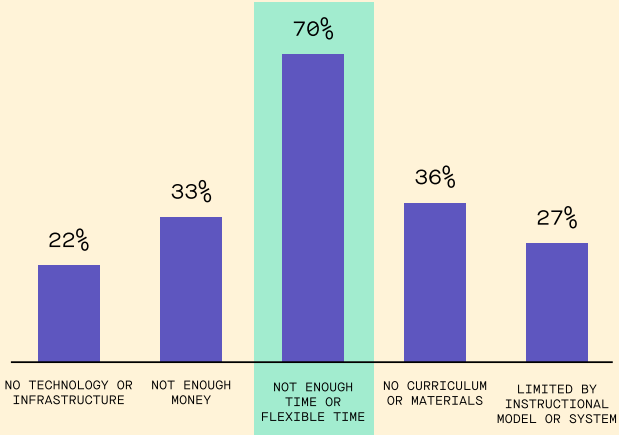
Source: Prescient & Strategic Intelligence "AI in Education Market Research" (2020)

INCREASING DEMAND FOR PERSONALISED LEARNING

Educators recognise the benefits that direct interactions have with students yet struggle to allocate the time. One of the largest impediments to the success of personalised learning is insufficient educator resources, as over 50% of available educator time is spent without direct student interaction(2).

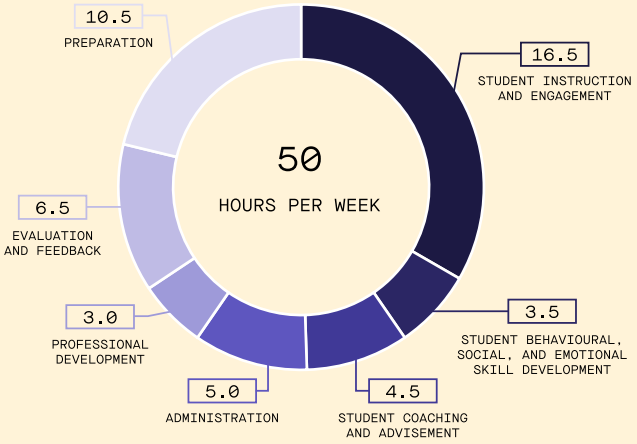
Immediate resources can be freed up by having AI technology automate administrative, evaluation, and feedback-related tasks. Then, as the technology continues to progress, it can enhance and automate even more functions, allowing educators to focus on the most critical and value-adding aspects of teaching.

US EDUCATORS' LARGEST BARRIER TO
PERSONALISED LEARNING - TIME



Source: McKinsey (January 2020)

HOW US EDUCATORS SPEND THEIR
AVERAGE WORK WEEK



Source: McKinsey (January 2020)

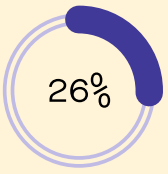
Note: Prescient & Strategic Intelligence "AI in Education Market Research" (2020)
McKinsey "How artificial intelligence will impact K-12 teachers" Jake Bryant, Christine Heitz, Saurabh Sanghvi and Dilip Wagle (January 2020)

GROWING NEED FOR HOLISTIC ADAPTIVE EDUCATIONAL SUPPORT

AI educational ecosystems have strong personalised learning applications as well as safety features for identifying risky use of technology and the social dynamics that occur within. This technology can identify areas in which schools can intervene outside of the classroom to help mitigate issues before they emerge, helping education systems offer more holistic adaptive educational support.

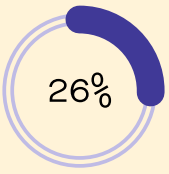
US K-12 EDUCATORS (KINDERGARTEN TO 12TH GRADE) ON HOW AI IS UTILISED IN THEIR DISTRICT

FLAGGING POTENTIALLY SENSITIVE / DANGEROUS USES OF DISTRICT / SCHOOL TECHNOLOGY



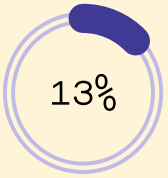
PERSONLISATION TOOLS TO ADAPT CURRICULUM TO STUDENT REACTION IN REAL TIME

PREDICTING WHICH STUDENTS ARE IN DANGER OF FALTERING ACADEMICALLY

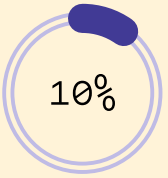


ID SOCIAL MEDIA / ONLINE COMMUNICATIONS THREATS AGAINST SCHOOLS / STUDENT SELF-HARM

DESIGNING TRANSPORTATION OR CLASS SCHEDULES



PREDICTING / ID MAINTENENCE NEEDS / EMERGING PROBLEMS



PROGRAMMES THAT GRADE / RATE STUDENT WRITING OR RESPONSES TO OPEN-ENDED EXAM QUESIONS

Source: EdWeek Research Center Survey (May 2020)

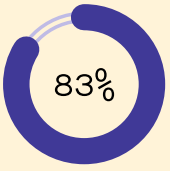
AI PREVALENCE AND DEMAND IN THE US

AI is an effective and widely adopted student engagement and instructional tool in the US, and its value is only likely to continue to increase. However, one key obstacle that AI must overcome is the lack of technical training that teachers receive, as AI tools and technology are emerging faster than educators can adapt to them.

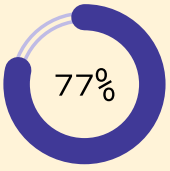
PROMETHEAN SURVEY RESULTS: EDUCATORS ON AI IN US SCHOOLS(3)

AI IS VITAL TO INSTITUTION'S COMPETITIVENES

EXPERIMENTING WITH AI TECHNOLOGY

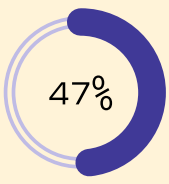


TECHNOLOGY SHOULD BE INCORPORATED INTO LESSONS

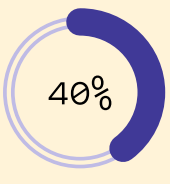


TECHNOLOGY IS A HIGHLY EFFECTIVE WAY TO ENGAGE STUDENTS

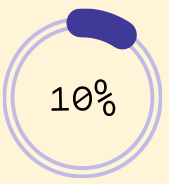
AI USE WOULD INCREASE AS A DIRECT RESULT FROM COVID REMOTE LEARNING



LEARNING MANAGEMENT TOOLS WILL BE AI-ENHANCED WITHIN THE NEXT THREE YEARS



EDUCATORS WORK HAS THE POTENTIAL TO BE AUTOMATED



IN-CLASS TECHNOLOGY TRAINING

Note: Promethean The State of Technology in Education 2021/22. Survey results of over 1,600 educators including Superintendents / Assistant Superintendents, Curriculum Administrators / Coordinators, Principals / Assistant Principals, Heads of Departments, Teachers, IT Admin / Network Manager / IT Coordinators & Other.

Advantages of adaptive learning and artificial intelligence

STUDENTS

1 PERSONALISATION

Students have varying degrees of knowledge, learning speeds, and desired goals. AI can detect and adapt to individual students' profiles to maximise the value they derive from education.

2 FLEXIBLE TUTORING

AI has tutoring and chat functions able to assist students and fill gaps where educators' capacity is stretched thin. This allows students to constantly receive support and feedback to improve their weak spots, even outside of the classroom.

3 RAPID RESPONSES

AI can easily respond to commonly-asked questions, ensuring students are never stuck without an answer. One AI-powered chatbot has shown it can respond to student questions at a response rate of 2.7 seconds, showing the real-time impacts the technology can have.

4 CONTINUOUS ACCESS

Learning is accessible through AI-powered tools for all students regardless of time or geography. This equalises access to education and allows students to independently move through the content.

5 STRESS REDUCTION

Tailored lessons and feedback promote learner success by reducing student stress with limitless Q&A and informed timelines.

EDUCATORS

1 PERSONALISATION

AI gives educators a way to constantly view the effectiveness of lessons and track student performance, which ultimately helps to customise the learning plan and best address student needs. Teachers can also direct the algorithms to analyse new and old material to then create more personalised material.

2 ANSWERING QUESTIONS

AI-powered chatbots can automate repetitive questions that can drain other student and teacher resources, thus allowing educators to focus on higher value-add activities in the classroom.

3 TASK AUTOMATION

AI can automate a variety of typical tasks including administrative work, grading and assessment activities, and other small items. By freeing up this time, educators can be more flexible in resource allocation.

4 STUDENT ENGAGEMENT

AI can introduce a variety of other engagement programmes that can keep learners focused such as crafting schedules, automated reminders, and digital interaction technologies.

5 PREDICTIVE ANALYTICS

AI enables educators to proactively spot student performance and behaviour trends to ensure students are on the right path.

What the future holds for this technology

VIRTUAL TEACHING ASSISTANTS

AI-powered virtual teaching assistants can broaden the areas of training beyond just academic education to social or other innovative use cases. Artificial environments can be created to introduce students to social circumstances that are otherwise difficult to create, such as a conversational AI bot that could mimic real-life interactions.

DIAGNOSIS OF MEDICAL CONDITIONS AND DISABILITIES

The granularity of data collection via AI and adaptive learnings tools can be used for diagnosis of medical conditions, vision problems, and learning difficulties, while collecting even more data available for scientific research.

FEEDBACK AND INSTRUCTION

Technology, such as automated essay scoring, uses natural language processing to grade written essays. As algorithms of AI become more complex, they can give qualitative, replicable, and fast feedback to the learner. AI algorithms can be consistent, fair and, theoretically, free of bias in giving feedback and instruction.

RECOMMENDATION SYSTEMS

In the same way that Netflix currently uses an AI-based recommender system to suggest new films to its users, AI technology can find the most engaging or important information for a pupil to learn, to maximise the use of their time.

VISION-BASED ASSESSMENT

Vision-based AI is another tool that can assist with assessment by providing learners with real-time feedback, freeing up teacher time and leading to better student outcomes. For example, teachers can now use their mobile phones to grade student assessments by just pointing their cameras at responses.

REAL-TIME AUDIBLE RESPONSE

AI's increasing ability to understand spoken information can provide qualitative feedback and respond audibly in real-time to aid with reading and speaking exercises. For example, in language learning instruction the technology could process and respond in language-agnostic form. This can help the visually impaired and auditory learners, and those still learning how to read.

Expert view

GAUTHIER VAN MALDEREN, PERLEGO

CO-FOUNDER AND CEO

Perlego

HOW WOULD YOU DESCRIBE THE OVERALL MARKET FOR ADAPTIVE LEARNING IN EDUCATION?

We are seeing significant investment in the space, with EdTech investment currently at an all-time high.

WHERE HAS ADAPTIVE LEARNING BEEN MOST EFFECTIVE IN EDUCATION?

Adaptive learning is highly effective when:

- Testing out of material associated with learning objectives is already mastered.
- Serving up additional content for areas one has not mastered.
- Giving personalised scaffolded feedback. For example, when a multiple choice question may have specific feedback based on a correct or incorrect answer, the number of attempts, and the level of mastery the student has shown so far.
- Increasing or decreasing rigour in algorithmically-generated math problems depending on the mastery level and performance of the student.

ARE THERE ANY KEY RISK FACTORS TO CONSIDER IN THIS MARKET THAT MIGHT IMPACT FUTURE GROWTH?

There is a bit of backlash on using adaptive learning as a "magic bullet" without intervention and monitoring by an instructor or mentor. This was more apparent in the K-12 market as online learning increased during the pandemic. The frequency of adaptive learning without an instructor increased and parents observed this more as it was happening at home rather than in school.

- Privacy is a huge issue and tagging someone as at-risk could raise issues if we communicated in-house predictive analytics.
- Social and emotional learning (SEL) has increased the interest in mentoring programmes to offset adaptive programmes and meet the emotional needs of learners. SEL in education is currently very polarising in the US.
- Bias can occur in predictive analytics. There is a history of tracking in education that can be detrimental if a student is put on a low-performing or at-risk track. It can be difficult for students to move up in these tracks once assigned, and instructors can form biases against students, such as incapable of learning to the same level as other students.

WHAT ARE SOME OF THE INNOVATIONS AND INTERESTING WORK BEING DONE ACROSS THE INDUSTRY TODAY?

AI-enabled adaptive learning systems have come a long way and have streamlined the creation of adaptive learning. Using predictive analytics to prompt and inform interventions using mentors has also picked up as institutions and learners increasingly see the need to use analytics to augment human interventions in the classroom.

WHERE DO YOU SEE THE FUTURE OF ADAPTIVE LEARNING IN EDUCATION?

AI is rapidly growing in capability. One of the issues with building adaptive pathways is that it is very labour intensive. AI-enabled adaptive learning systems will help scaling that works, and adapt the pathways in ways we cannot do today.

WHERE DOES PERLEGO FIT INTO THIS MARKET AND HOW IS PERLEGO ADVANCING ITS MISSION TO MAKE EDUCATION ACCESSIBLE TO ALL?

Perlego was born to provide an affordable and sustainable solution to learners around the world, by partnering with publishers and removing the costs of print, distribution, and retail markup. We believe education has the power to transform lives. By empowering people with all the resources they need to learn, we can give everyone a fair chance at a brighter future. To date we work with over 6,000 publishers, have a catalogue of over one million titles, and have subscribers in 176 countries.

WHERE DO YOU WANT TO TAKE THE BUSINESS? WHAT DOES SUCCESS LOOK LIKE OVER THE NEXT FIVE YEARS?

We are now expanding our TAM by adding more languages including Italian, Spanish, French and German. We will also be looking at adding toolset layers with the content allowing for collaboration and a multi-sided learning experience. Lastly, we aim to aggregate not just textbook material but all learning material by empowering professors and students to create their workspaces and share this with their fellow learners.

Note: Umer, R., Susnjak, T., Mathrani, A., & Suriadi, L. (2021). Current stance on predictive analytics in higher education: Opportunities, challenges and future directions. Interactive Learning Environments, 1-26.
Lemay, D. J., Baek, C., & Doleck, T. (2021). Comparison of learning analytics and educational data mining: A topic modelling approach. Computers and Education: Artificial Intelligence, 2, 100016.

Augmented reality, virtual reality, and immersive learning

Augmented and virtual reality create artificial environments, bridging the digital and physical worlds, allowing for more immersion within the learning experience.

AUGMENTED REALITY, VIRTUAL REALITY, AND IMMERSIVE LEARNING IN BRIEF

This technology broadens the possibilities of teaching techniques and offers unique experiences that can enhance learners' education.

EXTENDED REALITY (XR)

The umbrella term for describing the mix of real-and-virtual environments within human-to-machine interactions. It includes augmented reality (AR) and virtual reality (VR), which have unique definitions but often have significant overlap.

AUGMENTED REALITY (AR)

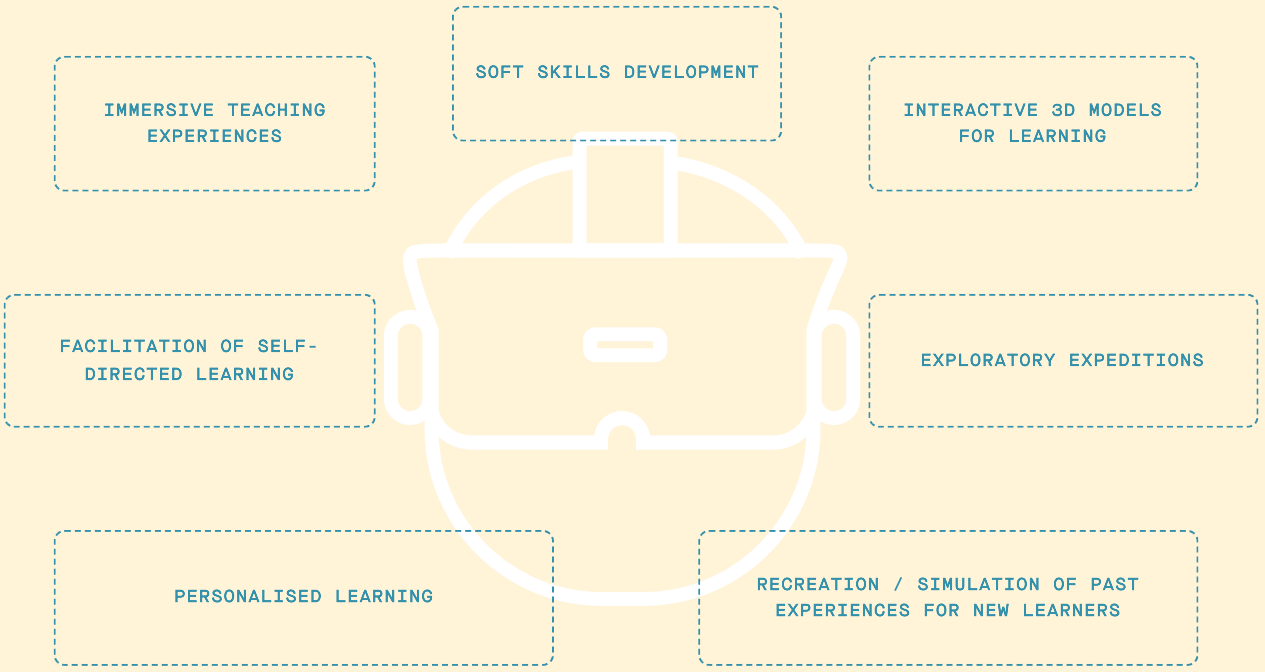
AR utilises real world settings and layers digital content on top for a hybrid virtual environment that typically leverages standard smartphone technology. Users can interact with computer-generated objects while maintaining situational awareness of their current environment.

VIRTUAL REALITY (VR)

Requiring a monitor and headset to access, VR is entirely simulated and fully immerses users, allowing them to replicate real-world experiences and convey complex information in unique ways.

Why this technology is set to grow

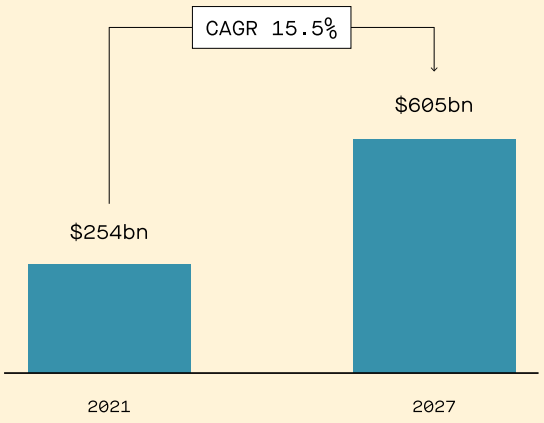
AR/VR tools allow educators to have a new method of information delivery. The compounded audio-visual format has been shown to be highly effective in education and can be applied through the following applications.



EDUCATION SPENDING ON TECH TO NEARLY TRIPLE IN THE NEXT FIVE YEARS

With the emergence of broader digital transformation, educational institutions, governments, and investors have begun to allocate significant capital to education technology. In the next five years, education technology digital spend is expected to roughly triple from $254 billion in 2021 to $605 billion in 2026[1]. AR/VR, while currently expensive given hardware requirements, is likely to spearhead this growth given its transformative impact on student learning outcomes and increasing adoption within the broader education space.

GLOBAL EDTECH DIGITAL SPENDING, 2021-2027E ($BN)



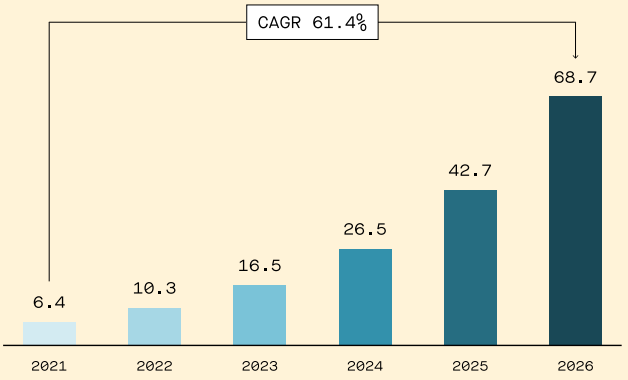
Source: Research and Markets (January 2022)

Note: Research and Markets (January 2022)

AR IN EDUCATION MARKET TO HIT C.$69BN BY 2026E(2)

As funds pour into education technology spending, the addressable market for AR will grow at a fast pace. Covid-19 has been a large driver of virtual learning and recently has helped spark more investment into the industry. The cost of production of AR technology will likely decline as economies of scale and competition ramp up. This growth in education AR experiences strong spill-over effects from the overwhelming amount of funding and spending in the general AR market, thus producing top-quality technology that is vertical agnostic.

GLOBAL AR SOFTWARE FOR TRAINING AND EDUCATION TOTAL ADDRESSABLE MARKET ($BN)



Source: Business Wire (July 2022)

EDUCATION VR PLAYERS DRIVING GROWTH THROUGH STRATEGIC ALIGNMENTS

Large industry players have partnered with educational institutions to create key testing grounds for new technologies and provide brand exposure that helps further proliferate AR/VR.

VR PARTNERSHIPS

EON Reality and Honoris United Universities XR Partnership

EON to deliver XR technology to strategic education verticals such as engineering, health, and architecture to institutions across Africa

EON Reality is a global leader in AR/VR-based software for knowledge and skills transfer for industry and education sectors. It has 20 development locations, 8,000 applications and over 40 million users worldwide

Largest pan-African private higher education network spanning 10 countries, 32 cities, 70 campuses, and 57,000 students

Top tech players create an AR/VR research centre at University of Washington

Facebook will be one of the founding partners of the $6m UW Reality Lab, one of the world's first academic centres dedicated to AR/VR research and education initiatives

UW REALITY LAB

The lab serves as a research centre, education facility, and an incubator for AR/VR, offering courses and research in 3D computer vision, object recognition, graphics, game science, and education

Meta Google HUAWEI

Each founding member contributed an equal part of the $6m of funding. They all represent some of the biggest leaders in AR/VR technology

Oculus education pilot in California

Oculus will provide just under half of the 184 library jurisdictions within California with Rifts (AR/VR headsets) for educational purposes. Thus, allowing anyone with local library access the opportunity to access AR/VR

CALIFORNIA STATE LIBRARY

The California State Library is the organisation that provides assistance and manages the public libraries across California

oculus

Oculus is a VR headset provider, now incorporated into Meta Platform's Reality Labs, an AR/VR hardware and software platform

Note: Business Wire "Global Market for Augmented Reality (AR) in Training & Education to Cross $68.7 Billion by 2026 - AR Game-based Learning is Driving Industry Growth" (July 2022)

Advantages of AR, VR and immersive learning

1 IMMERSIVE

Immersive learning encourages focus due to a reduction or elimination of distracting external stimuli and a rise in user sensory engagement, improving educational outcomes. Immersive experiences also have been shown to reduce cognitive load and distance, while encouraging mental engagement and memory recall.

2 INTERACTIVE

Interactivity is key to enjoyment and engagement which ultimately leads to increased knowledge retention. This medium of communication enables learners to be creative and adapt to kinesthetic, audio, visual or other learning styles that work best for the individual learner.

3 DISTANCED LEARNING

AR/VR technology tools can create distance learning environments that are more akin to face-to-face contact or differentiated solutions such as virtual avatar environments.

4 SIMULATED EVENTS

AR/VR enables uncapped explorations of culture, experiences, and events through tools such as comprehensive, real-time and accurate virtual tours or often hard-to-replicate scenarios.

5 DYNAMIC TEACHING METHODS

Highly differentiated and bespoke nature of teaching tools encourages multi-faceted lessons.

6 RELATIONSHIP MANAGEMENT

Integrated technology will further enable virtual interactions and allow educators to closely track student journeys.

7 EXPANDED POSSIBILITIES

AR/VR technology provides educators and content creators a platform on which new learning material can be constructed. The audio-visual format provides a multi-sensory experience which can evoke more robust emotional responses and create stronger memory creation.

What the future holds for this technology

Educational institutions will modernise with AR/VR technology upgrades and seek to overcome the technical literacy learning curve brought by new technology. Educators can maximise AR/VR's utility while proving efficacy as they become better equipped to use these tools.

INCREASED AR/VR HARDWARE AND SOFTWARE DEVELOPMENT

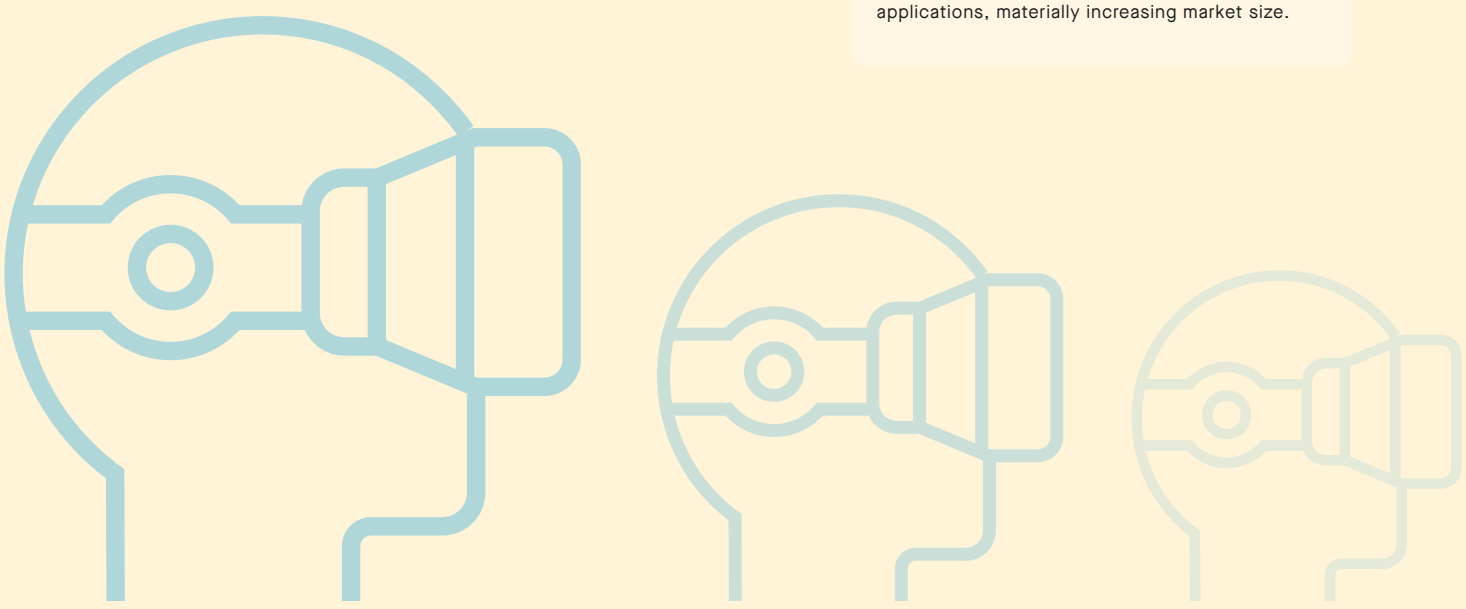
Large technology players like Google and Meta have been increasingly competing within AR/VR, with a particular emphasis on education. Key drivers include outsised growth in the mobile gaming market and data collection implications. This correlates to technology companies pouring more resources into developing hardware and software technology for the AR/VR market, which would ultimately reduce cost, improve product quality, and increase availability.

PERSONALISED AR/VR

Newer AR/VR iterations will strive to be increasingly more personalised. Some examples are real-time translation for different language learners, screen-reading applications and text augmentation for visually impaired or dyslexic students. Efforts are focused on making headsets lighter, more user-friendly, and more accessible for all types of people. These adaptations will reduce barriers to use and encourage technology laggards to adapt.

AR APPLICATION SECTOR SET FOR EXPANSION

VR has historically had higher revenue potential for companies, but this is shifting as new AR/VR use cases continue to expand, driven by the rising number of smartphones worldwide and the seamless no-download shift of technologies. This expansion opens up the need for countless AR applications, materially increasing market size.



Expert view

PAUL KELLENBERGER, ZSPACE

CEO

zSpace

HOW WOULD YOU DESCRIBE THE OVERALL MARKET FOR AR/VR IN EDUCATION?

Amid ramping demand surrounding AR/VR and the metaverse, the global mixed reality market reached $28bn in 2021 and is predicted to rise to over $250bn by 2028. In the global education market alone, spending on AR, VR, and the emerging "eduverse" is expected to grow from $1.8bn in 2018 to $12.6bn in 2025, representing a compound annual growth rate of 32%. Applications of AR and VR can enhance student engagement with educational material and improve efficacy and student outcomes. Covid-19 legislation passed in the US increased funding to K-12 education by $190bn and approximately 80% had not yet been spent as of December 2021, offering further growth potential, as additional US school districts explore new technology and methods to increase student engagement.

WHERE HAS AR/VR BEEN MOST EFFECTIVE IN EDUCATION?

AR/VR has already impacted education positively in improving student success and preparation for college and careers. The industry has seen specific success in the science subjects, mathematics, computational thinking and problem solving, to prepare students for advanced math and computer sciences, and in career and technical pathways (eg STEM, Manufacturing, Architecture, Transportation, IT, Arts, Technology and Communications) when aligned to industry certifications like the National Occupational Competency Testing Institute in the US. Applications of AR and VR can enhance students' engagement with educational material and improve efficacy and student outcomes.

WHY IS AR/VR IN EDUCATION GROWING SO RAPIDLY? WHAT HAS HELPED TO SPEED UP ADOPTION?

The global AR, VR, and mixed reality market is rapidly growing, becoming more mainstream in various markets including the consumer market, which is helping to fuel the growth in education. We believe innovation in both AR/VR hardware technology, and the software driving AR/VR experiences, is making the technology highly desirable in education. These innovations, such as systems that create a stereo3D immersive visual without any required eyewear, have led to intuitive, responsive, comfortable, and affordable user experiences. The rapidly growing number of compelling educational software applications in AR/VR has enabled growth across K-12 and higher education. Development of teacher resources, including professional development, has enabled easy integration of AR/VR into existing classroom and remote learning environments, accelerating successful adoption. Lastly, the increased funding and associated investments in technology and remote learning, caused by the pandemic, helped to speed up AR/VR's adoption. "Learning by doing" is the most impactful utilisation of this technology.

WHAT ARE SOME OF THE INNOVATIONS AND INTERESTING WORK BEING DONE ACROSS THE INDUSTRY TODAY?

There are many innovations in the usage of AR/VR in education. This autumn, autostereo technology is beginning to be used in schools in the US, enabling students to experience virtual, lifelike, hands-on learning without the need for any specialised eyewear or glasses. This enables comfortable, familiar experiences without health or sanitation concerns associated with sharing equipment. The industry is also seeing innovations in the integration between physical and digital learning, particularly in career and technical education. This allows students to experience hands-on learning with physical equipment combined with tightly integrated digital virtual experiences, further enhancing the learning with both. There is additional innovation in providing learning opportunities anytime, anywhere, and anyplace, allowing students to learn in school, at home, or wherever they are located. Innovations in virtual labs and the gamification of AR/VR learning software, including the use of AI, is expanding the value to students, teachers, and school administrators.

ARE THERE ANY KEY RISK FACTORS TO CONSIDER IN THIS MARKET THAT MIGHT IMPACT FUTURE GROWTH?

If the technology being evaluated or used requires a headset or glasses, concerns surrounding multiple students' usage and associated health/cleanliness issues could impact adoption. In addition, if the technology delivers an uncomfortable experience or requires too much teacher intervention or new user education, it could make it difficult to expand. If technology requires user logins, like consumer products often do, and does not manage privacy and security appropriately for minor-aged school users, it will inhibit the usage of that technology.

WHAT ARE SOME OF THE INNOVATIVE WAYS THAT ZSPACE IS USING AR/VR TO DELIVER IMMERSIVE AND INTERACTIVE LEARNING EXPERIENCES?

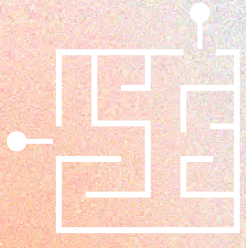
ZSpace allows for the expansion of content by providing access to content that would otherwise be too dangerous, impossible, counterproductive, or too expensive regardless of whether learning is taking place at school, remotely, or in a hybrid environment. Whether dissecting in biology, running a physics experiment on another planet, working on a car engine, or welding in a career and technical education class, students can experience content that is typically delivered in a hands-on environment virtually without the costs and resources associated with a lab environment. We believe the value of zSpace resides in its ability to deliver a wide range of content through one device – providing access to content that students may not otherwise have. ZSpace brings the dangerous, impossible, counterproductive, and expensive to life for the purpose of learning. In addition to being able to use content at school, students can "take labs home" because the content is delivered via a computing device with enhanced features that allow for the virtual experience. Teachers can present to students remotely by sharing augmented reality representations of content. It has been demonstrated that integrating AR/VR like zSpace into instruction has resulted in improved outcomes and efficacy, including test score improvements and greater social and emotional learning.

WHERE DO YOU SEE THE FUTURE OF AR/VR IN EDUCATION?

We believe AR/VR will be a key part of the education process and common across K-12 and higher education, potentially through becoming embedded in the tools students use every day, such as laptops and phones; through educators becoming expected to meet varying student needs by providing access to experiential content regardless of where students are learning; AR/VR improving equitable learning by bringing programmes of study to remote areas that would not have it otherwise and, in addition, to providing a consistent level of virtual experiences to students; students becoming able to experience lifelike learning all-round; and learning applications becoming game-like, engaging students in the learning process while providing challenges and the ability for them to experiment, create, and fail without fear.

WHAT IS NEXT FOR ZSPACE AND WHERE DO YOU WANT TO TAKE THE BUSINESS? WHAT DOES SUCCESS LOOK LIKE OVER THE NEXT 5 YEARS?

We recently announced the proposed business combination of zSpace with EdtechX Holdings, which would result in zSpace being a publicly traded company. As a publicly listed company, we expect to continue to do software acquisitions, through which we seek to drive additional annual recurring revenue growth with new K-12 and workforce software applications, facilitating additional scale and international growth in the APAC and EMEA regions. We are looking to expand our global presence, delivering the same AR/VR experiences that have driven US growth into established and emerging markets. We also plan to continue US expansion through increased sales and market penetration. Lastly, we will aim to continue our history of innovation, investing in R&D and delivering products that exceed customer expectations.



Gamification and game-based learning

Incorporating game-like elements into existing learning activities and creating inherently game-like learning activities to bolster student engagement and motivation.

GAMIFICATION AND GAME-BASED LEARNING IN BRIEF

Once merged with education, gamification has vast potential to positively influence motivation, engagement, performance, problem-solving, and the overall learning experience by incorporating familiar and enjoyable gaming tactics.

Game-based learning in education has historically been popular in early childhood education but is beginning to pick up steam in other categories, such as higher education and professional learning, as there is widespread enthusiasm from both educators and learners.

Popular gamified applications such as Kahoot! and Quizizz are pervasive due to how easily they are configured with applicability across disciplines. Game-based learning has also extended from academic settings to consumer education platforms, including language learning and software application platforms, as corporations across industries have realised the many benefits of gamified learning for their workforce.

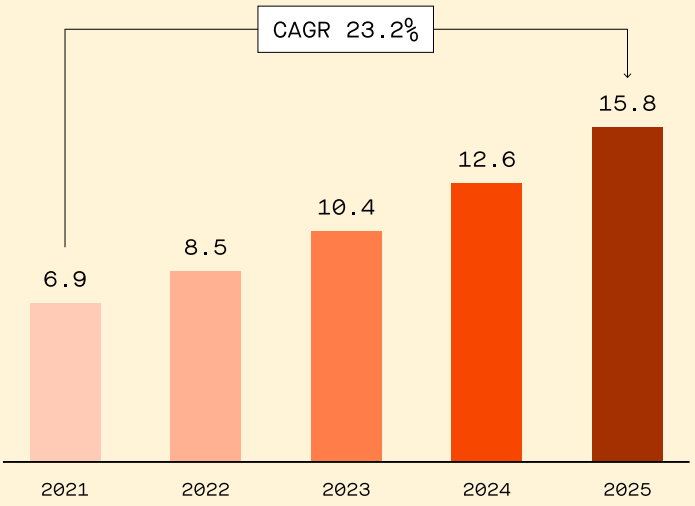
Why this technology is set to grow

Gamification and game-based learning are growing rapidly around the world, driven by the increasing adoption of digital learning, the growing need to enhance the learning experience for good outcomes, the adoption of AR/VR technologies, the shift to prioritising learning over grades, and the increased use of tablets, smartphones, and other mobile devices.

GAME-BASED LEARNING MARKET CAGR OF 20%+ BY 2025E

The game-based learning market is set to grow by almost ~$10bn from 2021 to 2025, according to Business Growth Reports. Game-based learning for early education is likely to be among the leading revenue opportunities for game developers during this period.

GLOBAL GAME-BASED LEARNING ADDRESSABLE MARKET ($BN)



Source: Business Growth Reports (2022)

DATA SHOWS STRONG IMPACT ON STUDENT PERFORMANCE

Gamification has a strong impact on student performance, with data-driven and measurable tracking insights. An International Journal of Human-Computer Studies experiment on over 400 subjects on gamification objects and complexity found the following:

35%

INCREASE IN STUDENT PERFORMACE WITH CHALLENGE-BASED GAMIFICATION IN EDUCATION

54%

OF NEW HIRES ARE HIGHLY PRODUCTIVE BECAUSE OF GAMIFIED ONBOARDING

67%

OF STUDENTS FOUND GAMIFIED LEARNING MORE MOTIVATING AND ENGAGING THAN TRADITIONAL COURSES

75%

K-8 TEACHERS IN THE US USE DIGITAL GAMES FOR INSTRUCTION

90%

BETTER PERFORMANCE FOR THOSE EDUCATED WITH CHALLENGE-BASED GAMIFICATION VERSUS LECTURES ONLY

Source: International Journal of Human-Computer Studies, "The effect of challenge-based gamification on learning: An experiment in the context of statistics education", NZ Legaki & Nannan Xi (December 2020)

GAMING IS WIDESPREAD WITH GROWING ENTHUSIASM

Gaming culture is deeply embedded in our daily activities, transforming the mundane into amusing experiences that mimic popular culture. This appeal can be attributed to a variety of factors, including the ability to evoke people's competitive nature and that games are structured to maximise enjoyment. Games also naturally have an ability to connect effort and success to gratification, directly rewarding positive learning attributes.

GAMING STATS

70%
OF PARENTS SAY VIDEO GAMES HAVE A POSITIVE INFLUENCE ON THEIR CHILD'S LIFE

80 BILLION
MOBILE GAME DOWNLOADS IN 2020

227m+
PEOPLE IN THE US PLAY VIDEO GAMES ONE TO A FEW HOURS PER WEEK

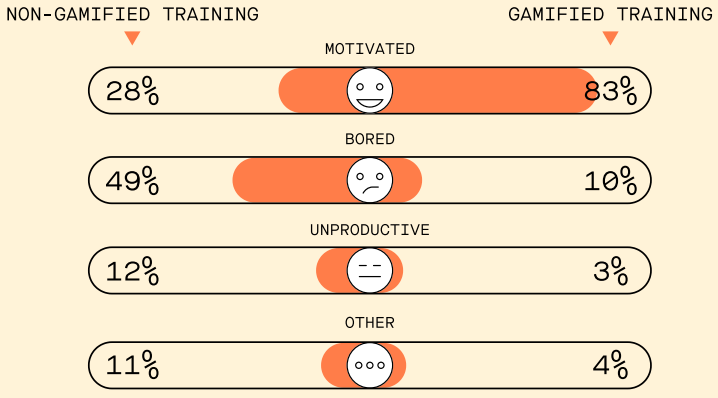
97%
OF YOUTH PLAY VIDEO GAMES

GAMIFIED TRAINING IMPROVES MOTIVATION, PRODUCTIVITY AND ENJOYMENT

The ROI on training resources through gamification has picked up, with 70% of the Global 2000 list of corporations using game-based training, according to Gartner (2021). Recent examples of large employers utilising game-based learning to train employees include KPMG and PwC, which effectively rolled out an app to teach new hires and interns meaningful digital and client skills.

GAMIFICATION AT WORK

HOW EMPLOYEES FEEL WHILE TAKING TRAINING



EFFECTS OF GAMIFICATION ON EMPLOYEES

+30%
Increased learning engagement

+30%
Increased desire to be engaged at work

+27%
Increased desired to be more productive

+20%
Increased focus

Source: TalentLMS Gamification Survey 2019

Advantages of gamification and game-based learning

1 REMOTE & ASYNCHRONOUS LEARNING

The shift to more remote and asynchronous learning is highly conducive to gamification, as games have the ability to be intuitive, fast-paced, and self-scoring.

2 HIGHER ENGAGEMENT

Studies suggest that challenge-based gamification improves students' performance by 35%, particularly when combined with traditional teaching methods(1).

3 STRONGER MOTIVATION

In one study, 68% of students reported feeling more motivated during a gamified course as compared to a traditional one(2).

4 BETTER PERFORMANCE

In another study, groups who experienced gamification had greater performances than groups that only participated in traditional teaching methods such as only attending lectures or reading papers(3).

5 HIGHER DEGREE OF INCLUSIVITY

Gamification allows students with different needs or learning preferences to have an adaptive style of learning (e.g., SPED).

6 STUDENT MANAGEMENT

Gamification allows for real-time feedback and performance monitoring.

7 GREATER USE OUTSIDE THE CLASSROOM

Programmes could see extra-curricular engagement without having any educational institutional guidance or encouragement due to learner enjoyment.

8 IMPROVED ATTENTION SPANS

Fast media and technology have severely impacted attention spans, and game-based learning's strong emphasis on engagement helps overcome this challenge(4).

9 BUILDS CONNECTIONS

Gamification can be used as a tool for collaboration and team relationship building.

Note: 1) International Journal of Human-Computer Studies, "The effect of challenge-based gamification on learning: An experiment in the context of statistics education", NZ Legaki & Nannan Xi (December 2020); 2) Journal of Education for Business, "Does educational gamification improve students' motivation? If so, which game elements work best?", Jared R. Chapman & Peter J. Rich (June 2018); 3) Agile Meridian, "Understanding the ROI of Gamification in Adult Learning", Chris Daily (January 2022); and 4) Counter Current.org "Impact of Social Media on Our Attention Span and its Drastic Aftermath" Mohmad Ashrof (December 2021)

What the future holds for this technology

Gamification is set for further innovation and EdTech application through enhanced security, low setup costs, easy accessibility, quicker deployment, high scalability, customisability, enhanced storage space, ease of maintenance, automatic upgrade of course materials, and mechanical licensing by vendors.

GAMIFICATION TO DRIVE RECRUITMENT PROGRAMMES

Gamification can be used to train and provide an enjoyable way to sample what a career might look like in a particular field.

DATA AND DETAILED ANALYSIS TO IMPROVE PRODUCTS

Gamification can provide vast amounts of data that can be leveraged for actionable insights.

INTEGRATION WITH AR/VR

Gamification is set to continue to integrate with other immersive technologies like AR/VR.

BLOCKCHAIN

Blockchain technology will synch to gamification to further allow digital transparency and reward functions.

VIDEO-BASED INTERACTIVE LEARNING

Video-based interactive learning is a key area of growth for gamification, with a particularly strong use case for younger generations with interactive videos.

KIDS GAME-BASED LEARNING DRIVING DEVELOPER REVENUE

Game-based learning for kids is now predicted to be among the leading revenue opportunities for game developers through 2024, registering a growth of 20.6 %(1).

Note: Truic Startup Savant "Game-Based Learning for Kids Set to Explode Through 2025" Jemima McEvoy (December 2021)

Expert view

SHAWN YOUNG, CLASSCRAFT

CEO

Classcraft

HOW WOULD YOU DESCRIBE THE OVERALL MARKET FOR GAMIFICATION IN EDUCATION?

There are strong tailwinds for gamification in education – increasingly, student motivation and engagement are critical global issues, exacerbated by shifts brought about by the pandemic. Although we've looked at solutions around game-based learning that have been successful, there's not a lot that's been done around a robust systems-wide gamification platform like Classcraft to promote student motivation across the whole educational experience. From a competitive landscape, there aren't a lot of players in gamification. In education at large, we're really looking at more game-based type learning experiences, like math or reading games, which are smaller experiences focused on developing a specific content area.

WHERE HAS GAMIFICATION BEEN MOST EFFECTIVE IN EDUCATION?

Gamification has been effective in behaviour intervention in the form of Classcraft, where we are using the mechanics and the culture of games, in a very robust platform, to go beyond just points and leader boards, to rethinking and redesigning the whole educational experience. Our recent meta-analysis shows that gamification experiences, and Classcraft in particular, have a significant impact on student motivation and learning achievement. Other examples of using game mechanics for education have been around simulation-type experiences, like Minecraft EDU, or around game-based learning, such as Prodigy Math, Dreambox or Math Makers.

HOW DOES GAMIFICATION CONTRIBUTE TO ASYNCHRONOUS LEARNING?

One of the challenges in asynchronous learning is the ongoing motivation and engagement of students. We're asking them to be more autonomous than ever and do tasks in between learning moments. Gamification sustains student engagement and motivation as they're experiencing these different new modalities, while giving them timely feedback. As an example, in Classcraft you would earn points for handing in assignments, handing assignments in early, and participating in online forums and online discussions. All the behaviours that we want to see in asynchronous learning need to be promoted and explicitly reinforced. Using gamification, we can encourage and motivate students to exhibit those behaviours.

WHAT ARE THE DATA IMPLICATIONS OF GAMIFICATION IN EDUCATION? WHAT ARE SOME INTERESTING WAYS THAT CLASSCRAFT IS LEVERAGING INTERVENTION DATA?

From a data perspective, what we're able to do is super interesting, because, by awarding points for specific behaviours that we want to see – demonstrating empathy, being inclusive and participating in class – we can generate data points about student behaviours that educators don't usually have. Because teachers are giving kids feedback and rewarding them for these behaviours, we're able to track them and create a very insightful behaviour profile of a student, which schools can use to develop personalised intervention models. Usually, most of the behaviour data schools have is data that is tied to suspensions or referrals, so the worst students when they're at their worst. With Classcraft, what we can get is positive occurrences. The lack of positives becomes a strong early indicator of students that need specific intervention, or that need course correction. We've also started working on predictive models and therefore give teachers feedback about their own pedagogy, while identifying students in need of personalised intervention.

WHAT ARE SOME OF THE INNOVATIONS AND INTERESTING WORK BEING DONE WITHIN THE SPACE TODAY?

Many organisations are gravitating towards the SEL space, but most of that is curricular or student-surveying. There's still room for disruption in educators' approaches to that. I don't see great and immediate potential for VR, because it's still cost-prohibitive, both for students to own the headsets, and also to develop interactive and interesting content. However, AR has a lot of interesting potential. With Classcraft, we add a layer of game-like interactions on top ofinteractions that exist in real life. There's a lot of potential for AI too. As the algorithms get more sophisticated, we'll be seeing smarterand more robust digital assistants, both for teachers and students.

ARE THERE ANY KEY RISK FACTORS TO CONSIDER IN THIS MARKET THAT MIGHT IMPACT FUTURE GROWTH?

Data privacy is, and will continue to be, a chief concern. Rightly so, as educators are concerned with protecting student data and ensuring their data is not misused. We support this wholeheartedly, but it does create a bigger barrier to entry for emerging EdTech companies. It's something Classcraft has been working on for years, and you're never done adapting to new legislation and improving current practices. Ultimately, the data needs to belong to the schools, the students, and the teachers. EdTech companies need to see themselves as custodians of that data.

IN ADDITION TO MOTIVATION, ENGAGEMENT, AND DATA, ONE BENEFIT OF GAMIFICATION IS ITS ABILITY TO PROMOTE HEALTHY COMPETITION, ALTHOUGH EDUCATIONAL INSTITUTIONS ARE RE-EVALUATING COMPETITION/RANKING SYSTEMS. IS THIS SOMETHING THAT YOU HAVE ENCOUNTERED OR CONSIDERED?

In terms of growth potential for Classcraft and gamification in general, the growth potential is great. Student motivation is a key issue. However, education is in a crisis, so there are a lot of competing issues. For example, teacher turnover, politicisation of education, Covid-related impacts and mental health issues. These are all contexts that increase the likelihood of teacher burnout, which is a significant barrier to implementing anything new. That said, there are a lot of interesting trends around the acceptability of games and gamification. A decade ago, many of the actors in education had never played a video game. This has changed significantly. More teachers and principals today grew up or went through their teenage years with video games. Many people think about gamification as a way to foster competition. Our approach is to foster collaboration. We believe that there's enough competition in schools. Competition is motivating to students who are at the top of a leader board, but the students that need motivation the most, the ones who are struggling, don't see a pathway to winning in competitive scenarios and are further demotivated. The solution is to work and play as a team. This has been our approach to designing the motivational mechanics in Classcraft. There are no leader boards and students are accountable to one another and win as a team. The best way to level up is to be the most collaborative, helpful student.

WHAT IS NEXT FOR CLASSCRAFT AND WHERE DO YOU WANT TO TAKE THE BUSINESS? WHAT DOES SUCCESS LOOK LIKE OVER THE NEXT FIVE YEARS?

We want to continue growing in the US market and expand internationally. We have users in 165 countries, and there are many opportunities because this is a global issue. Classcraft is extremely scalable because it's non-curricular, subject agnostic, grade agnostic and highly configurable. It's a platform, as opposed to a singular set of prescribed content or curriculum. That said, we also see that there's a lot of potential to capture more than just real-life behaviours. We've been focusing on classroom management, but with the expansion of EdTech, there are behaviours that are happening in the digital space that we want to see rewarded. Our integration with Canvas, for example, a large LMS, means we are automatically rewarding students points for handing in homework, being proactive about it and for participating in discussions. There are behaviours we want to see in other platforms; they can be encouraged and reinforced using Classcraft. We are poised to go beyond the brick and mortar, and expand across the entire ecosystem of education, including the digital space, to foster student motivation and behaviour through API connections.

Professional licensing, upskilling, and micro-credentialing

The newest proof of skills for job seekers.

PROFESSIONAL LICENSING, UPSKILLING, AND MICRO-CREDENTIALING IN BRIEF

Micro-credentialing is the process of earning a micro-credential, which is like a mini-degree or certification in a specific topic area.

They can either be broad, such as 'Machine Learning,' or specific, like 'Using Data to Differentiate Instruction for ELL Students'.

Professional licences are like micro-credentials but are issued, certified, and required by an industry's regulatory body for any professionals working within it.

Professional licences have risen to prominence in the corporate, post-education world to validate a potential employee's skill set. Many licences are now required to work in many professions, such as financial services and real estate.

Upskilling enables continuous learning through training programmes and development opportunities to expand employee abilities.

Some upskilling services include virtual or online courses, mentoring and shadowing, and micro-learning. Many companies have been founded to provide test prep and other key upskilling services for those looking to acquire a professional licence.

Why this sector is set to grow

Upskilling solutions are set to play a key role in supporting learners after their completion of secondary school, particularly post-Covid, due to the shift towards online learning solutions, as well as rising inflation rates and increasing tuition fees. With that shift, employers are realising the value of job candidates upskilling and specialising in areas to add value immediately upon being hired. Employers understand that niche certifications such as professional licenses and micro-credentials not only narrow their search for skilled employees but also save costs traditionally spent on training new hires, recruiting, and compliance. With the proliferation of a more specialised workforce, companies have emerged to support aspiring professionals seeking to pass exams and secure relevant licensure.

GLOBAL MICRO-CREDENTIALING MARKET TO GROW BY 17% IN 2021-2025E

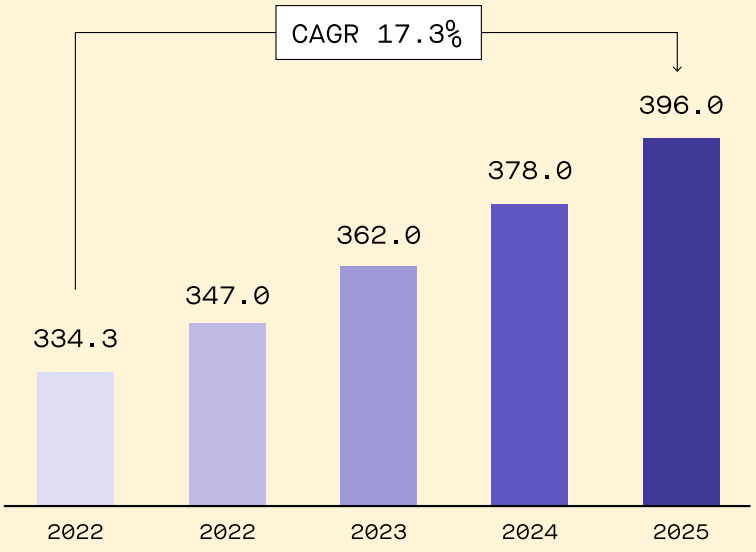
As sectors readjust to life post-Covid, firms have keyed in on finding more efficient and cost-effective ways to locate, hire, and train specialised workers so that they can perform sought-after skilled labour. Professional certifications have proliferated as traditional career paths have given way to more lateral moves, and the workforce having the agency to move easily between occupations within a certain industry.

Financial services, real estate, and engineering are going through regulatory reorganisations and are looking to further explore upskilling models. As the competition for skilled labour has significantly increased, upskilling has become a strategic focus for firms across industries to differentiate themselves from competitors as they seek to attract and retain talent.

DID YOU KNOW...

North America to capture over half of global market

GLOBAL MARKET
MICRO-CREDENTIALING ($BN)



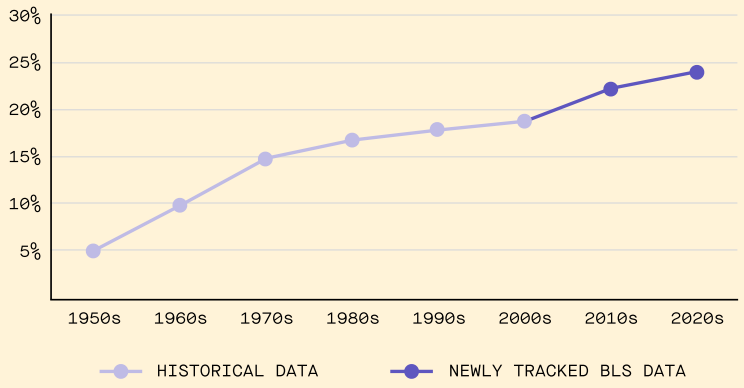
Source: Alternative Credentials Market for Higher Education by Product and Geography - Forecast and Analysis 2021-2025, June 2022

SHIFT IN EMPLOYER PERCEPTION TOWARDS WORKFORCE SPECIALISATION

North America is likely to emerge as the key geographic region driving growth, capturing 57% of the global market share in 2021-2025[1]. The key drivers include employers investing more time on hiring more specialised workers to be more efficient immediately upon being hired, strengthening training and education programmes to be more bespoke and individualised, broader adoption of remote and asynchronous learning modules, and increasing regulatory requirements across jurisdictions in various professional end markets.

Since the 1950s, professional licensure requirements have steadily risen, creating a growing market for professional education services. Over 34 million US full-time workers today are in a profession that requires a government-mandated licence[2]. The number of workers with professional licences has grown across economic and political cycles, indicating a steady, reliable increase in professions that will require licencing or micro-credentialing in the future.

US WORKFORCE WITH PROFESSIONAL LICENCE (%)



Sources: The Council of State Government (1952), Green (1969), Kleiner (1990), Kleiner (2006), Kleiner & Krueger (2013), Westat data, Bureau of Labor Statistics (2015-2021).

2019

20%

Of employers selected micro-credentials as **something they would consider** when evaluating a potential job candidate

2021

54%

Of employers said they view micro-credentials as **extremely important** when evaluating a potential job candidate

Source: Wiley University Services

BIG PLAYERS TACKLING UNDERREPRESENTED DEMOGRAPHICS

Micro-credentialing is gaining momentum the world over. Many countries are implementing policies to support the development, implementation, and recognition of micro-credentials across institutions, businesses, sectors and borders, knowing that education for skilled labour is not equally accessible to all demographics.

Large organisations are also getting in the game. Companies like Google and Meta have created their own micro-credentialing programmes to remove obstacles for underserved communities that do not have the same access to other programmes that give job prospects a leg up in marketing themselves for employment. They have significantly invested in removing barriers for underrepresented communities to gain access to micro-credentialing and professional licensing models.

Meta's Elevate programme partners with organisations working with minority job seekers and prospective employees, with the goal of reaching one million members of the Black community and one million members of the Latinx and Hispanic communities in the US by 2023.

Google

PROFESSIONAL CERTIFICATION PROGRAMMES IN DATA ANALYSIS, PROJECT MANAGEMENT, AND UX DESIGN

100,000

NEED-BASED SCHOLARSHIPS PLEDGED TO THEIR OWN PROFESSIONAL CERTIFICATION PROGRAMMES

$10m

IN GRANTS PLEDGED TO NON-PROFITS WORKING WITH WOMEN, VETERANS, AND OTHER UNDERSERVED AMERICANS

Meta

ELEVATE

PARTNERING WITH ORGANISATIONS WORKING WITH MINORITY JOB SEEKERS AND PROSPECTIVE EMPLOYEES

2 MILLION BY 2023

RESOURCES, EDUCATION, AND SUPPORT FOR BLACK, LATINX, AND HISPANIC COMMUNITIES IN THE US

Note: Alternative Credentials Market for Higher Education by Product and Geography - Forecast and Analysis 2021-2025, June 2022,
The Council of State Government (1952), Green (1969), Kleiner (1990), Kleiner (2006), Kleiner & Krueger (2013), Westat data, Bureau of Labor Statistics (2015-2021)

What the future holds

Professional licences, upskilling services, and micro-credentials are set to become the newest proof of skills for those seeking employment. Recent graduates and educators may find that their micro-credentials are what set them apart from other candidates.

SCALABLE AND COST-EFFECTIVE TRAINING MODELS

Organisations will continue building scalable and cost-effective training models to attract and retain the best talent due to the lack of skilled labour available and growing regulation in various professional end markets.

SHIFT TOWARDS ONLINE AND REMOTE

The shift towards online and remote learning post-Covid has also driven demand for more bespoke and individualised training.

UBIQUITY IN THE CORPORATE WORLD

Combining the above factors with the focus on providing underrepresented communities equal opportunity, all signs point towards professional licensure and micro-credentials becoming more ubiquitous in the corporate world, fuelling long-term growth for years to come.

Expert view

TYLER YORK, ACHIEVABLE

CO-FOUNDER AND CEO

Achievable

HOW WOULD YOU DESCRIBE THE OVERALL MARKET FOR PROFESSIONAL LICENSES?

Covid accelerated the digital transformation of learning in all areas. GSV expects the digital learning market to grow from $160bn in annual expenditures in 2019 to $1tr in 2027 - 26% YoY growth. In this transformation, 4.2 billion learners will be brought online in the next five years: 1.6 billion students and 2.6 billion workforce learners. The digital transformation of learning has produced multiple billion-dollar edtech companies, such as Coursera, Udemy, Duolingo, and Outschool. Coursera, Udemy, Udacity, Pluralsight, and many others either focus on professional education or have large, growing professional development business lines. Professional licensing is no exception given the rapid move to digital sparked by Covid-19 together with advances in technology that make digital and distance learning more effective. Many old incumbents still roll out the same online courses they created in the early 2000s and 2010s, but there's a lot of innovation in the space in the startup sphere, from Artificial Intelligence and Machine Learning (AI and ML), to advanced adaptive learning methodologies based on learning science. Unlike some early hyped edtech trends, these innovations have a big impact on student success and course effectiveness. Acquisitions of startups like Rosh Review and Osmosis, along with the success of challengers like UWorld, show that professional licensing is undergoing a similar digital transformation as the rest of the education world.

HOW HAVE PROFESSIONAL LICENSES CONTRIBUTED TO ENHANCING THE SKILLED WORKFORCE AND DIFFERENTIATING PROSPECTIVE EMPLOYEES?

We work with multiple regulated fields with licensing exams, notably FINRA for finance and wealth management, and the USMLE for professional medical licensing. Each of these industries has its own language and important (and legally consequential) rules. It's not always clear in the hiring process if a candidate will be able to pass these exams. In 2016, the pass rate for the FINRA Series 7 - at the time, the entry-level exam for wealth management - was 65%. Over one-third of the time, candidates could not pass their required licensing exam, and if they failed a second time, they'd lose their job and cost the firm an estimated $50,000 in sunk costs. To combat this, FINRA released the FINRA Securities Industry Essentials (SIE) exam, which can be taken by candidates before they apply for finance roles. Licensing exams like this is a great step forward: in providing a relatively gentle onramp to the licensing path of a regulated industry, and in making the exams accessible to candidates so that they can pre-qualify for said undustry. This is great for the hiring company. For example, the SIE covers the fundamentals that you'll need for any role in finance, regardless of the specialised field. But it's also better for the candidate: passing licensing exams is required for many roles in these licensed industries, and taking the entry-level licensing exam before applying gives candidates a chance to experience the licensing process and make an informed decision on whether it's right for them. I see more licensing moving in this direction, as it's practical and a win-win for both employers and candidates. Passing these industry-specific exams differentiates prospective employees from their peers in the hiring process, and gives the employer more confidence that they can handle the necessary licensing requirements that their career will entail.

WHICH INDUSTRIES HAVE BEEN THE QUICKEST TO ADOPT PROFESSIONAL LICENSING AND WHAT HAS BEEN THE LEVEL OF SUCCESS?

We're most familiar with the financial services industry, which is required by its self-governing bodies FINRA and NASAA to license all employees that serve or advise customers. They have been early adopters of new professional licensing advancements, including digital continuing education and the new FINRA SIE pre-licensing exam. Similarly, the medical industry has a robust set of licenses across all of its disciplines, with different licensing tracks for doctors, nurses, physician's assistants, and more.

When there's a significant negative consequence of not knowing the rules and regulations, these licensing exams are an important milestone for ensuring compliant and knowledgeable employees. These exams have been quite successful in preventing the kind of behaviour that organisations like FINRA are tasked with reducing. FINRA's new disciplinary actions filed have decreased every year for the last five years, as has the number of firms suspended or expelled. The system is clearly working at preventing the undesirable behaviours it was tasked to prevent.

ARE THERE ANY KEY RISK FACTORS TO CONSIDER IN THIS MARKET THAT MIGHT IMPACT FUTURE GROWTH?

Professional licensing is a fragmented market - each vertical and exam is different, with its own challenges, customer archetypes, and regulatory body. For our businesses, we have to approach each product line differently depending on the goals and needs of our customers. This increases the learning curve and means that success in one market may not beget success in another. However, the upside of this is that you're rarely going to see a major externality negatively affect all of your markets at the same time, as they are driven by different market forces. The main risk I see in professional licensing is the license creators themselves. They have to strike a careful balance between difficulty and ease. Make the exam too difficult and it stops being an accessible stepping stone for career progression and starts being an impassable gateway. A recent example of this is the CFA exam, which had its pass rates plummet from 45% in 2019 to 22% in July 2021, before reversing course and seeing pass rates rise back to 42% in May 2022. However, make the exam too easy and it stops having the needed weight in hiring decisions and joins the many certifications or nano degrees that do not show a demonstrable difference in candidate quality. This doesn't mean that an exam shouldn't have a high pass rate - the driver's license exam has a high pass rate but is also a very important qualification. But it does mean that in a professional context, it has to be difficult enough to have a real bearing on the qualifications of the candidate.

WHAT ARE SOME OF THE INNOVATIONS AND INTERESTING WORK BEING DONE WITHIN THE SPACE TODAY?

Adaptive learning was a hot buzzword in the 2010s - to the point that many startups over-promised and under-delivered on student success. In the past five years, that has changed dramatically, with many adaptive learning platforms seeing significant, provable improvements in student outcomes. Many startups, including Achievable, use AI and ML to digest thousands of data points to arrive at the optimal study experience for each student, creating a personalised learning experience that delivers better outcomes in less time. Spaced repetition, also known as spaced rehearsal, is another major trend in the licensing space today. Many licensing exams contain a ton of trivia, which must be memorised and successfully retained over time as they study the full body of the test material. Spaced rehearsal is a research-backed learning method that's proven to increase retention of information by 46% (Modigliani and Hedges (1987), and improve test scores by 45% (Karpicke & Roediger (2003)) when compared to traditional study methods.

Originally loved by language learners and other lifelong learning groups, spaced rehearsal is becoming a key trend in the professional licensing prep space, with many startups, including Achievable, incorporating it as the backbone of their adaptive learning experiences. Lastly, much like the rest of the media world, video is becoming more and more prominent as a learning tool for all kinds of subjects and exams. Asynchronous learning is on the rise, and for good reason – it's far more convenient and cost-effective than even live online classes. However, students still love the human element of a video learning experience, which provides a rich media palate with which the instructors can do their magic. Osmosis turned video into its primary offering before being acquired by Elsevier in 2021, and many startups, including Achievable, are leveraging more video than ever before in their course offerings.

WHERE DO YOU SEE THE FUTURE OF PROFESSIONAL LICENSING IN EDUCATION AND TRAINING?

Post-graduate career certifications will become more commonplace as firms and industries try to differentiate applicants and best-quality candidates for roles. There's a marked difference in both attitude and approach between a wealth management adviser doing outbound sales and an outbound tech sales development representative. Licenses like the FINRA SIE help companies and candidates better understand what they're getting into before making a hiring decision. That said, even as usage of professional licensing increases, I also expect pass rates to increase as candidates gain a clearer understanding of the criteria and test preparation firms improve their offerings with technology to help candidates pass. Advanced learning platforms are already empowering students to pass these tests more effectively and in less time. In a sense, there's no reason the pass rate of these exams shouldn't be 100% - there's a predetermined body of knowledge that one needs to know to pass, and all the candidate needs to do is put in the work. Candidates should pass these exams every time, like a driver's license. And yet, also like a driver's license, the fact that everyone passes doesn't diminish the importance of the license. This is the primary goal of Achievable - to have every candidate pass their exam the first time. Self-regulatory agencies like FINRA are preferable to direct government involvement because they act as intermediaries, balancing the needs and goals of the regulators and the industry they represent. This leads to a better understanding of regulatory goals and better dialogue between the parties. Every regulated industry deserves a good balance between regulation and freedom that gives them practical rules that keep customers safe while not overly hindering business operations or the ability to change.

WHAT ARE SOME OF THE INTERESTING THINGS THAT ACHIEVABLE IS DOING IN THIS SPACE?

Achievable was founded on the premise that adaptive learning is most effective when it's deeply integrated with the course material and learning platform - united together to create an enjoyable and productive learning experience for our customers. Our platform leverages AI, ML, and a spaced rehearsal-backed adaptive algorithm to dramatically improve student performance and create better outcomes in less time. We have built a question generation engine that's capable of creating thousands of high-quality questions from a single template, ensuring that students never take the same question twice and instead learn the underlying concept. Our ML essay grader for the GRE Analytical Writing section immediately grades students' writing with the same degree of accuracy as a human scorer and gives instant, actionable feedback. These are just small examples within the entire platform, which leverages technology to make learning engaging and effective regardless of the subject matter. Achievable recently partnered with NVIDIA's Inception programme, which is designed to nurture startups revolutionising industries with advancements in AI, ML, and data sciences. NVIDIA Inception will allow Achievable to accelerate its research and development efforts, assisting its team by providing access to cutting-edge technology, support, and training. The programme will also offer Achievable the opportunity to collaborate with industry-leading experts and other AI-driven organisations.

WHERE DO YOU WANT TO TAKE ACHIEVABLE? WHAT DOES SUCCESS LOOK LIKE OVER THE NEXT FIVE YEARS?

Our goal is to help people unlock opportunities in their lives. We've built a powerful learning platform that simplifies preparing for any licensing or certification exam, making it straightforward to study for and pass. We want to get this into as many people's hands as possible so that they can experience the power of our product and achieve their goals. Achievable currently serves the FINRA, USMLE, GRE, and ACT markets, and we are expanding into new markets each year. Our technology platform and the methodologies underlying it work for any content, so there's no reason why we shouldn't have a course for every professional exam - it's just a matter of building them and bringing them to market.

With every exam we bring online, we learn more about customer needs, course development, and go-to-market, creating a flywheel that will continue to improve as we grow. Our long-term vision is to become the place where candidates certify themselves for work in any industry. Professional licensing and certifications are exciting fields that, executed well, marry the best parts of online learning and apprenticeship-style training. We see a future where these post-graduate licenses become an important part of the fabric of each industry, and Achievable as the premier provider of preparation for those licenses.

Cybersecurity, particularly in primary and secondary education

Digital transformation has led to an uptick in cyber-attacks on schools and institutions, causing heightened concerns on privacy, data protection, and security.

CYBERSECURITY IN PRIMARY AND SECONDARY EDUCATION IN BRIEF

Technology has been highly advantageous to the education sector, but it has also introduced several new risks to data protection and privacy, impacting over 130,000 schools and 50 million students aged 5-18 in the US alone[1]. In the UK, 41% of primary schools, 70% of secondary schools, and 92% of higher education colleges have identified breaches or attacks in the last 12 months[2].

Since 2016, the K-12 Security Information Exchange – a threat intelligence sharing community for schools in the US – has tracked 1,331 publicly disclosed school cyber incidents, a number that only scratches the surface of the true total number of global cyber-attacks[3]. The figure only accounts for US attacks and does not include personal, unreported, and unknowing victim attacks that would significantly boost this number.

These incidents can be led by sophisticated cyber criminals from around the world, targeting often unsuspecting and even moderately trained school community members, suppliers, and vendors.

KEY FACTORS CAUSING CYBERSECURITY CONCERNS IN EDUCATION

- LACK OF PROPER CYBERSECURITY EDUCATION
- ABSENCE OF SET POLICY
- LACK OF FUNDING AND RESOURCES
- GENERAL UNPREPAREDNESS

SIGNIFICANT NEGATIVE EFFECTS OF GROWING NUMBER OF ATTACKS AND COMPLEXITY

- MAINTAINING A SAFE EDUCATIONAL ENVIRONMENT
- EDUCATION BUDGETS
- STABLE AND RELIABLE COMMUNICATION
- PROTECTION OF SENSITIVE STUDENTS AND EMPLOYEE DATA

Note: Security Infowatch.com "6 best practices for mitigating active shooter threats in schools" Patrick Fiel (August 2019); Gov.UK Official Statistics Educational institutions findings annex - Cyber Security Breaches Survey 2022 (July 2022); and K-12 Dive "K-12 cyber incident report calls for more public disclosure of cyberattacks" Anna Merod (March 2022)

COMMON MOTIVATION FOR CYBER-ATTACKS

- DATA THEFT
- FINANCIAL GAIN
- ESPIONAGE
- DISRUPTION

MOST COMMON CYBERATTACKS ON SCHOOLS

- **Data breaches:** Unauthorised users can view or change certain types of data.
- **Denial-of-service:** Networks are flooded with requests until they are no longer able to respond and crash, blocking users from accessing features including banking, emails, and websites.
- **Other:** Additional forms of cyber-attacks include meeting invasions, website and social media defacement, and Internet of Things vulnerabilities.
- **Ransomware:** Stolen data is encrypted, and districts are blocked from accessing it until they pay a ransom.
- **Phishing:** According to the Consortium for School Networking in the US, over 90% of cyberattacks today start with phishing, attacks that leverage social engineering to trick victims into handing over sensitive information including passwords or financial information(4). The effectiveness of these attacks is significantly correlated with the susceptibility of their victim, making children and pre-teens a key target.

CYBERSECURITY POLICY AND LEGISLATION

Cybersecurity has become one of the top priorities for planning, budgeting, and strategising among technology leaders from elementary to high schools in the US. Leadership within IT has become more essential than ever as educators and policymakers work to implement proactive approaches to security controls, including:

K-12 CYBERSECURITY ACT OF 2021

In October 2021, US President Biden signed the K-12 Cybersecurity Act of 2021 into law in response to the growing data security incidents impacting K-12 schools. The law authorises the US federal cybersecurity agency (CISA) to conduct a study on threats facing school districts and provide a guide on best practices to address the concern.

THE STATE AND LOCAL CYBERSECURITY ACT

The Act, also passed in 2021, authorised the use of $1bn for grants to state, local and tribal governments in the US – including school districts – to remediate cybersecurity threats and IT risks, with a portion being allocated to school districts.

STATE LEGISLATION

In 2021, state lawmakers introduced over 170 cybersecurity bills (51 of which were codified into laws) that focused either directly or indirectly on K-12, almost double the number of bills introduced in 2020(5). In New Mexico, state leaders are currently working to add $45m to the budget to create a cybersecurity programme by 2027.

In Europe, The Digital Education Action Plan sets out a common vision for digital education among European Union Member States and aims to support the adaptation of cybersecurity infrastructure, with a focus on relevant cybersecurity training for teachers and education providers.

In the UK, two-thirds of schools have a senior manager responsible for cybersecurity – 68% of primary schools and 64% of secondary schools, versus 34% of businesses and 62% of large businesses(6).

Note: Berkeley Extension "Cybersecurity in Education: What Teachers, Parents and Students Should Know" (2021)Berkeley Extension "Cybersecurity in Education: What Teachers, Parents and Students Should Know" (2021); EdTech "The K–12 Cybersecurity Act Becomes Law" Rebecca Torchia (October 2021); and Gov.UK (July 2022)

Why this is an increasingly critical issue

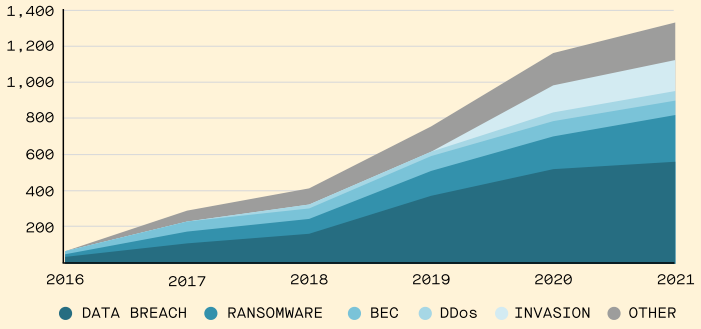
INCREASED ATTACKS

Check Point Research (CPR) recently published its Cyber Attack Trends: 2022 Mid-Year Report, which claims Education and Research still leads as the most targeted industry globally, with an average of 2,297 attacks against organisations every week in the first half of 2022, showing a 44% increase compared to H2[1] 2021.

In the US, a total of 1,331 publicly disclosed school cyber incidents, which when averaged over the past six years, is equivalent to one K-12 cyber incident per school day. Data breaches and ransomware attacks have experienced the largest increases while all categories have steadily grown[2].

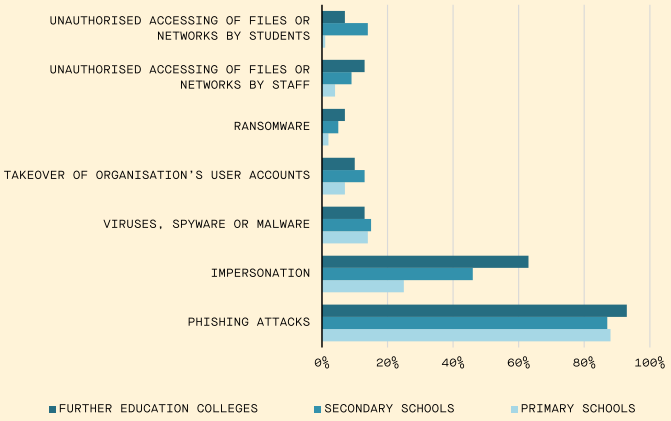
In the UK, phishing attacks and others impersonating an organisation in emails or online are the most common forms of cyber-attacks[3].

US: NUMBER OF PUBLICLY DISCLOSED K-12 CYBER INCIDENTS BY TYPE (2016-2021)



Source: K12 Six The State of K-12 Cybersecurity 2022 Annual Report

UK: TYPES OF BREACHES OR ATTACKS IN THE LAST 12 MONTHS (%)



Source: Educational institutions findings annex - Cyber Security Breaches Survey 2022

ACCELERATED DIGITAL TRANSFORMATION

Educational institutions and school districts have increasingly invested in technology, devices, and digitisation.

RAPID DEPLOYMENT OF DEVICES

In the US in 2020, K-12 education deployed millions of digital devices, increasing the total number of devices by users by 74% compared to 2019[4]. In conjunction, many districts had also set up WiFi hotspots for students and increased the number of apps and online programmes they were using on these devices.

In the UK in 2020-2022, when schools were forced to switch to remote learning due to Covid, the UK Department for Education provided approximately two million laptops and digital devices to schools, colleges, and academy trusts[5].

WIDESPREAD REMOTE LEARNING

The leap to online learning lead to countless new apps and programmes, and traditional security networks were not prepared for it. It further exposed the vulnerabilities within the security nets of institutions and opened the doors to potential risks.

Note: Check Point Research: Education sector experiencing more than double monthly attacks, compared to other industries (July 2022); K12 Security Information Exchange (K12 SIX) "The State of K-12 Cybersecurity: Year in Review – 2022 Annual Report" Douglas Levin (2022); Gov.UK Official Statistics Educational institutions findings annex - Cyber Security Breaches Survey 2022 (July 2022); Education Week "Schools Handed Out Millions of Digital Devices Under COVID-19. Now, Thousands Are Missing" Benjamin Herold (July 2020); and Gov.UK Official statistics Laptops and tablets (January 2022)

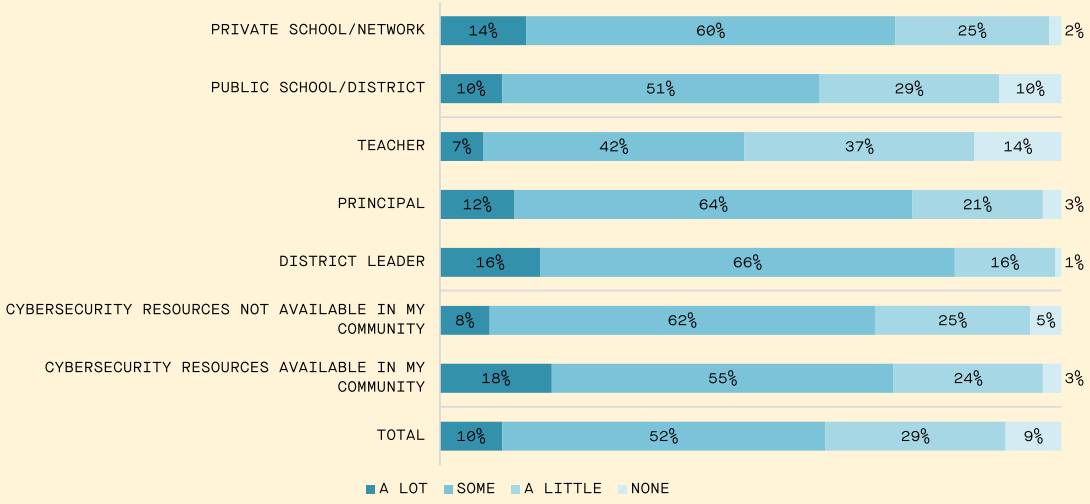
HISTORICAL LACK OF CYBERSECURITY IN EDUCATION

Educators and students have historically been unaware of cybersecurity best practices and the extent of danger present. It is rarely taught as a standalone course and is often merged into the broader school curriculum when it is taught.

In addition, it is often taught more in private schools, leaving public school students and underfunded school districts more vulnerable and susceptible to cyber-attacks. This gap in cybersecurity education stems from both an absence of sufficient policy and a lack of resources.

Less than half of respondents to a Cyber.org survey of 918 K-12 educators reported that their district offered cybersecurity education. Even when polled individuals knew about the resources offered in their community, they were equally unaware of alternative options available[(6)].

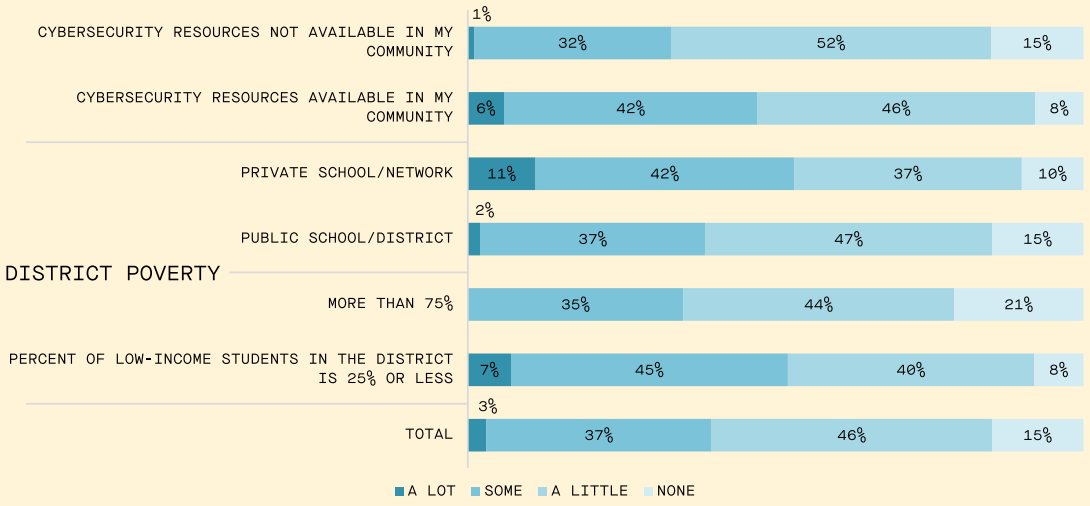
DEPTH OF US EDUCATORS' CYBERSECURITY KNOWLEDGE



Only 10% of US educators report in-depth cybersecurity knowledge

Source: K12 Security Information Exchange 2022 Annual Report

DEPTH OF US STUDENTS' CYBERSECURITY KNOWLEDGE



Only 3% of US students report in-depth cybersecurity knowledge

Source: K12 Security Information Exchange 2022 Annual Report

Note: EdWeek Research Center "The State of Cybersecurity Education in K-12 Schools" (2020)

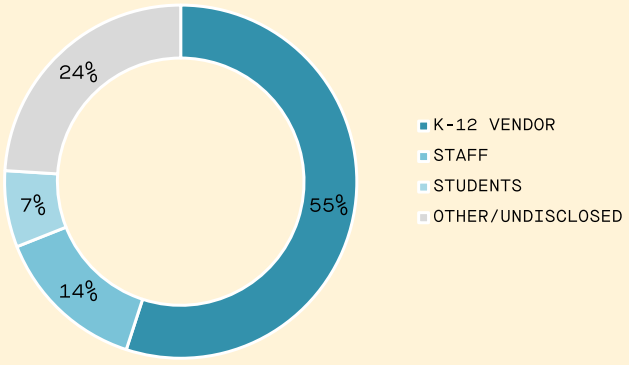
INCREASED DATA COLLECTION

Students are increasingly using more education applications and programmes, leading to vast amounts of data being collected and stored by third parties, which can be vulnerable to cyberattacks. In the US, data vendors are most targeted[7].

Outside of the US, there are two roles when it comes to ensuring General Data Protection Regulation (GDPR) compliance in schools – a data controller and a data processor. In the education sector, the school itself is usually the data controller. But even if relevant protocols are in place by the data controller, many vulnerabilities lie with the data processors, which include but are not limited to school photographers, shredding companies, software, online learning platforms, and online storage systems.

However, despite there being instances of hackers, ransomware and cybercrime, most breaches within the education sector in the EU are caused by human error[8].

US: INITIATOR OF K-12 DATA BREACH / LEAK INCIDENT



Source: Tech Reformers "K-12 Cyber Incidents Escalate, Report Shows" John Krull (May 2022)

SHORTAGE OF CYBERSECURITY PROFESSIONALS

There are currently 2.7 million unfilled cybersecurity positions globally[9]. In 2021, the need for cybersecurity professionals rose by 30% in the US, according to Clar Rosso, CEO of the nonprofit cybersecurity association (ISC)².

To respond to these emerging supply shortfalls, governments and universities have expanded education, degrees, and certification programmes. For example, US federal experts have begun encouraging K-12 cybersecurity curricula to help guide students in that direction. In the UK, the government has launched its National Cyber Strategy to strengthen the country's cyber ecosystem by building and shaping an education framework that delivers cyber talent via its CyberFirst training programme, which is designed to nurture young people into a cyber security career, as well as provide additional training for existing teachers.

US CYBERSECURITY LABOUR SHORTAGE[10]

17,000
CYBERSECURITY VACANCIES IN THE DEPARTMENT OF HOMELAND SECURITY

465,000
UNFILLED CYBER JOBS ACROSS THE NATION

36,000
SHORTAGE OF PUBLIC-SECTOR CYBER JOBS

Note: Tech Reformers "K-12 Cyber Incidents Escalate, Report Shows" John Krull (May 2022); Tech Reformers "K-12 Cyber Incidents Escalate, Report Shows" John Krull (May 2022); CPD Online College, Knowledge base "GDPR Compliance in Schools" Laura Allen (February 2022); Fortune Education "Companies are desperate for cybersecurity workers—more than 700K positions need to be filled" Sydney Lake (June 2022); 0) The Washington Post "The Cybersecurity 202: The government's facing a severe shortage of cyber workers when it needs them the most"

SURGING COSTS

The costs of cyber-attacks can be significant, with potential damages including wasted time, productivity loss, remediation costs, ransom costs, and loss of data.

The Ponemon Institute together with IBM Security estimates that the average cost of a data breach in education globally is $3.9m as of 2022. According to the report, for a twelfth consecutive year, the US ranks the costliest country for an average total cost of a data breach across all industries. It also leads the globe as having the most cybercrime.

In 2021, the most reported type of cyber-attack was ransomware, which can inflict severe financial damage, as shown by Maryland's Baltimore Country public school district hit by $9.7m in estimated costs from a ransomware attack.

KEY US CYBERSECURITY STATISTICS(11)

1,331

PUBLICLY DISCLOSED SCHOOL CYBER SECURITY INCIDENTS, 2016-2021

57%

OF ALL REPORTED RANSOMWARE ATTACKS IN AUG-SEPT 2020 TARGETED K-12 SCHOOLS

41%

OF HIGHER EDUCATION CYBERSECURITY INCIDENTS CAUSED BY SOCIAL ENGINEERING ATTACKS

55%

OF K-12 DATA BREACHES FROM 2016-2021 WERE RELATED TO SCHOOL DISTRICT VENDORS

37%

FOR THE FIRST TIME RANSOMWARE MADE UP THE MAJORITY OF PUBLICLY DISCLOSED K-12 CYBER INCIDENTS IN 2021

300%

INCREASE IN INSURANCE PREMIUMS OVER THE PAST YEAR FOR ORGANISATIONS THAT DO NOT HAVE CERTAIN PROTECTIONS IN PLACE

Note: 11SecuSolutions "Cyber Crime Statistics by Attack Type" (2021), Content Keeper "K-12 ransomware attacks are on the rise. Here's how to prevent them" (December 2021), Campus Technology "Cyberinsurance Companies Raising Rates, Tightening Requirements" Kristal Kuykendall (February 2022) and K-12 Dive "K-12 cyber incident report calls for more public disclosure of cyberattacks" Anna Merod (March 2022).

What the future holds

INCREASED REGULATORY OVERSIGHT AND ENFORCEMENT

In addition to regulation and legislation aimed at school districts and municipalities on cybersecurity protocols, 2022 is likely to see further scrutiny and regulation over the data collection practices of third-party applications and ed-tech companies that collect or use students' personal information. As an example, in 2021 the US Federal Trade Commission clarified that the Children's Online Privacy Protection Act (COPPA) can also apply to edtech applications and tools.

Early last year, OpenX Technologies was required to pay $2m to settle allegations that it had violated COPPA by collecting information from children under 13 without parental consent. US regulators have signaled they will continue to thoroughly review and examine these applications in 2022 as their widespread use continues even as the pandemic subsides.

RISING COMPLEXITY OF ATTACKS

The return to in-person education may have contributed to the decline in cyber-attacks but this was accompanied by an increase in potentially more damaging ransomware attacks on K-12 schools and districts. Institutions will continue to adapt to the new hybrid norm but will continuously need to keep raising the bar of security basics to protect students, or at a minimum to satisfy rising insurance requirements.

ENHANCED EDUCATIONAL OFFERINGS

Educators will continue to need to understand how to utilise technology safely and learn to be able to effectively promote and teach cybersecurity. In addition to increasing exposure to cybersecurity through classes and extracurriculars, a push is needed to make cybersecurity tools and knowledge more equitable by reaching smaller and lower-income school districts.

GREATER HIRING OF IT AND CYBERSECURITY PROFESSIONALS

Other industries have largely addressed hiring challenges by outsourcing components of their cybersecurity infrastructure and the education sector is likely to follow suit. In addition to on-property staff and IT teams, schools need to increasingly look for official full-time employees focused on data privacy and protection. Investing in staff and training would improve cybersecurity and avoid the significant costs involved with the remediation of breaches or denial of services which can cripple education networks and technology.

DATA GOVERNANCE FRAMEWORKS

Data governance is the process of identifying critical information across an institution or organisation. To ensure secure data management, schools and universities will more frequently rely on comprehensive data governance programmes and integrate them with network intrusion detection systems. One tool institutions can begin to deploy is centralised third-party apps with significantly improved authentication methods to verify identity across multiple channels and programmes.

ADVANCED TOOLS AND NEXT-GEN TECHNOLOGY

Some of the most popular tools to surface in response to cyberattacks are next-gen protection powered by artificial intelligence and machine learning, including security orchestration and automation and response tools. Another powerful tool to be further adopted in education is multifactor authentication, which like cybersecurity education itself, has not been implemented as fast or as systematically as in other sectors and industries.

IMPROVED VENDOR MANAGEMENT

From 2016-2021, 55% of K-12 data breaches in the US involved vendors such as ACT, Student Transportation of America, and Independent Health[1]. In the UK, only 30% of primary schools and 38% of secondary schools report monitoring risks from suppliers or the wider supply chain[2]. Moving forward, schools and universities will need to implement stronger vendor management and vetting protocols. In tandem, vendors and suppliers serving the education sector will be expected to improve their own cybersecurity practices.

Note: K-12 Dive "The State of K-12 Cybersecurity: Year in Review" 2022 Annual Report, and 2) Gov.UK "Official Statistics Educational institutions findings annex - Cyber Security Breaches Survey 2022 Updated" (July 2022)

Expert view

DAN VIGDOR, THRIVEDX

FOUNDER & CO-CEO

ThriveDX™

HOW WOULD YOU DESCRIBE THE OVERALL MARKET FOR CYBERSECURITY IN EDUCATION AND TRAINING?

Cybersecurity is one of the highest-paying and in-demand industries today. The global cybersecurity awareness training market size is over $18bn and projected to grow at CAGR value of 6.2% from 2022 to 2027. Cybercrimes have seen a 300% – 600% increase since the beginning of the Covid-19 pandemic, forcing companies to urgently seek skilled cybersecurity professionals. The global cybersecurity workforce needs to grow 65% to effectively defend organisations' critical assets. A recent cybersecurity skills gap study by Fortinet discovered that 80% of organisations globally suffered one or more breaches that they could attribute to a lack of cybersecurity skills or awareness. Additionally, the survey showed that organisations struggle to find and retain certified cybersecurity talent and the shortage of qualified candidates creates additional risks.

WHAT ARE THE MOST SERIOUS ATTACKS? WHAT ATTACKS ARE THE MOST COMMON IN EDUCATION AND TRAINING?

The most common type, phishing, accounts for over $12bn in business losses. Phishing attacks occur when an attacker pretends to be a trusted contact and entices a user to click a malicious link, download a malicious file, or give them access to sensitive information, account details or credentials. Malware attacks are also widespread, and these include spyware, ransomware, viruses, and "worms". When a user clicks on a malicious link, these are installed into the system. Lastly, ransomware is also extremely common. This is when users are denied access to files on their computer by encrypting files and demanding a ransom payment for the decryption key.

CAN YOU SPEAK TO THE EFFICACY OF CYBERSECURITY TRAINING IN EDUCATION AND ITS BENEFITS TO THE VARIOUS STAKEHOLDERS?

Firstly, regarding the benefits of training and education, we see that this solves one of the biggest challenges in the cybersecurity world, which is the talent shortage. With approximately four million unfilled jobs, the current talent pool is not enough, and we need to reskill millions of people globally to meet the demand. Secondly, training helps protect industries, nations, and the global economy - there are millions of cyber-attacks and cyber- crimes that cost hundreds of billions of dollars on an annual basis. It also affects the stability of nations and the safety of millions of people because of cyber-attacks on critical infrastructure. Cyber training and education, from behaviour-changing awareness programmes to advanced boot camps, is significantly lowering the risk from cyber-crime, contributing to many stakeholders including governments, enterprises, and individuals. Lastly, while every person's career journey is different, statistically we see our upskilling training programmes (including awareness, application security and others) provide 3x ROI on average to companies by risk reduction from cyber-attacks; and our reskilling programme, with emphasis on bootcamps, achieves more than 80% employment rates, solving the talent shortage, increasing diversity in the industry, and lowering hiring costs for chief information security officers and HR teams.

HOW IF AT ALL ARE YOU SEEING THE IMPACT OF THE TALENT GAP IN CYBERSECURITY?

Many livelihoods today are more digital than ever. Our critical resources, including public services, healthcare, energy, and transportation are all online. And threat actors know this. Taking down a large supply chain or critical power grid can cause significantly more chaos than cyber-attacks that have taken place in the past. Cybersecurity is now more important than ever. Attackers are becoming sophisticated and, as a society, we're increasing our digital identity and digital footprint. The dire need for cyber protection is clear – from the energy sector to academia, health, manufacturing, and finance. According to a 2021 Cybersecurity Workforce Study, the global cybersecurity workforce needs to grow by 65% to effectively defend organisations' critical assets.

WHAT ARE THE KEY MARKET RISK FACTORS THAT MIGHT IMPACT FUTURE GROWTH? HOW HAS FEDERAL LEGISLATION IN THE US IMPACTED CYBERSECURITY IN EDUCATION AND TRAINING?

In July, the National Cyber Director, Chris Inglis, hosted a National Cyber Workforce and Education Summit at the White House. The goal was to chart a path toward a more secure future in which all Americans can raise the bar on cybersecurity through greater awareness, education, and training. President Joe Biden issued a National Security Memorandum establishing voluntary cybersecurity goals that clearly outline our expectations for owners and operators of critical infrastructure, and the US Administration has also engaged with the private sector on the importance of prioritising cybersecurity as a central part of their efforts to maintain business continuity. The short-term economic downturn may reduce the money organisations spend on training, reskilling, and upskilling. But in the longer term, our solutions are recession-proof, as both cybersecurity solutions and online education solutions grow during economic crises.

WHAT ARE YOU MOST EXCITED ABOUT FOR CYBERSECURITY'S FUTURE IN EDUCATION? WHAT ARE YOUR TOP CYBERSECURITY PRIORITIES FOR THE NEAR FUTURE?

Our number one priority is creating a sustainable cyber talent pipeline. Another priority is to create meaningful social impact while at the same time fuelling the economy and protecting the US from cyber-attacks. Fuelling the digital economy is accomplished not by automating tasks but by filling the pipeline of qualified talent to fill tech jobs and bridge the digital gap. Lastly, it's changing the lives of learners who come from all walks of life. Providing institutions accessibility to a wider variety of financial options, such as workforce development funds, grants, and scholarships to lower the overall cost of learning, while giving the opportunity for greater professional mobility to all. Whether it be someone from an underrepresented or under-resourced group, ThriveDX provides access to a lucrative career path in an in- demand digital skills industry. Lastly, we aim to deal with Human Factor Security – as 95% of the cyber incidents involve the human factor, it needs to be defined as a standalone category in cybersecurity. We provide the necessary skills and talent end-to-end to every organisation to minimise cyber risks from the classroom to the boardroom.

WHAT ARE SOME OF THE INTERESTING THINGS THRIVEDX IS DOING IN THE CYBERSECURITY MARKET?

We just announced that we're launching the Global Cyber Talent Hub – the world's first united ecosystem of educators, government agencies and employers to raise cyber literacy, empower diverse demographics and build the cybersecurity workforce in the interest of national security and our daily way of life. This is the first of its kind and will serve as a comprehensive ecosystem designed to attract, retain, foster, and continuously develop cyber talent. The launch includes a founding set of industry partners including Carahsoft, Exclusive Networks, Ingram Micro Inc., Jacobs, Kyndryl, Liberty Mutual Insurance, Mandiant, and Marsh, and educators like New York University, University of Chicago, University of Michigan, and University of Wisconsin, who are committed to closing the cybersecurity talent gap and building a more diverse and inclusive workforce.

WHAT IS NEXT FOR THRIVEDX AND WHERE DO YOU WANT TO TAKE THE BUSINESS? WHAT DOES SUCCESS LOOK LIKE OVER THE NEXT 5 YEARS?

By improving equity in access to high-quality training in the most in-demand digital skills, ThriveDX is committed to impacting the lives of one million learners by 2030 and leading the market in growing the cyber talent pipeline globally. We commit to doubling down on bringing quality training and education to learners from under-resourced environments to further foster equity in education. Additionally, we're going to continuously enhance the quality of our current cybersecurity programmes to ensure we're providing skills with the latest trending technologies and content, to equip our learners with a solid foundation for starting a career in cybersecurity, bettering their lives and protecting our basic way of life.

Social media

Connecting students and teachers through several new touchpoints and enhancing the educational experience.

SOCIAL MEDIA IN BRIEF

According to Pew Research, 95% of teens have daily access to a smartphone and 46% report being online almost constantly [(1)]. As the use of these platforms has become ubiquitous among students, the initial reaction by schools was to block internet access and social media use.

As such policies proved ineffective, schools began embracing devices as a tool to enhance the in-school experience. Once seen as a distraction, social media has become the nexus for all digital interactions. A large part of our lives happens in this “digital world”, and it can take learning beyond the classroom.

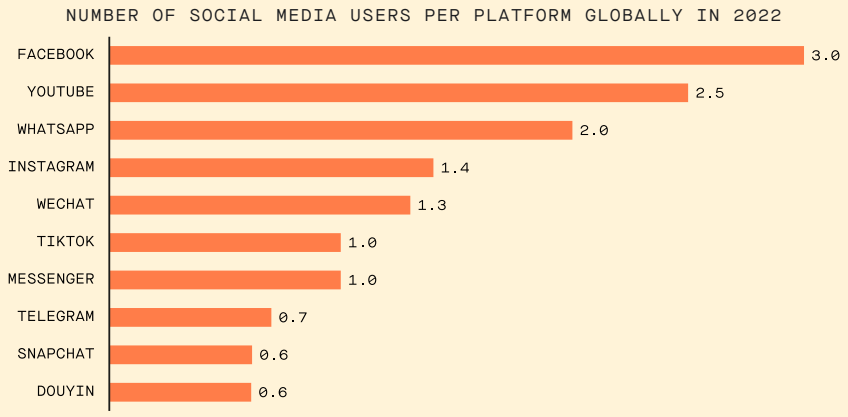
Note: Pew Research Center “Teens, Social Media and Technology 2022” (August 2022)

Why this technology is set to grow

Social media can be worked into classrooms by offering live lectures and discussions, providing forums for debate, questions or announcements, while also engaging students in their downtime. It facilitates easy access to submitting content across written, photo or video forms while also encouraging users to find relevant content and driving engagement through seamlessly sharing content.

PERVASIVENESS OF SOCIAL MEDIA

Over 70% of Americans under 30 use social media, and the rate is closer to 100% for students attending university[1]. In the EU, almost 90% of the 16-24 age bracket participate in social networks. Globally, Facebook is the most popular platform[2].

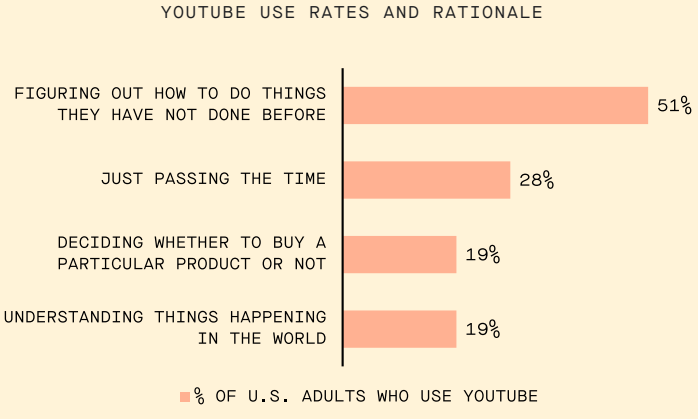


Source: DataReportal "World's Most-Used Social Media Platforms" (January 2022)

SOCIAL MEDIA GOES BEYOND JUST ENJOYMENT AND SHOPPING

YouTube EDU currently has over 700,000 educational videos that are classroom quality and millions of teachers and students around the globe use YouTube for learning every day. A major driver of YouTube's utilisation is self-directed learning, additional instruction, and access to materials that further inform students on topics they wish to learn more about.

This has strong implications for deepening education within curricula as well as supporting learning independently from educational institutions. Moreover, this extends beyond simple instructional videos. For example, an American Association for Anatomy study showed that 98% of medical school students also utilised YouTube for learning[3].



Source: GMI "YouTube User Statistics 2022" GMI Blogger (2022)

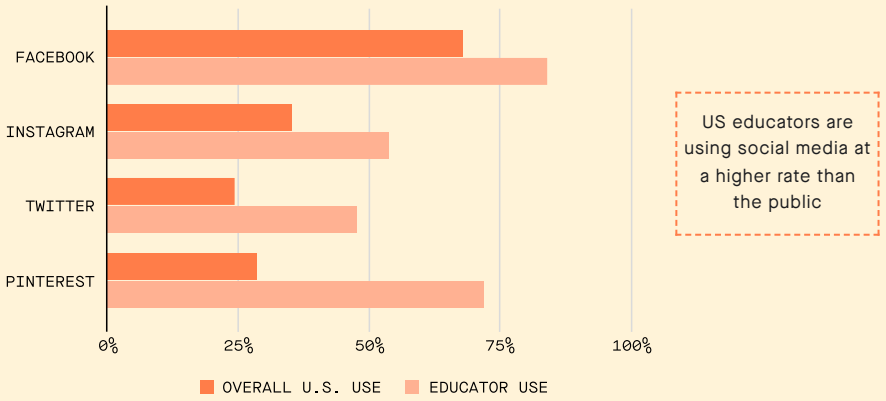
Note: Fierce "7 Ways to Use Social Media as College Classroom Learning Tools" Peggy Bresnick (May 2022); Eurostat "Do you participate in social networks?" (June 2021), and American Association for Anatomy " YouTube: An emerging tool in anatomy education" Akram Abood Jaffar (March 2012)

EDUCATOR INVOLVEMENT WITH SOCIAL MEDIA

Social media is an excellent platform for professional development as individuals can share ideas, and stay up to date and connect with other professionals in their fields. This is especially important in functions where innovation and creativity are key aspects of job performance.

For example, image sharing platform Pinterest, which educators use at over 2x the rate of the general population, is specifically designed to provide creative inspiration for its users and includes abundant content for teachers to share and learn.

OVERALL US USE AND EDUCATOR USE



Source: Dun & Bradstreet Division

MULTIPLE CHANNELS TO IMPROVE EDUCATORS' JOBS

There are multiple channels through which educators can enhance their job with social media. Lesson plans can be tailored or innovated to find the best strategies. The success and failures of this can be shared with relevant networks, allowing for feedback loops of experimentation to continuously refine the best educational methodologies. This also helps educators connect with others, receive deals on tools, and help increase their engagement.

All of these factors are particularly important given the significant resignation of educators in 2021. In the US, private institution resignations rose by 148% and public education increased by 40% from January to November of 2021, according to Chief Learning Officer Magazine[4].

US EDUCATOR USE WITHIN SOCIAL

Source: Dun & Bradstreet Division survey (2018)

Note: Chief Learning Officer "The Great Teacher Resignation" Lauren Dixon (May 2022)

Advantages of social media

SOCIAL MEDIA AS LEARNING CHANNELS AND PLATFORMS HAS SHOWN SEVERAL KEY BENEFITS.

1 COLLABORATION

Students use social media to work together remotely and to coordinate work and responsibilities.

2 STUDENT-CENTRIC APPROACH

As cultural norms shift, education systems can move in sync to keep their mediums up-to-date and engaging for students.

3 SENSE OF COMMUNITY

Parents, students and educators have ways to build community and connect with each other virtually. Concerns can be rapidly addressed, with an increased emphasis on extra-curricular social bonding that can holistically improve the educational experience.

4 MOTIVATION AND ENGAGEMENT

Technology can be fun and, when harnessed correctly, can directly lead to an improved classroom experience.

5 INFORMAL TUTORING

Students are able to leverage their personal networks with questions and advice that can augment their subject matter comprehension, help them complete work and catch up when they fall behind.

6 PREPARATION FOR THE 'NEW NORMAL'

Social media has proliferated passed personal use and is deeply imbedded within professional culture. Preparing students for these mediums in a non-personal setting is a helpful tool to general readiness.

7 ACCESSIBILITY

Vast amounts of free and easily accessible information is stored online, and social media can help students self-generate content and then share it across a wide audience.

8 EDUCATIONAL RECRUITMENT

58% of future students considered putting a college or university on their application list after looking at their social media presence(1).

Note: Fierce "7 Ways to Use Social Media as College Classroom Learning Tools" Peggy Bresnick (May 2022)

What the future holds for this technology

WEB 3.0

Education is increasingly becoming decentralised and personalised – all fields in which Web 3.0 applications can be a value-add. Web 3.0 can allow users to gather skills and certifications from a wide range of sources that they can then aggregate in their own wallets. Learners can pick and choose the best educational content while building their block-chain verifiable educational resume for employers and other stakeholders to view.

WEB 1.0

Knowledge transfer directly from educational institutions like universities and high schools

WEB 2.0

Opened centralised platforms for distributing education, like online course providers edX and Khan Academy

EDUCATION AND JOBS

Social media is dominating the marketing industry as the presence of influencers and brands has increased in importance. The number of jobs and opportunities within this space have multiplied, and educational courses offering lessons in the segment will continue to expand. Furthermore, the way that trends and culture adapt within social media changes rapidly, so there will be a need for continuous education within the space.

TEACHING IN THE METAVERSE

As the metaverse rises to popularity and social media companies look to engage students, there will be a strong push for applications in and out of the classroom. Given the trends towards digitisation and remote learning, a digital classroom in the metaverse hosted through a social media platform could become part of the normal curriculum within education along with many other potential applications in the future.

Expert view

CHAKRAPANI APPALABATTULA, BLOOMZ

CO-FOUNDER AND CEO

HOW WOULD YOU DESCRIBE THE OVERALL MARKET FOR COMMUNICATIONS PLATFORMS WITHIN EDUCATION?

The communication landscape has transformed tremendously over the years and is now moving towards the 3.0 generation of unified platforms. As mobile technology penetrated, there were a lot of point apps on the market, but they all did very specific things, forcing schools and district administrators to use too many tools to communicate with their families. This would lead to things getting lost in the shuffle. Overloaded parents often ended up missing important messages, leading to further disengagement and frustration. Bloomz is a parent-teacher communication app that combines all tools in one simple platform. We take the maturity of the tools to a whole new level including the Positive Behavioural Interventions and Supports (PBIS) and Social and Emotional Learning (SEL) communications, which are integral for schools and districts. Over the years, investments have been made into 2.0 technologies and now more money is flowing into 3.0 technologies. Taking Remind and ClassDojo as samples, they raised a lot of capital with user growth, but their business models are still evolving and are not considered unified platforms for an entire district in the US. ParentSquare is another platform demonstrating the disruption of the communication landscape but lacks critical PBIS components leading to additional points. Bloomz's integrated approach to offering PBIS components is disrupting the entire communication landscape by eliminating the need for many specialised solutions such as Liveschool, Seesaw, Kickboard, PBISRewards, SWIS, and Panorama Education.

WHAT ARE SOME OF THE BENEFITS OF THESE PLATFORMS FOR BOTH EDUCATORS AND STUDENTS?

With the unified communication platforms, schools are delighted to unify all family interactions in one system, save money, improve contactability, and streamline their communications. Teachers love having one unified system to interact and deepen connections with their families. Parents are thrilled because they just log into a single app and feel more engaged and connected to their children's education.

Students are engaged and perform better because they feel more connected to their teachers and parents. More than any other app on the market, Bloomz is positioned as not just a communication app but a complete communication management system for entire schools or districts. We have everything needed to track, analyse and reward student behaviour, both in the classroom and across the school. Bloomz offers the following:

Attendance, Grade & Balance Notices: Parents can see attendance records without waiting for a report card in the mail.
Social Media, Homepage & Web Sharing: The more mediums you can reach parents on, the better. Also means schools don't need to invest in social media scheduling software.

Attendance Management: Admins can create and schedule student-specific notifications to be automatically sent at recurring intervals for attendance, lunch balances, grades and bus route updates.
Events & Appointments: A centralised calendar and diary reminders, which make participatory opportunities accessible to all. Saves time for admin and ensures parents can make appointments.
Health Documents & Permission Slips: Simplifies the health screening process with question categorisation, automated alerts for positive submissions, and detailed administrator reports.
Customisable Groups, Subgroups, & Roles: Subgroups inside classrooms allow supporting staff like counsellors, speech therapists, special-ed, aides, paraprofessionals and more, to share information with parents and guardians.
Classroom, Group & Private Messaging: Safe sharing of information through posts, scheduled announcements, groups, or private messaging.
Office-hour scheduling & volunteer opportunities: Saves time by streamlining conference and office-hour scheduling, classroom volunteer opportunities, and supply wishlists.
PBIS Behaviour Management: PBIS behaviour management system allows schools to prevent negative behaviours by reinforcing positive ones.

ARE THERE ANY KEY RISK FACTORS TO CONSIDER IN THIS MARKET THAT MIGHT IMPACT FUTURE GROWTH?

There has been a systematic change in schools and districts in the US to consolidate and unify communications. Covid-19 only made our software more essential, and if there was another big variant, that would probably increase the demand for communication apps all around. Many EdTech investments failed due to their inability to respect inherent forces present in the education industry, which are security, proprietorship, institutionalisation, consolidation, expansion, and synergy.

WHAT ARE SOME OF THE INNOVATIONS AND INTERESTING WORK BEING DONE ACROSS THE INDUSTRY TODAY?

The real innovation is eliminating the siloed environment in schools with unified all-inclusive platforms like ours. We anticipate the whole industry will be forced to move in this direction to be relevant in the new era.

WHERE DO YOU SEE THE FUTURE OF COMMUNICATIONS PLATFORMS IN EDUCATION AND TRAINING?

Communication apps will continue to be adopted by schools until every school is on one. Because of the one-use and tailored nature of most apps, schools and districts will slowly start adopting more and more all-encompassing, completely integrated solutions. We predict that point solutions and custom school apps will become obsolete, while two-way dialogue will become the norm, but communication will remain on schools' terms.

WHAT ARE SOME OF THE INTERESTING THINGS THAT BLOOMZ IS DOING IN THIS SPACE?

We continue to innovate to move ahead and unify more digital tools under one roof to fulfil the promise of an all-in-one communication platform. An example of this is how Bloomz has been innovating in the PBIS domain to bring the toolset that streamlines and motivates kids with a positive behaviour intervention and support system.

WHERE DO YOU WANT TO TAKE THE BUSINESS? WHAT DOES SUCCESS LOOK LIKE OVER THE NEXT FIVE YEARS?

We want Bloomz to become synonymous with "3.0 generation of unified school communications platform". Success to us is seeing most schools and districts in the US realising the need to transition to Parent Engagement 3.0 platforms. Schools adopting unified platforms will increase parental engagement, and result in improved student outcomes. We want schools utilising integrated PBIS and SEL components that will be equipped with tools to identify threats and proactively act on them so that they save lives and eliminate security risks.

Methodology

This report is based on the expert insights of GP Bullhound's worldwide team alongside detailed analysis of the most prevalent trends across the education technology landscape, intended to provide insights into emerging and existing tailwinds that we view will propel the industry for years to come.

Our sources only include public data and information, and the accuracy of our dataset is limited to the disclosed.

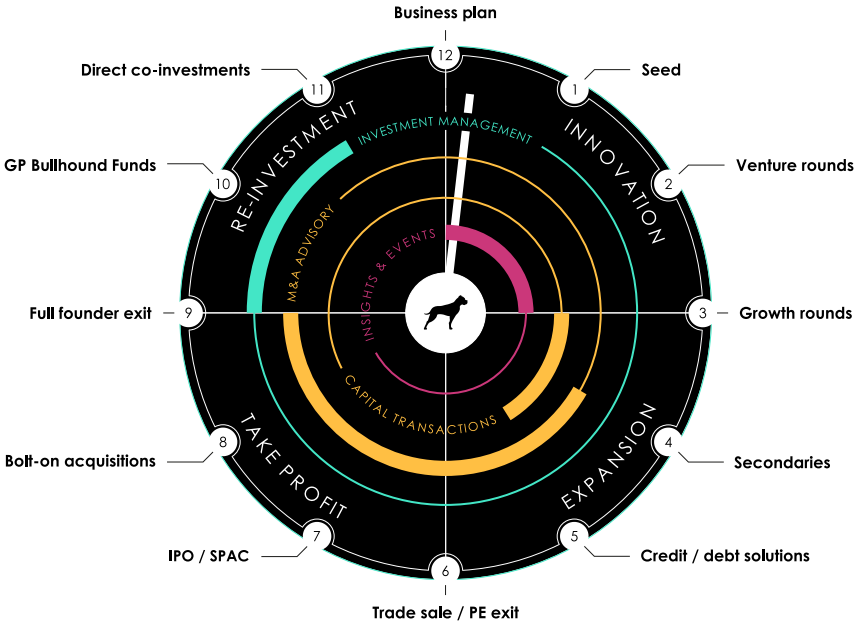
Independent of our findings, we have interviewed various C-Suite executives who operate successful businesses within education technology to provide their own unique insights into emerging trends and the future of the industry.

About GP Bullhound

GP Bullhound is a leading technology advisory and investment firm, providing transaction advice and capital to the world's best entrepreneurs and founders. Founded in 1999 in London and Menlo Park, the firm has 12 offices spanning Europe, the US, and Asia. For more information, please visit www.gpbullhound.com.

GP BULLHOUND'S ENTREPRENEUR CLOCK

GP Bullhound partners with entrepreneurs throughout their founding journey, supporting them with advisory, capital, insights and access to our global network.



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