

Curriculum Advisory Committee  
September 19, 2019  
Agenda

\*\*Location: Nordonia High School Google Lab, room 205

As you enter the high school grounds, please continue to drive towards the back of the building (towards the football field). You can park on your left hand side, before you turn towards the football stadium. There is an overhead door on the side of the building that faces this parking lot. Please enter through the side doors and down the hallway. After you pass the gym doors, you will find the 200 hallway on your left. Room 205 (Google Lab) will be on your left as you start down the hallway.

5:00 Start Time

- A. Review Portrait of a Graduate work and product
- B. Discuss ideas for communicating Portrait of a Graduate work
  - a. School board presentation
  - b. Principals share work at staff meetings
  - c. Hanging banners
  - d. Social media and newspaper
  - e. Other ideas....
- C. Provide overview of next steps
- D. Introduce leaders and organize groups
- E. Remainder of time is for groups to organize next steps

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# Future of the Classroom

Emerging Trends in K-12 Education  
Global Edition



# Foreword

We believe that every student and every educator, in every classroom, deserves the tools and skills that set them up for success in building the future they want for themselves.

Education is evolving at a faster pace than any other period in recent history. Because of this, it's more important than ever to understand how and where it's changing so that educators and schools can support students in preparing for challenges and careers that don't exist today. This report aims to identify and examine research-based shifts in classroom education that are taking place around the world.





## Our approach

This report is part of a series on the evolution of K-12 education, mapping out current and emerging trends in classroom education. In collaboration with our research partner **Canvas8**, we conducted a global analysis spanning:

- Fourteen expert interviews with global and country-specific thought leaders in education
- Academic literature review focusing on the last two years of peer-reviewed publications
- Desk research and media narrative analysis across the education sector, including policy research and teacher surveys

We acknowledge that some of the areas discussed in this report are ones that overlap with Google-led products and programs. In order to maintain a focus on the research and studies presented, we've intentionally excluded them.

# We identified 8 emerging trends in K-12 education



Digital  
Responsibility



Computational  
Thinking



Collaborative  
Classrooms



Innovating  
Pedagogy



Life Skills & Workforce  
Preparation



Student-led  
Learning



Connecting  
Guardians & Schools



Emerging  
Technologies



# Digital Responsibility

Parents want schools to help students to have healthy relationships with technology, and to be safe and confident explorers of the digital world.

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## DIGITAL RESPONSIBILITY

# What's driving it?

There have been endless media headlines covering Silicon Valley parents' decisions to raise their kids without tech and send them to tech-free schools, sparking discussions around the role of technology in education.<sup>1</sup>

At the same time, children are online at a younger age than ever before – people under 18 account for an estimated one in three Internet users globally.<sup>2</sup> In the US, more than 39% of young people get a social media account by the time they're 12 years old,<sup>3</sup> as do over 46% of those in the UK.<sup>4</sup> These conditions have created a desire to help students develop a healthy, responsible relationship with technology – something that often falls under the jurisdiction of the education system.



99%

of UK teachers say that online safety should be part of the school curriculum.<sup>7</sup>

Google (2018)

**“So I think it’s not about technology itself, it’s about pedagogy. How do you use technology in learning? Nowadays we have to be aware of safety issues of technology, the ethics of technology. I think it’s now a natural part of everything that we learn.”**

Anneli Rautiainen, Head of Innovation Unit at Finnish National Agency for Education

## DIGITAL RESPONSIBILITY

# What's happening?

Research shows that including online safety within the school's curriculum is key to helping children become safe and responsible users of technologies, especially if they are taught how to manage, rather than avoid, risks online.<sup>5</sup> But while many schools focus on teaching children functional digital skills and providing them with one-way online safety messages, there is room to promote a more interactive and dynamic pedagogy.<sup>6</sup>

Considering that 37% of UK teachers have seen an online safety incident in their school, it's not surprising that 99% say online safety should be part of the curriculum.<sup>7</sup> In the UK and Italy, government education policies are evolving to reflect this need, making digital citizenship compulsory in schools.

**“Digital citizenship and digital literacy programmes are about more than learning how to use something. They must navigate the challenge of encouraging a healthy relationship with technology as a whole.”**

Vikas Pota, Group CEO of Tmrw Digital and Chairman of the Board of Trustees of the Varkey Foundation



# Where are we seeing it?

## USA

The average amount of time Americans under 8 years old spent with mobile devices each day tripled between 2013 and 2017.<sup>8</sup>

## SPAIN

60% of teachers in Spain say that teaching digital competence and responsible use is one of the main advantages of using technology in the classroom at a pedagogical level.<sup>10</sup>

## UK

99% of UK teachers think online safety should be part of the curriculum. In 2020, guidance from the Department of Education will focus on helping young people keep personal information safe, challenge harmful content and balance their online and offline worlds.<sup>7</sup>

## NEW ZEALAND

According to a 2017 study from Monash University, 54% of Kiwi parents would like teachers to do more to help keep their child safe online.<sup>9</sup>

## DIGITAL RESPONSIBILITY

# In numbers

## 59%

of teachers in Mexico say that teaching digital competence and responsible use is one of the main advantages of using technology in the classroom.<sup>10</sup>

Blink Learning (2018)

## 73%

of parents in the UK are concerned about their kids accessing inappropriate material online.<sup>73</sup>

UK Children's Commissioner (2017)

## 52%

of teachers in Spain say they would like to receive more training in digital security and competence.<sup>31</sup>

Informe de resultados España (2018)

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The average amount of time Americans under 8 years old spent with mobile devices each day tripled between 2013 and 2017.<sup>8</sup>



# Further Reading

## Journal of Educational Technology & Society

### Patterns of Inclusion: Fostering Digital Citizenship through Hybrid Education (2018)

Alex Young Pedersen (Denmark) et al.

Reconsidering the concept of digital citizenship and the essential component of education the authors propose that the concept of Hybrid Education may serve both as a guideline for the utilization of digital technologies in education and as a methodology for fostering new forms of participation, inclusion and engagement in society. The paper presents a theory-based, value driven and practical oriented framework for innovation in education.

## New Media & Society

### Defining and measuring youth digital citizenship (2016)

Dr. Lisa M Jones (USA) et al.

There is an increasing interest in improving youth digital citizenship through education. However, the term 'digital citizenship' currently covers a broad range of goals. To improve education, the current article argues for a narrower focus on (1) respectful behavior online and (2) online civic engagement. Using this definition, a digital citizenship scale was developed and assessed with a sample of 979 youth, aged 11–17 years, and confirmatory factor analyses (CFAs) supported measurement of both constructs.

## LEARNING Landscapes Journal

### Sound, Smart, and Safe: A Plea for Teaching Good Digital Hygiene (2017)

Dr. Alissa Sklar (Canada)

The concept of “digital hygiene” addresses the way digital technology can be integrated into our lives in safe, healthy, responsible, and respectful ways. Teaching kids about digital hygiene requires parents to be confident about their role as models and guides for the use of these devices. This commentary addresses the need for broadening the notion of digital hygiene with input from kids and teens, then educating and supporting parents (and educators) in its application.



# Life Skills & Workforce Preparation

Parents and educators want children to have a more holistic education that goes beyond standardized testing to include social and vocational skills.



## What's driving it?

As more value is placed on soft skills – research suggests that higher levels of emotional intelligence are linked with better leadership and ability to cope with pressure (Saini, 2018) – there is a desire to help students develop such abilities at school.<sup>11</sup>

Meanwhile, concerns are growing about how current curriculums will prepare students for adult life – people are looking for a more holistic education that includes general life skills, rather than focusing on memorizing and repeating information. It means academic success isn't seen as the only way to prepare students for the future. For example, 90% of the Australian public say that education should place a higher value on practical vocational skills.<sup>12</sup> In the UK, just 44% of young people feel prepared for employment and 81% want their school or college to expand their offerings of vocational qualifications.<sup>13</sup>



53%

of UK teachers believe that life skills are more important than academic qualifications to young people's success.<sup>15</sup>

Sutton Trust (2017)

**“Addressing a problem from different disciplinary perspectives is important. This is not only what students need to do when they enter the workforce. This is what we need to solve the big problems that we face, like climate change.”**

Dr Hanna Dumont, Educational Psychologist and  
Researcher in International Education

# What's happening?

With 91% of CEOs globally saying that they need to strengthen their organisation's soft skills to sit alongside digital skills, the workplace is already looking to improve soft skills.<sup>14</sup> In schools, this is resulting in skills such as empathy, confidence, articulation and teamwork being incorporated into lessons to be taught alongside traditional subjects like Maths and English.

In the UK, 53% of teachers believe such skills are more important than academic qualifications to students' success – and 72% believe their school should increase the teaching of them.<sup>15</sup> In some markets, it is resulting in backlash to standardized testing, which is being perceived as inaccurate and putting less academic students at a disadvantage. For example, 85% of Australian teachers feel that standardized testing is ineffective as a method for truly assessing the real abilities and knowledge of students.<sup>16</sup>

**“Learning virtues and values such as empathy and kindness, and developing emotional intelligence are equally as important as the math and science lessons that we teach, in order for children to understand themselves, their connection to others and to the world.”**

Nastaran Jafari, Independent International Education Consultant

# Where are we seeing it?

## USA

75% of Americans think budgeting should be part of the school curriculum, while 71% want to see CPR introduced in school syllabi.<sup>17</sup>

## UK

In the UK, 88% of young people, 94% of employers and 97% of teachers say life skills are as or more important than academic qualifications.<sup>15</sup>

## NEW ZEALAND

Two-thirds of parents in New Zealand believe it was the responsibility of teachers to impart lessons traditionally handled at home.<sup>19</sup>

## In numbers

91%

of CEOs globally say that they need to strengthen their organisation's soft skills to sit alongside digital skills.<sup>14</sup>

PWC (2018)

72%

of UK teachers believe their school should increase teaching of them.<sup>15</sup>

Sutton Trust (2017)

85%

of Australian teachers feel that national standardised testing is ineffective as a method for teachers to use to assess students.<sup>16</sup>

Australian Education Union (2018)

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**“We know that from our research and looking at big data, that 21st century skills are just as strong a predictor of long-term job successes as technical skills. In the complex new world of work, the transferability of those skills will enable young people to navigate a world where jobs are going to be affected by automation, globalisation and increasing flexibility.”**

Alex Snow, Head of Research at The Foundation for Young Australians



# Further Reading

## Teaching and Teacher Education Journal

**Designing global futures: A mixed methods study to develop and validate the teaching for global readiness scale (2017)**

Dr. Shea N. Kerkhoff (USA)

In response to globalization, leaders have called for more global education in K-12 schools. This study utilized a sequential exploratory mixed methods design to validate the construct teaching for global readiness. After exploratory qualitative analysis of 24 expert teacher interviews, an instrument was developed and administered to K-12 U.S. classroom teachers.

## European Journal of Engineering Education

**What do K-12 students feel when dealing with technology and engineering issues? Gardner's multiple intelligence theory implications in technology lessons (2017)**

Dr. Jesús Sánchez-Martín (Spain)

This research presents a preliminary evaluation of how relevant is Gardner's multiple intelligence theory (MIT) in the teaching-learning process within the technology lessons. Interest on engineering and scientific studies can be fostered from the earliest years of academic instructional process, and an understanding of the emotional skills involved can play a role.

## PNAS Journal

**Skill discrepancies between research, education, and jobs reveal the critical need to supply soft skills for the data economy (2018)**

Dr. Katy Börner (Germany)

Rapid research progress in science and technology (S&T) and continuously shifting workforce needs exert pressure on each other and on the educational and training systems that link them. Educational institutions aim to equip students with skills and expertise relevant to workforce participation for decades to come, but their offerings sometimes misalign with commercial needs and new techniques forged at the frontiers of research.



# Computational Thinking

Parents and teachers want students to develop problem solving alongside digital skills so they will be better prepared for future jobs.



## COMPUTATIONAL THINKING

# What's driving it?

Globally, 92% of future jobs will need digital skills and 45% of jobs will require workers who can configure and work confidently with digital systems and technology.<sup>20</sup> The OECD has also highlighted that students entering schools in 2018 will face future challenges that can't even be predicted today.<sup>21</sup> This narrative is affecting attitudes towards education – STEM education is becoming increasingly vital in the classroom to prepare students for the tech challenges of the future.

Access to digital skills is no longer perceived as a plus; it is now seen as a right for every student. There's a call for curriculum changes to reflect this shift – 42% of Australians maintain that the current curriculum is inadequate and 30% are not confident that children are being prepared for future jobs.<sup>22</sup>



79%

more jobs related to STEM have emerged since 1990 and this is expected to grow a further 13% by 2027.

Pew Research Center (2018)

**“I don't think schools can manage without coding and STEM. In Finland, we have had coding in the curriculum starting in the first grade; it is not taught separately, but through the thinking of various subjects.”**

Anneli Rautiainen, Head of Innovation Unit  
at Finnish National Agency for Education

## COMPUTATIONAL THINKING

# What's happening?

To give students the best start possible, schools are looking to help them develop a toolkit of technical skills – such as problem-solving, coding and a good understanding of STEM subjects. The idea is that these will prepare them for future technologies and challenges.

Responding to this initiative, the Australian Government has allocated more than \$64 million to support early learning and school STEM initiatives as part of the Inspiring all Australians in Digital Literacy and STEM measure. Meanwhile, the Digital Technologies in Focus programme in Australia supports 160 disadvantaged schools by providing digital technologies expertise to school teachers and school leaders.<sup>23</sup>

**“I place a greater importance on computer science education or computational thinking and take it one step further than that to ask - how do you teach kids to design AI algorithms? The foundations for this lay in computer science education, and that is such a specialist area that I think we should be investing resources into promoting this in schools.”**

Vikas Pota, Group CEO of Tmrw Digital and Chairman of the Board of Trustees of the Varkey Foundation

# Where are we seeing it?

**USA**

By 2020, experts forecast that 1.4 million computer science jobs will be available in the US, but only 400,000 computer science graduates are expected to fill them.<sup>24</sup>

**BRAZIL**

85% of Brazilians aged 16-23 want to work in the tech sector.<sup>25</sup>

**SWEDEN**

Since summer 2018, coding is a core subject in Sweden – it is now taught from year one in primary school.<sup>26</sup>

**GERMANY**

40% of university students in Germany are enrolling in STEM degrees, as these areas are seen as 'safe' career paths.<sup>27</sup>

## COMPUTATIONAL THINKING

# In numbers

92%

of future jobs globally will need digital skills.<sup>20</sup>

ZDNet (2018)

93%

of American teachers believe computational thinking in K-12 involves using heuristics and understanding algorithms.

*Computational Thinking in K-12: In-service Teacher Perceptions of Computational Thinking: Foundations and Research Highlights (2018)*<sup>91</sup>

40%

of new students in Germany are enrolling in STEM degrees, as these areas are seen as 'safe' career paths.<sup>27</sup>

OECD (2017)

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**“The measured ways of return to people are much higher if they have system-based skills and ways of thinking. It’s the biggest predictor of wage returns. One of the biggest mistakes that we have made is that a very high proportion of people give up all mathematics and all STEM at 16.”**

Rachel Wolf, Founding Partner at Public First

# Further Reading

## K-12 STEM Education

### Attempting STEM Education in Informal Japanese Educational Facilities Through the Theme of "Sand" (2018)

Dr. Shoko Sakata (Japan)

The Shizuoka Science Museum RU KU RU and the Lifelong Learning Centers in Shizuoka City, Japan, hold many class sessions for elementary school students. At these sessions, scientific experiential programs are provided to cultivate children's interests and curiosities in nature and science. The authors focused on one of the experiential programs and explored ways to make STEM education programs based on the expected science-education programs of the future.

## TechTrends Journal

### Developing Computational Thinking with Educational Technologies for Young Learners (2018)

Dr. Yu-Hui Ching (USA) et al.

The aim of this article is to provide an overview of the opportunities for developing computational thinking in young learners. It includes a review of empirical studies on the educational technologies used to develop computational thinking in young learners, and analyses and descriptions of a selection of commercially available technologies for developing computational thinking in young learners. The challenges and implications of using these technologies also are discussed.

## Computers in Human Behaviour

### Exploring the computational thinking effects in pre-university education (2017)

Dr. García-Peñalvo (Spain) et al.

Several countries have usually adopted several priorities for developing ICT competences from kindergarten to secondary education. Most of them are focused on the development of key competences and/or coding skills. Although coding may be very attractive for young students and a very good practice or experience, it could be more interesting to develop students' logical thinking skills and problem-solving skills throughout programming approaches or computational thinking.



# Student-led Learning

There is a desire to give students more agency over their education, from what they learn to how the classroom operates.





## STUDENT-LED LEARNING

# What's driving it?

With increasing recognition of the importance of transitioning students from school to the outside world, student autonomy has become a key area of focus. Education leaders argue that 'student agency must become the norm, not the exception.'<sup>28</sup>

Leading this trend, professor of Educational Technology Sugata Mitra (Newcastle University) has been quoted as saying that a free and safe environment coupled with digital infrastructure and an uninformed mediator can result in children passing final exams independently of a teacher.<sup>29</sup> The importance placed on student-led learning can also be seen in individual countries – 76% of teachers in Mexico and 64% of teachers in Spain say autonomous learning is one of the biggest advantages of using technology in the classroom at a pedagogical level.<sup>30 31</sup>



64%

of teachers in Spain say autonomous learning is one of the biggest advantages of using technology in the classroom at a pedagogical level.<sup>31</sup>

Informe de resultados España (2018)

**“There shouldn't be a teaching-led versus student-led discussion. There should be a more nuanced discussion about which conditions make teacher-led activities better, and which conditions make student-led activities better. The idea is to be as flexible as possible. To really adapt to what each student needs.”**

Dr Hanna Dumont, Educational Psychologist and Researcher in International Education

## STUDENT-LED LEARNING

# What's happening?

Globally, schools are updating their teacher-student structures to offer students agency over their education and educational environments. Growing in international popularity, Sudbury schools reimagine formal education by promoting student-led learning: students choose their own activities and learn through everyday experiences outside the context of strict classrooms, curriculums and grades. Instead of traditional teacher-student power relationships, teachers and students are given equal votes in these schools. Significantly, Sudbury schools are open to all types of learners, from kinaesthetic learners to differently abled learners.<sup>32</sup>

In Japan, research shows that passive learning techniques fail to engage learners – 91.2% of Japanese high school students say that their classes are designed to have students memorize textbook content, while only 16.6% report that their classes require them to conduct independent research, write reports, and make presentations.<sup>33</sup>

**“There’s student-centered learning in more minor ways and that can be students not controlling things like the curriculum, but having a much stronger voice through student counsels on how the school is organized, how things that are not part of the curriculum but parts of other kinds of school days – lunches – are done.”**

Rachel Wolf, Founding Partner at Public First

# Where are we seeing it?

## SPAIN

A 2017 study by Pew Research Group found that 67% of the general public in Spain think that it is more important for schools to teach students to be creative and think independently than to encourage discipline.<sup>77</sup>

## JAPAN

In Japan, Nishinomiya Sudbury School features no tests and involves students in school administration. It encourages students to explore their interests and values, with no timetables to dictate what they will be learning each day.

## BRAZIL

The Lemann Creative Learning Program, a collaboration between the MIT Media Lab and the Lemann Foundation, has been working with educators across Brazil to foster creative learning in Brazilian public education.<sup>92</sup>

## NEW ZEALAND

A New Zealand study using adolescent student-led focus groups suggests that student voices should be heard in conversations about developing educational practices in the digital world.<sup>35</sup>

## STUDENT-LED LEARNING

# In numbers

## 91%

of Japanese high school students think their classes are designed to have students memorize the contents of textbooks, while only **16%** feel their classes require them to do their own research.<sup>33</sup>

National Institution for Youth Education Survey (2017)

## 67%

of people in Spain want schools to prioritize the teaching of creativity and independent thinking, while **24%** prefer schools to prioritize academic basics and discipline.<sup>89</sup>

## 65%

of American educators say student-led learning is extremely valuable in developing 21st-century skills.<sup>90</sup>

Pew Research (2017)

Nureva (2016)

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**“There have been many experiments of schools that have been completely child directed. What I’d say you’re getting now, in some places, is a backlash to that.”**

Rachel Wolf, Founding Partner at Public First

# Further Reading

## Teacher Education and Special Education

### Examining Learner Engagement Strategies: Australian and Canadian Teachers' Self-Report (2017)

Dr. Tiffany L. Gallagher (Australia) et al.

The Learning and Engagement Questionnaire (LEQ) measures instructional and environmental variables associated with learner engagement. The present study sought to determine the suitability of the LEQ to measure learner engagement with a sample of Canadian teachers and to further investigate the factorial structure in comparison with the Australian context.

## The Curriculum Journal

### Student perspectives on assessment for learning (2018)

Dr. Christopher DeLuca (Canada) et al.

Assessment for learning (AfL) has become a widespread approach across many educational systems. To date, AfL research has emphasized teachers' knowledge, skills, and practices, with few studies examining students' responses to an AfL pedagogical approach. The purpose of this research was to focus directly on students' perspectives on their use and value of AfL approaches through a survey of 1079 K-12 students and portfolio-based interviews with 12 purposefully selected students.

## Educational Research Review

### Literature review: The role of the teacher in inquiry-based education (2017)

Dr. Marjolein Dobber (Netherlands) et al.

Inquiry-based education receives much attention in educational practice and theory, since it provides pupils and teachers with opportunities to actively engage in collaboratively answering questions. However, not only do many teachers find this approach demanding, it also remains unclear what they should do to foster this type of education. This research surveys the teaching strategies used by K-12 teachers when promoting inquiry-based education and their outcomes.



# Collaborative Classrooms

As schools put a focus on openness, flexibility and collaboration, they're redesigning classrooms to match.



## COLLABORATIVE CLASSROOMS

# What's driving it?

Research is continually proving that classroom design – including color, lighting, acoustics and spatial organisation – impacts student learning. A landmark study from 2012 found that classroom design alters students' academic progress over a school year by as much as 25%,<sup>36</sup> and ongoing research from 2018 suggests that classroom design affects learning by an average of 16%.<sup>75</sup> Research has grown exponentially in the field of "Future Learning Spaces" to account for how technology is already changing the way we think and learn.<sup>76</sup>

Yet in 2017 the *Innovative Learning Environment and Teacher Change* project concluded that conventional or traditional classrooms account for approximately 75% of all spaces in Australian and New Zealand schools. Schools that combine open-plan spaces with differentiated or more conventional spaces have been touted as the leaders of innovative learning environments. For example, assessment of the Gateway School in New York City suggests that classrooms and breakout spaces must be part of an interconnected design strategy.<sup>37</sup>

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25%

A landmark study found that classroom design alters students' academic progress over a school year by

25%.<sup>38</sup>

Edutopia (2018)

**"It's no longer this, in rows, facing a blackboard, which is what it was like when I was growing up. Schools are actually encouraging groups to collaborate. I think that's a welcome change."**

Vikas Pota, Group CEO of Tmrw Digital and Chairman of the Board of Trustees of the Varkey Foundation

## COLLABORATIVE CLASSROOMS

# What's happening?

With classrooms being seen as the 'third teacher' (following parents and educators), schools are looking to embrace classroom layouts that encourage creativity, collaboration and flexibility. Even minor changes can result in positive outcomes. A study has shown that greeting students at the classroom door leads to 20% higher student engagement and 9% lower disruptive behavior.<sup>38</sup>

UK research has found that classrooms feel most lively and warm when 20–50% of the walls are bare and the remaining space is filled with learning aids, inspiring posters and student work.<sup>39</sup> Meanwhile, 50% of Norwegian teachers say that the introduction of technology has not influenced the way they furnish their classrooms, but they add that teachers have to adapt their teaching style to accommodate moving to different parts of the room.<sup>40</sup>

**“Most of the time, you will find that the room itself can be adapted in a flexible way to meet the needs of the teacher or the students. It does help if there’s a flexibility, even in the layout of the classroom.”**

Dr Hanna Dumont, Educational Psychologist and Researcher in International Education



# Where are we seeing it?

## UK

A 2017 study of UK pupils, published in the *Environment and Behaviour*, found that “flexibility” was the most ubiquitous element that influenced student progress, and had the most pronounced effect on student progress in math.<sup>82</sup>

## SWEDEN

In a 2019 EU Commission study, Swedish upper secondary students report an 87% average confidence rate with collaboration and communication using digital tools.<sup>84</sup> Sweden is also one of the most innovative countries for classroom design, as their classroom-less Vittra free schools continue to make future-focused headlines.<sup>83</sup>

## FINLAND

Finland's highly successful education system employs the mantra, 'better architecture contributes to better scholastic experience.'<sup>41</sup>

## COLLABORATIVE CLASSROOMS

# In numbers

### 43%

The classroom environment accounts for **43%** of variability in student learning experience and outcomes.<sup>82</sup>

Dr. Peter Barrett, *Journal of Environment and Behaviour* (2016)

### 73%

of the students' progress that was attributed to classroom design was traced back to flexibility and student ownership.<sup>85</sup>

Edutopia (2018)

### 91%

Early experiments in hybrid or “blended” classroom designs in the United States’ *Intrinsic Schools* have yielded test results in reading in math that outpace **91%** of their conventionally designed counterparts.<sup>86</sup>

Education Next (2018)

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**“Collaborative layouts benefit teachers in the way of managing groups, managing different abilities of groups, encouraging peer-to-peer learning.”**

Vikas Pota, Group CEO of Tmrw Digital and Chairman of the Board of Trustees of the Varkey Foundation

# Further Reading

## Journal of Formative Design in Learning

### Future Learning Spaces in Schools: Concepts and Designs from the Learning Sciences (2017)

Dr. Yotam Hod (Israel)

As institutions invest time and money into constructing or redesigning spaces to meet educational goals of the innovation age, it is prudent for designers to be guided by lessons learned from research. Based on a synthesis of four leading future learning spaces, a novel conceptualization is offered here to advance both scholarship and practice of future learning spaces.

## Environment and Behaviour

### The Holistic Impact of Classroom Spaces on Learning in Specific Subjects (2016)

Dr. Peter Barrett (UK) et al.

The Holistic Evidence and Design (HEAD) study of U.K. primary schools sought to isolate the impact of the physical design of classrooms on the learning progress of pupils aged from 5 to 11 years (U.S. kindergarten to fifth grade). This article presents analyses for the three main subjects assessed, namely, reading, writing, and math. Variations in the importance of the physical design parameters are revealed for the learning of each subject.

## Entertainment Computing

### Entertainment, engagement, and education: Foundations and developments in digital and physical spaces to support learning through making (2017)

Dr. Michail N. Giannakos (Norway) et al.

Contemporary technical and infrastructural developments, such as Hackerspaces, Makerspaces, TechShops, and FabLabs, and the appearance of tools such as wearable computing, robotics, 3D printing, microprocessors, and intuitive programming languages, posit making as a very promising research area to support learning processes, especially towards the acquisition of 21st-century learning competences.



# Connecting Guardians & Schools

Guardians want to be more involved in their child's education - and technology is being used as a tool to connect them with teachers.

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## What's driving it?

Globally, 25% of parents spend seven or more hours per week assisting their children with homework. At the same time, 78% of parents worldwide describe their confidence in the quality of teaching at their schools as “good” or “very good.”<sup>42</sup>

Yet since 49% of couple households feature two parents working full-time, technology that facilitates conversation between parents and teachers is becoming increasingly valuable.<sup>44</sup> In fact, in the US, 76% of teachers and administrators say that technology is important in engaging parents with their child's school performance.<sup>45</sup> In the most recent OECD PISA report, parents reported a myriad of obstacles to being involved in their child's education. In Hong Kong, 68% of parents reported that they are unable to get off from work to attend school meetings and 66% reported that meeting times with teachers are a barrier to their involvement.<sup>87</sup>



70%

of teachers in the US think that parents are not sufficiently involved in their child's education.<sup>47</sup>

Age of Learning (2018)

**“What’s exciting about communicative technologies, but what I think has been underexplored, is how you really use parents as a partner in education. I think often there’s been a bit of a: once kids get to school age, it’s all the school's job and the parents are slightly shut out.”**

Rachel Wolf, Founding Partner at Public First

# What's happening?

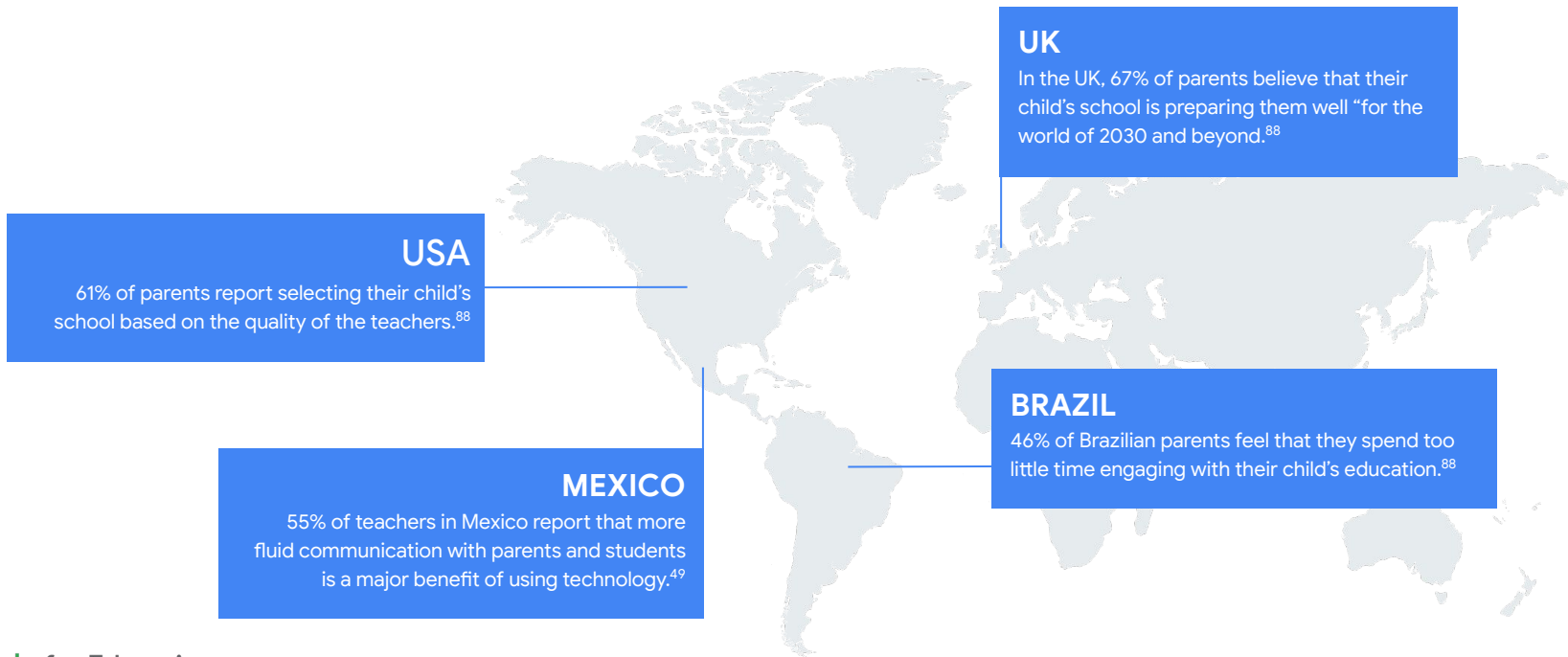
Research on the effects of parent-teacher communication in students' education is on the rise.

In 2018 Age of Learning, an American education technology and resource company, spearheaded an online survey for parents and teachers of children from 2 to 12 years old. The study revealed a disparity between teachers' and parents' views of children – while teachers say 30% of their students are reading below grade level, just 9% of parents believe their child falls into this category. In fact, two-thirds of parents aren't aware of their child's reading level. In line with these results, 70% of teachers think that parents are not sufficiently involved in their child's education.<sup>47</sup> Meanwhile, a majority of teachers in Spain (58%) report that more fluid communication with parents and students is a major benefit of using technology.<sup>48</sup>

**“Collaboration between parents and teachers would not only be helpful for parents, but also be helpful for teachers to know more about the environmental conditions and the family situation where students are coming from, because most of the differences in student outcomes are actually shaped by families and not by schools.”**

Dr Hanna Dumont, Educational Psychologist and Researcher in International Education

# Where are we seeing it?



## CONNECTING GUARDIANS & SCHOOLS

# In numbers

## 52%

of parents worldwide list a lack of time as their primary obstacle to being more involved in their child's education.<sup>88</sup>

The Varkey Foundation (2018)

## 32%

of parents globally say that the lack of information from their child's school on how they can help is a major obstacle to their involvement in their child's education.<sup>88</sup>

The Varkey Foundation (2018)

## 87%

of parents in the US trust that schools are keeping their child safe online.<sup>46</sup>

Data Quality Campaign (2018)

Google for Education



**“It is very important for the threshold of getting engaged for parents to be really low: even parents who speak a different language or who are not as familiar with the school system, regardless of where they’re coming from. The entrance level is made as easy as possible.”**

Dr Hanna Dumont, Educational Psychologist and Researcher in International Education



# Further Reading

## Journal of Education for Teaching

**Teacher education and family–school partnerships in different contexts: A cross country analysis of national teacher education frameworks across a range of European countries (2018)**

Dr. Ian Thompson (UK) et al.

Collaboration with parents is widely regarded as important in the education of children and young people, yet teachers rarely feel sufficiently prepared for this task. Our purpose in this study was to assess whether national ITE frameworks in seven European countries enable or constrain effective FSP preparation for preservice teachers.

## Interdisciplinary Journal of Applied Family Studies

**Building Strong Family–School Partnerships: Transitioning from Basic Findings to Possible Practices (2017)**

Dr. Susan M. Sheridan (USA) et al.

This research describes the translational process undergirding a particular aspect of family science: families working in partnership with schools to achieve mutual goals for children’s optimal functioning. In doing so, it illustrates a translational cycle that begins with identifying problems of practice and leads to the development of a family–school inter-vention in a way that embraces families as partners in goal-setting and problem-solving.

## IFIP Conference on Human-Computer Interaction

**Parental Perspectives Towards Education Technology in Low-Income Urban Households (2017)**

Dr. Sumita Sharma (Finland) et al.

Government and NGO schools catering to children from low-income urban environments are increasingly introducing technology in the Indian classroom. However, one of the challenges is convincing low-literate parents the potential benefits of technology in education. In this study, we aim to uncover the concerns and expectations of low-income low-literate parents towards educational technology for their children, through semi-structured interviews.



# Innovating Pedagogy

Motivated teachers have more engaged classes, and they want to streamline administrative tasks to focus on teaching.



## INNOVATING PEDAGOGY

# What's driving it?

From grading to preparing resources, teachers invest a lot of time and energy in administrative tasks. Globally, teachers spend an average of three hours a day on work-related tasks, including marking and lesson planning. In comparison, they spend five hours per day teaching lessons. And only 34% of teachers worldwide say they currently have a good work-life balance.<sup>50</sup>

In the UK, 67% of teachers report being stressed at work, while in the US, 61% of teachers say they are always or often stressed.<sup>51,52</sup> Freeing up time can have a big impact on teacher engagement and motivation. And technology can be harnessed as a tool to achieve this. Whether it's streamlining admin tasks or helping with grading, 84% of UK teachers say that technology saves educators time. A staggering 88% of UK teachers add that educational technology enables pedagogical innovation and improves educational quality.<sup>53</sup>

Google for Education



# 87%

of teachers in Spain say that one of the main advantages of technology is that it allows them to search for, edit and create content with more ease.<sup>54</sup>

Informe de resultados España (2018)

**“Lesson planning or marking are tasks that take a disproportionate amount of time. This is where I think tech can be leveraged to free up time and allow teachers to do what they’re meant to be doing, which is teaching and interacting with students.”**

Vikas Pota, Group CEO of Tmrw Digital and Chairman of the Board of Trustees of the Varkey Foundation

# What's happening?

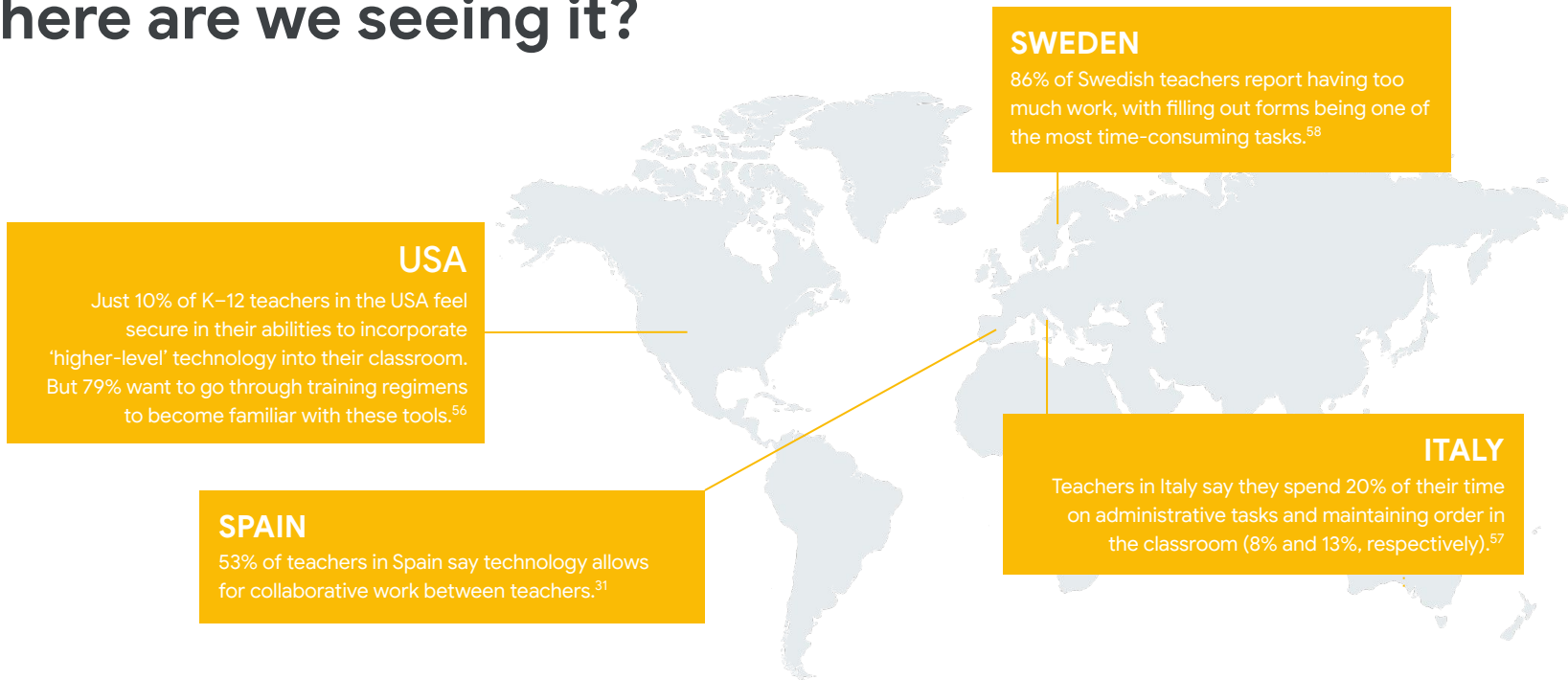
As teachers are increasingly seen as 'agents of change', schools are looking for ways to help motivate them and focus on professional development, rather than spending time on administrative tasks. Technology is being employed to streamline the day to day, so teachers can focus on their classrooms and teaching methods.

Technology can also be instrumental in saving teachers' resources by creating time through fostering communities of collaboration. 83% in Mexico say that one of the main advantages of technology is that it allows them to search for, edit and create lesson content with more ease. Meanwhile, 60% of teachers in Mexico respectively say technology allows for collaborative work between teachers.<sup>55</sup>

**“I think that technologies can and should be used to free up resources for the teacher to have interactions with students, in particular those who need more support. I do think that it would be important for the technology itself to be adaptive.”**

Dr Hanna Dumont, Educational Psychologist and  
Researcher in International Education

# Where are we seeing it?



## INNOVATING PEDAGOGY

# In numbers

### 71%

of teachers worldwide say that teaching is a rewarding career.<sup>50</sup>

Global Education Census Report (2018)

### 87%

of UK teachers say that technology has a positive impact on educational outcomes.<sup>53</sup>

Tes (2018)

### 83%

of teachers in Mexico say that access to more contents and resources is one of the main advantages of using technology in the classroom at a pedagogical level.<sup>55</sup>

Informe de resultados México (2018)

**Google** for Education



**“Technology can be a powerful tool for transforming learning...However, to be transformative, educators need to have the knowledge and skills to take full advantage of technology-rich learning environments.”**

2017 US National Education Technology Plan, p. 3-5

# Further Reading

## Journal of STEM Education

### [Educators in Industry: An Exploratory Study to Determine how Teacher Externships Influence K-12 Classroom Practices \(2018\)](#)

Dr. Bradley Bowen (USA) et al.

This exploratory study investigates the impacts of industry-based externships for K-12 teachers, and reports teachers' perspectives on how these experiences influenced K-12 classroom practices. The program of focus in this research study is the *Educators in Industry: K-12 Externship Program*. For four weeks in the summer, teacher-participants are placed at a company whose primary focus is design or process-oriented activities.

## OECD Education Working Papers

### [Understanding Innovative Pedagogies: Key Themes to Analyse New Approaches to Teaching and Learning \(2018\)](#)

Dr. Hanna Dumont (Germany) et al.

Pedagogy is at the heart of teaching and learning. Preparing young people to meet new contemporary challenges means to review and update the pedagogies teachers use. However, despite the increased reporting of teachers and schools that are innovating, schools remain largely seen as very resistant places for innovation. To address the importance and challenges of implementing new pedagogies, this paper brings together leading experts to reflect on key areas of pedagogy.

## Journal of Education for Teaching

### [Innovating science teaching with a transformative learning model \(2018\)](#)

Dr. Sandra Gudiño Paredes (Mexico) et al.

This study took place in a public elementary school in Monterrey, Mexico, which has been developing this project for more than thirteen years with students from 4th, 5th and 6th grade. Results showed that there is a relationship between positive attitudes towards science in students who were exposed to transformative learning models of teaching. This study helps to illuminate the extent to which teacher education models influence students' attitudes and how positive attitudes to science are influenced by the use of learning by doing projects.



# Emerging Technologies

Schools are incorporating emerging technologies into the classroom to create more innovative and engaging teaching methods.



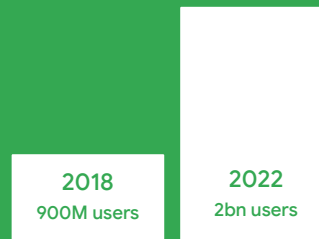


## EMERGING TECHNOLOGIES

# What's driving it?

Emerging technologies such as Artificial Intelligence, Virtual Reality, and Augmented Reality are becoming more prevalent in people's everyday lives. In the US, 91% of children between age 4 and 11 have access to a smart speaker or voice assistant, while in the UK, 70% of children between age 8 to 17 use voice assistants.<sup>62 63</sup> By 2022, it is estimated that, per month, there could be 2 billion mobile AR users worldwide.<sup>60</sup>

It means that people are increasingly recognizing how tech can be used in the classroom to create exciting, engaging experiences. For example, research on AR in the classroom has confirmed that AR in educational settings improves learning performance and encourages learning motivation.<sup>61</sup> They are tools to aid educators – 82% of US teachers think that using technology in the classroom better prepares students for future careers,<sup>64</sup> and a third of Australian parents think innovations in education technology will give children new opportunities to engage with learning.<sup>65</sup>



By 2022, it is estimated that, per month, there could be 2 billion mobile augmented reality users worldwide.<sup>60</sup>

Tractica (2018)

**“I think one of the things that most tech companies realize very early on is that you cannot introduce tech successfully by disrupting the relationship between the teacher and the student.”**

Rachel Wolf, Founding Partner at Public First

## EMERGING TECHNOLOGIES

# What's happening?

Schools are looking for more ways to incorporate emerging technologies into learning in the classroom. Ashu Kumar, an instructor of Information Sciences and Technology at Penn State University, has proposed a voice-enabled AI classroom assistant that can take attendance and track class participation.<sup>66</sup>

Meanwhile, in Japan, the education ministry is rolling out English-speaking AI in 500 Japanese classrooms to improve students' oral and written English skills.<sup>67</sup> In Germany, the government has dedicated 3 billion euros to be used by 2025 to researching and developing AI. A key area of focus for this initiative is digital competence from kindergarten to old age.<sup>68</sup> In line with this initiative, 48% of teachers in Germany report a willingness to try VR out in the classroom, rising to 58% of those under 30 years old.<sup>69</sup> As with any new technology, implementation is still in its early stages, as educators weigh the potential benefits with the challenges of navigating public perception and regulatory environments.

**“I don't think that technologies, per se, are going to change classrooms if they're not addressing the deep level of learning. If it's just superficial and if it's just having some digital device in front of you but actually doing the exact same thing as doing without this device, then it's not changing anything.”**

Dr Hanna Dumont, Educational Psychologist and  
Researcher in International Education

# Where are we seeing it?

## USA

By 2021, more than 15% of schools in the US are predicted to have a VR class kit.<sup>70</sup>

## AUSTRALIA

48% of teachers have a strong interest in professional development using digital learning to engage students.<sup>81</sup>

## NEW ZEALAND

New Zealand is the first country in the world to invite a digital teacher into its classrooms. The digital human avatar teaches primary school students about renewable energy as part of a Vector free education program for Auckland schools and is programmed to recognize emotion.<sup>80</sup>

## NORDICS

Schools in the Nordics are highly digital – in Sweden, 90% of primary schools and 100% of upper secondary schools are classified as “highly digitally equipped and connected.” These numbers are mirrored in the other Nordic countries, with over 88% of schools in Finland, Denmark, Norway and Iceland meeting the highly digital criteria.<sup>72</sup>

## EMERGING TECHNOLOGIES

# In numbers

## \$6 billion

is the amount that AI in the education market is set to be worth globally by 2024.<sup>79</sup>

Global Market Insights (2018)

## 8 in 10

teachers in New Zealand say that digital technologies are having a positive impact on student achievement.<sup>78</sup>

Research New Zealand (2017)

Google for Education

## 69%

of U.S. teachers believe that technology can be used to support any subject.<sup>64</sup>

Tech & Learning (2017)



**“The kinds of things that tech ought to be able to do and can do is get the very best content and scale it out to people – content I think has been an underappreciated dimension of this.”**

Rachel Wolf, Founding Partner at Public First

# Further Reading

## Journal of Educational Technology

### Designing for Interactivity, While Scaffolding Student Entry, Within Immersive Virtual Reality Environments (2019)

Dr. Eileen A. O'Connor (USA) et al.

This study reports on data gathered from an avatar-based immersive experience where teacher-education students gathered in VR spaces for synchronous meetings, learning how to maneuver within the environment, and develop preliminary three-dimensional building perspectives. Student reports and instructor observations throughout the course provided insights into both the challenges experienced and effective practices within this immersive VR environment.

## Journal of Educational Computing Research

### Developing Elementary Students' Digital Literacy Through Augmented Reality Creation: Insights From a Longitudinal Analysis (2018)

Dr. Hsiao-Ping Hsu (USA) et al.

This mixed-method case study investigated digital literacy (DL) development among 32 elementary-level students who created multimodal, contextual, and interactive augmented reality (AR) artifacts in a 20-week after-school program in Northern Taiwan. The instructional design combined situated and spiral learning experiences with AR, implemented through a blended learning environment.

## EU Commission: JRC Science for Policy Report

### The Impact of Artificial Intelligence on Learning, Teaching, and Education

Dr. Ilkka Tuomi (Finland)

This report is a contribution to the *Digital Education Action Plan* which foresees policy research and guidance on the impact and potential of digital technologies in education. The impact of AI technologies in practical educational settings has been relatively modest until recently. Technical developments over the recent years, however, suggest that the situation may be changing rapidly.

# Conclusion

Education provides students with the foundation of skills and knowledge they will lean on for the rest of their lives. And as the world around them changes - be that due to changes in values, societal shifts or technological innovations - the education landscape needs to shift in response.

Education is evolving to nurture students to be more connected in their lives, engaged in class and equipped for their future. This is a space where technology and pedagogy can work hand in hand to facilitate change - be that by providing teachers with tools to enhance their lessons, creating more fluid learning ecosystems, or transforming classrooms into innovative learning spaces of the future.



# Works Cited <sup>1-25</sup>

- <sup>1</sup>Silicon Valley parents are raising their kids tech-free — and it should be a red flag. (2018). Retrieved from <https://www.businessinsider.com/silicon-valley-parents-raising-their-kids-tech-free-red-flag-2018-2?r=US&IR=T>
- <sup>2</sup>the State Of The World's Children 2017: Children in a Digital World. (2017). Retrieved from [https://www.unicef.org/publications/files/SOWC\\_2017\\_ENG\\_WEB.pdf](https://www.unicef.org/publications/files/SOWC_2017_ENG_WEB.pdf)
- <sup>3</sup>Generation Z. (2018). Retrieved from <https://www.laughlin.com/laughlin/media/public/pdf/LC-eBook-Gen-Z.pdf?ext=.pdf>
- <sup>4</sup>Children and Parents: Media Use and Attitudes Report. (2017). Retrieved from [https://www.ofcom.gov.uk/\\_data/assets/pdf\\_file/0020/108182/children-parents-media-use-attitudes-2017.pdf](https://www.ofcom.gov.uk/_data/assets/pdf_file/0020/108182/children-parents-media-use-attitudes-2017.pdf)
- <sup>5</sup>Middaugh, E., Clark, L., and Ballard, P. (2017). Digital Media, Participatory Politics, and Positive Youth Development. *Pediatrics*, 140(2), S127-S131. <http://dx.doi.org/10.1542/peds.2016-1758Q>
- <sup>6</sup>Harrison-Evans, P. and Krasodomski-Jones, A. (2017). The Moral Web: Youth Character, Ethics and Behaviour. Retrieved from <https://www.demos.co.uk/project/the-moral-web/>
- <sup>7</sup>Bringing online safety education programs to UK schools. (2018). Retrieved from <https://www.blog.google/technology/families/bringing-online-safety-education-programs-uk-schools/>
- <sup>8</sup>the Common Sense Census: Media Use By Kids Age Zero To Eight. (2017). Retrieved from [https://www.common SenseMedia.org/sites/default/files/uploads/research/0-8\\_executivesummary\\_release\\_final\\_1.pdf](https://www.common SenseMedia.org/sites/default/files/uploads/research/0-8_executivesummary_release_final_1.pdf)
- <sup>9</sup>Monash University study: parents want more life skills to be taught in school (2017). Retrieved from <https://www.monash.edu/news/articles/parents-want-more-life-skills-to-be-taught-in-school>
- <sup>10</sup>IV Estudio sobre el uso de la tecnología en la educación. (2018). Retrieved from <https://www.realinfluencers.es/wp-content/uploads/2018/11/iv-estudio-tic-2018-mexico.pdf>
- <sup>11</sup>Saini, S. (2018). Emotional Intelligence at Workplace – A Conceptual Study. *International Journal Of Management Studies*, V(3(5), 53. doi: 10.18843/ijms/v5i3(5)/08
- <sup>12</sup>The Real Future of Australian Education. (2018). Retrieved from <https://www.realinsurance.com.au/news-views/future-of-australian-education>
- <sup>13</sup>Vocational skills valued by students and employers. (2018). Retrieved from <https://www.tes.com/news/vocational-skills-valued-students-and-employers>
- <sup>14</sup>The talent challenge: Rebalancing skills for the digital age. (2018). Retrieved from <https://www.pwc.com/gx/en/ceo-survey/2018/deep-dives/pwc-ceo-survey-talent.pdf>
- <sup>15</sup>Life Lessons - Sutton Trust. (2017). Retrieved from <https://www.suttontrust.com/research-paper/life-lessons-workplace-skills/>
- <sup>16</sup>National teacher survey gives thumbs down to NAPLAN. (2018). Retrieved from <https://www.aeuvic.asn.au/national-teacher-survey-gives-thumbs-down-naplan>
- <sup>17</sup>Americans want life skills like budgeting and cooking added to standardized testing | YouGov. (2017). Retrieved from <https://today.yougov.com/topics/education/articles-reports/2017/09/18/americans-want-skills-budgeting-and-cooking-added->
- <sup>18</sup>Australian parents want schools to teach more social skills, survey finds. (2017). Retrieved from <https://www.theguardian.com/australia-news/2017/oct/10/australian-parents-want-schools-to-teach-more-social-skills-survey-finds>
- <sup>19</sup>New Zealand schools need to teach more life skills, parents say. (2017). Retrieved from <https://www.stuff.co.nz/national/education/97798269/new-zealand-schools-need-to-teach-more-life-skills-parents-say>
- <sup>20</sup>McLean, A. (2018). Innovation and Science Australia calls for the nation to up its level of ambition. Retrieved from <https://www.zdnet.com/article/innovation-and-science-australia-calls-for-the-nation-to-up-its-level-of-ambition/>
- <sup>21</sup>The Future of Education and Skills [PDF file]. (2018). Retrieved from [https://www.oecd.org/education/2030/E2030%20Position%20Paper%20\(05.04.2018\).pdf](https://www.oecd.org/education/2030/E2030%20Position%20Paper%20(05.04.2018).pdf)
- <sup>22</sup>Cowan, D. (2018). Essential education: future jobs must be taught with tech. Retrieved from <https://www.raconteur.net/technology/essential-education-future-jobs-tech>
- <sup>23</sup>Support for Science, Technology, Engineering and Mathematics (STEM). (2018). Retrieved from <https://www.education.gov.au/support-science-technology-engineering-and-mathematics>
- <sup>24</sup>Occupational employment projections to 2020, Bureau of Labor Statistics [PDF file]. Retrieved from <https://www.bls.gov/pub/mlr/2012/01/art5full.pdf>
- <sup>25</sup>Mari, A. (2018). Brazil's Generation Z aims for technology careers. Retrieved from <https://www.zdnet.com/article/brazils-generation-z-aims-for-technology-careers/>

# Works Cited <sup>26-50</sup>

- <sup>26</sup>Scherrer, D. (2017). Coding in schools: Soon a reality in Sweden. Retrieved from <https://digitalswitzerland.com/2017/04/12/coding-schools-soon-reality-sweden/>
- <sup>27</sup>ZEIT ONLINE. (2017). OECD-Bildungsstudie: Deutschland führend in technischer Ausbildung. Retrieved from <https://www.zeit.de/gesellschaft/zeitgeschehen/2017-09/oeecd-bildungsbericht-ausbildung-mint-faecher-frauen>
- <sup>28</sup>Cooper, R. (2017). How can educators best promote student agency? Retrieved from <https://www.educationdive.com/news/how-can-educators-best-promote-student-agency/508050/>
- <sup>29</sup>Chew, K. (2016). Computers, creativity and character – here's how to improve Asia's schools. Retrieved from <https://www.weforum.org/agenda/2016/06/how-to-improve-asia-schools-education/>
- <sup>30</sup>IV Estudio sobre el uso de la tecnología en la educación. (2018). Retrieved from <https://www.realinfluencers.es/wp-content/uploads/2018/11/iv-estudio-tic-2018-mexico.pdf>
- <sup>31</sup>IV Estudio sobre el uso de la tecnología en la educación. (2018). Retrieved from <https://www.realinfluencers.es/wp-content/uploads/2018/11/iv-estudio-tic-2018-espana.pdf>
- <sup>32</sup>Marano, H.E. (2016). Class Dismissed. Retrieved from <https://www.psychologytoday.com/gb/articles/200605/class-dismissed>
- <sup>33</sup>Japanese High School Students Passive in Studies: Survey (News). (2017). Retrieved from <https://www.nippon.com/en/behind/110188/>
- <sup>34</sup>The Kumon Method and Its Strengths. (2019). Retrieved from <http://www.kumongroup.com/eng/about-kumon/method/index.html>
- <sup>35</sup>Hodge, E.L., Robertson, N., and Sargisson, R. (2017). Mobile technologies in schools: The student voice. *Teachers and Curriculum*, 17(2), 71-76. <http://dx.doi.org/10.15663/tandc.v17i2.157>
- <sup>36</sup>Vanhemert, K. (2013). Study Shows How Classroom Design Affects Student Learning. Retrieved from <https://www.fastcompany.com/1671627/study-shows-how-classroom-design-affects-student-learning>
- <sup>37</sup>Byers, T. and Lippman, P.C. (2018). Classroom design should follow evidence, not architectural fads. Retrieved from <https://theconversation.com/classroom-design-should-follow-evidence-not-architectural-fads-89861>
- <sup>38</sup>Terada, Y. (2018). 2018 Education Research Highlights. Retrieved from <https://www.edutopia.org/article/2018-education-research-highlights>
- <sup>39</sup>Terada, Y. (2018). Dos and Don'ts of Classroom Decorations. Retrieved from <https://www.edutopia.org/article/dos-and-donts-classroom-decorations>
- <sup>40</sup>Helleve, I. and Almås, A.G. (2017). Teachers' Experiences with Networked Classrooms in Norway. *Education Research International*, 2017, 9 pages. <https://doi.org/10.1155/2017/8560171>
- <sup>41</sup>Classroom design has helped make Finland's schools an international success. (2015). Retrieved from <https://www.innovadesigngroup.co.uk/news/classroom-design-has-helped-make-finlands-schools-an-international-success/>
- <sup>42</sup>Anderson, J. (2018). Helping your kids with homework doesn't always pay off, says the largest-ever survey of parents. Retrieved from <https://qz.com/1224685/helping-your-kids-with-homework-doesnt-always-pay-off-says-the-largest-ever-survey-of-parents/>
- <sup>43</sup>Our research reveals parents want more say in education but 'one-size fits all' approach doesn't work. (2017). Retrieved from <https://www.parentkind.org.uk/News/Our-research-reveals-parents-want-more-say-in-education-but-one-size-fits-all-approach-doesnt-work>
- <sup>44</sup>MODERN FAMILIES INDEX. (2016). Retrieved from <https://www.workingfamilies.org.uk/wp-content/uploads/2016/02/Modern-Families-Index-2016.pdf>
- <sup>45</sup>Why Parent Engagement is Important to Student Success. (2016). Retrieved from <https://www.powerschool.com/resources/blog/why-parent-engagement-is-important-to-student-success/>
- <sup>46</sup>What Parents and Teachers Think About Education Data. (2018). Retrieved from <https://dataqualitycampaign.org/resource/what-parents-and-teachers-think-about-education-data/>
- <sup>47</sup>National Children's Reading Habits Study: Understanding the Reading Gap and How to Help Close it. (2018). Retrieved from <https://www.ageoflearning.com/readingstudy/>
- <sup>48</sup>IV Estudio sobre el uso de la tecnología en la educación. (2018). Retrieved from <https://www.realinfluencers.es/wp-content/uploads/2018/11/iv-estudio-tic-2018-espana.pdf>
- <sup>49</sup>IV Estudio sobre el uso de la tecnología en la educación. (2018). Retrieved from <https://www.realinfluencers.es/wp-content/uploads/2018/11/iv-estudio-tic-2018-mexico.pdf>
- <sup>50</sup>Global Education Census Report. (2018). Retrieved from <https://www.cambridgeinternational.org/Images/514611-global-education-census-survey-report.pdf>



# Works Cited <sup>51-75</sup>

- <sup>51</sup>Teacher Wellbeing Index. (2018). Retrieved from <https://www.educationsupportpartnership.org.uk/about-us/press-centre/teacher-wellbeing-index-2018-highlights-stress-epidemic-and-rising-mental>
- <sup>52</sup>Mahnken, K. (2017). 61% of Teachers Stressed Out, 58% Say Mental Health Is Not Good in New National Survey. Retrieved from <https://www.the74million.org/61-of-teachers-stressed-out-58-say-mental-health-is-not-good-in-new-national-survey/>
- <sup>53</sup>George, M. (2018). Teachers believe ed tech improves outcomes – but think their schools hold it back. Retrieved from <https://www.tes.com/news/teachers-believe-ed-tech-improves-outcomes-think-their-schools-hold-it-back>
- <sup>54</sup>IV Estudio sobre el uso de la tecnología en la educación. (2018). Retrieved from <https://www.realinfluencers.es/wp-content/uploads/2018/11/iv-estudio-tic-2018-espana.pdf>
- <sup>55</sup>IV Estudio sobre el uso de la tecnología en la educación. (2018). Retrieved from <https://www.realinfluencers.es/wp-content/uploads/2018/11/iv-estudio-tic-2018-mexico.pdf>
- <sup>56</sup>Zimmerman, E. (2018). 5 Key Areas of Technology Professional Development for Teachers. Retrieved from <https://edtechmagazine.com/k12/article/2018/09/5-key-areas-technology-professional-development-teachers>
- <sup>57</sup>Education GPS: Country Profile – Italy. (2013). Retrieved from <https://www.oecd.org/italy/TALIS-Country-profile-Italy.pdf>
- <sup>58</sup>Why Sweden's teachers have no time for their students. (2016). Retrieved from <https://www.thelocal.se/20160525/why-swedens-teachers-have-no-time-for-their-students>
- <sup>59</sup>How digital are Australian Schools? (2016). Retrieved from <https://www.pearson.com.au/insights-and-news/the-future-of-education/how-digital-are-australian-schools/>
- <sup>60</sup>Key Augmented Reality Statistics. (2017). Retrieved from <https://arpost.co/2017/11/15/key-augmented-reality-statistics/>
- <sup>61</sup>Richardson, J. (2018). Augmented reality could rule the classrooms of the future. Retrieved from <https://bigthink.com/jake-richardson/augmented-reality-could-rule-the-classrooms-of-the-future>
- <sup>62</sup>Creamer, S. (Interviewer) and Collins, D. (Interviewee). (2018). Kids Are Spending More Time with Voice, but Brands Shouldn't Rush to Engage Them [Interview transcript]. Retrieved from <https://www.emarketer.com/content/kids-are-spending-more-time-with-voice-but-brands-shouldnt-rush-to-engage-them>
- <sup>63</sup>70% of children use voice tech to find information. (2018). Retrieved from <https://edtechnology.co.uk/Article/70-of-children-use-voice-tech-to-find-information/>
- <sup>64</sup>Study: U.S. Teachers Lacking in Tech Training. (2017). Retrieved from <https://www.techlearning.com/ed-tech-ticker/12427>
- <sup>65</sup>The Real Future of Australian Education. (2018). Retrieved from <https://www.realinsurance.com.au/news-views/future-of-australian-education>
- <sup>66</sup>Beaver professor debuts voice-enabled classroom assistant. (2017). Retrieved from <https://news.psu.edu/story/484089/2017/09/22/academics/beaver-professor-debuts-voice-enabled-classroom-assistant>
- <sup>67</sup>Japan turns to classroom robots in bid to boost English skills. (2018). Retrieved from <https://www.japantimes.co.jp/news/2018/08/29/national/japan-turns-classroom-robots-bid-boost-english-skills/#.XG1Vc-j7Q2y>
- <sup>68</sup>Brady, K. (2018). Germany launches digital strategy to become artificial intelligence leader. Retrieved from <https://www.dw.com/en/germany-launches-digital-strategy-to-become-artificial-intelligence-leader/a-46298494>
- <sup>69</sup>Survey Shows that Teachers See Potential for Virtual Reality in Education. (2017). Retrieved from <https://news.samsung.com/global/survey-shows-that-teachers-see-potential-for-virtual-reality-in-education>
- <sup>70</sup>Molnar, M. (2018). Virtual Reality 'Class Kits' Expected to Gain Foothold in U.S. Schools. Retrieved from <https://marketbrief.edweek.org/marketplace-k-12/virtual-reality-class-kits-expected-gain-foothold-u-s-schools/>
- <sup>71</sup>Campos, G. (2018). Lenovo finds strong teacher demand for virtual reality. Retrieved from <https://www.avinteractive.com/news/virtual-augmented-mixed/lenovo-research-finds-strong-teacher-demand-virtual-reality-26-01-2018/>
- <sup>72</sup>2nd Survey of Schools: ICT in Education. (2019). Retrieved from <https://ec.europa.eu/digital-single-market/en/news/2nd-survey-schools-ict-education>
- <sup>73</sup>Growing Up Digital: A Report of the Growing Up Digital Task Force (2017). Retrieved from <https://schoolsweek.co.uk/wp-content/uploads/2017/01/Growing-Up-Digital.pdf>
- <sup>74</sup>OECD. (2018, September 11). Education at a Glance 2018. Retrieved from [https://www.oecd-ilibrary.org/education/education-at-a-glance-2018\\_eag-2018-en](https://www.oecd-ilibrary.org/education/education-at-a-glance-2018_eag-2018-en)
- <sup>75</sup>Well-designed classrooms can boost learning (2018). Retrieved from <https://epsrc.ukri.org/newsevents/casestudies/well-designed-classrooms-can-boost-learning/>

# Works Cited <sup>76-91</sup>

- <sup>76</sup> “Future Learning Spaces in Schools: Concepts and Designs from the Learning Sciences” (2017) Retrieved from <https://link.springer.com/article/10.1007/s41686-017-0008-y>
- <sup>77</sup> 4 charts on how people around the world see education (2017). Retrieved from <https://www.pewresearch.org/fact-tank/2017/08/28/4-charts-on-how-people-around-the-world-see-education/>
- <sup>78</sup> Digital technologies are having a positive impact on student achievement. (2017). Retrieved from [https://2020.org.nz/wp-content/uploads/2014/05/digital-technologies-in-schools-2017\\_report.pdf](https://2020.org.nz/wp-content/uploads/2014/05/digital-technologies-in-schools-2017_report.pdf)
- <sup>79</sup> Artificial Intelligence (AI) in Education Market worth over \$6bn by 2024 - Learning News. (2018). Retrieved from <https://learningnews.com/news/learning-news/2018/artificial-intelligence-ai-in-education-market-worth-over-6bn-by-2024>
- <sup>80</sup> World-first digital teacher in NZ schools. (2018). Retrieved from <https://www.newsroom.co.nz/2018/08/22/203646/digital-teacher-in-kiwi-schools>
- <sup>81</sup> How digital are Australian Schools?. (2017). Retrieved from <https://pearson.com.au/insights-and-news/the-future-of-education/how-digital-are-australian-schools/>
- <sup>82</sup> The Holistic Impact of Classroom Spaces on Learning in Specific Subjects (2017). Retrieved from <https://journals.sagepub.com/doi/full/10.1177/0013916516648735>
- <sup>83</sup> Take A Look At Sweden’s Classroom-Free School—Your Kid Might Go To One Just Like It (2017). Retrieved from <https://education.good.is/articles/sweden-classroom-free-school>
- <sup>84</sup> 2nd Survey of Schools: ICT in Education, Sweden Country Report. A study prepared for the European Commission DG Communications Networks, Content & Technology (2019). Retrieved from <https://ec.europa.eu/digital-single-market/en/news/2nd-survey-schools-ict-education>
- <sup>85</sup> Flexible Classrooms: Research Is Scarce, But Promising (2018). Retrieved from <https://www.edutopia.org/article/flexible-classrooms-research-scarce-promising>
- <sup>86</sup> New Blueprints for K–12 Schools: Innovative design supports blended learning (2018). Retrieved from <https://www.educationnext.org/new-blueprints-k-12-schools-innovative-design-supports-blended-learning/>
- <sup>87</sup> OECD PISA Results: Students Well-Being (Volume III) (Most recent, 2015). Retrieved from <https://www.oecd-ilibrary.org/docserver/97892264273856-en.pdf?expires=1555000450&id=id&accname=guest&checksum=036D978362EFA8D8F10DBF7FA23575BB>
- <sup>88</sup> The Varkey Foundation: Global Parents Survey (2018). Retrieved from <https://www.varkeyfoundation.org/media/4340/vf-parents-survey-18-single-pages-for-flipbook.pdf>
- <sup>89</sup> Silver, L. (2017). 4 charts on how people around the world see education. Retrieved from <https://www.pewresearch.org/fact-tank/2017/08/28/4-charts-on-how-people-around-the-world-see-education/>
- <sup>90</sup> Making the Shift to Student-Led Learning. (2016). Retrieved from <http://foggs.ca/wp/wp-content/uploads/2016/08/Making-the-shift-to-student-led-learning-white-paper.pdf>
- <sup>91</sup> Computational Thinking in K-12: In-service Teacher Perceptions of Computational Thinking: Foundations and Research Highlights, chapter in *Computational Thinking in the STEM Disciplines*. Retrieved from [https://www.researchgate.net/publication/327026270\\_Computational\\_Thinking\\_in\\_K-12\\_In-service\\_Teacher\\_Perceptions\\_of\\_Computational\\_Thinking\\_Foundations\\_and\\_Research\\_Highlights](https://www.researchgate.net/publication/327026270_Computational_Thinking_in_K-12_In-service_Teacher_Perceptions_of_Computational_Thinking_Foundations_and_Research_Highlights)
- <sup>92</sup> “Creative Learning in Brazil.” MIT Media Lab and Lemann Foundation (2015+). Retrieved from <https://www.media.mit.edu/projects/creative-learning-in-brazil/overview/>