European Commission

10 TRENDS TRANSFORMING EDUCATION AS WE KNOW IT

European **Political Strategy** Centre

From here	To there
Education frontloaded in early life	Learning throughout life
Blackboard, books and papers	Whiteboard, digital and virtual reality supports
Academic literacy	New forms of literacy, including digital
Lecture-based, theoretical, passive learning	Experiential, immersive learning; interactive, participatory courses and seminars; labs and simulation games across all disciplines
Teachers as lecturers	Teachers as learning coaches and mentors
Standardised, mass approach to learning	Customised, individualised learning
Discipline-based, focused on subjects and expertise	Competency-based, multi-disciplinary, project-based and digitally-enabled learning
Education mainly provided by a restricted set of state, religious or private actors	Diversification of education providers and of training partnerships
Recruitment based on degrees	Recruitment based on skills, talents and potential

Source: European Political Strategy Centre

TREND 1

THE EARLIER THE BETTER

Education received in early childhood often shapes life prospects.

- Pre-school education boosts cognitive, character and social skills. The educational impact of early childhood education is already evident in teenagers: **15-year olds who attended pre-school for one year or more score higher in the OECD's Programme for International Student Assessment (PISA)** than those who did not.
- Early childhood education also has wider social benefits: it increases the likelihood of healthier lifestyles, lowers crime rates and reduces overall social costs of poverty and inequality. It enhances future incomes: full-time childcare and pre-school programmes from birth to age 5 have been shown to boost future earnings for children from lower-income families by as much as 26%.[1]
- Early childhood education can ease inequality by enabling mothers to get back to work and support the household's budget with a second income. In most countries, women's participation in the labour market is clearly linked to the age of their children. Across Europe, 20% of women declare family responsibilities as the main reason for not working; lack of available care provision for young children is a primary reason.[2]

Early childhood education can lay the foundations for later success in life in terms of education, well-being, employability, and social integration. This is even more valid for children from disadvantaged backgrounds.

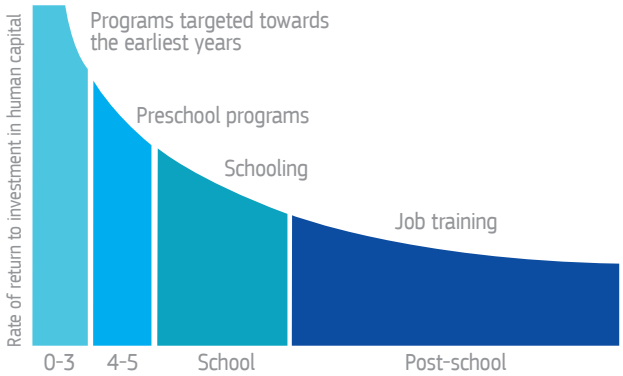
Investing in pre-school education is one of those rare policies that is both socially fair – as it increases equality of opportunity and social mobility – **and economically efficient**, as it fosters skills and productivity. But all these benefits are conditional on the quality of the education provided.

INCONVENIENT TRUTHS

There are more than 32 million young children below the age of compulsory education who could access early childhood education in the EU but only about 15 million children have access.[3]

Across Europe, **1 in 4 children under the age of six is at risk of poverty or social exclusion** and may need specific measures to support their educational needs.[4]

Investments in early education have the highest rate of return



Source: Strong Start for America's Children Act

TREND 2

GRADUATION IS NOT THE END OF LEARNING

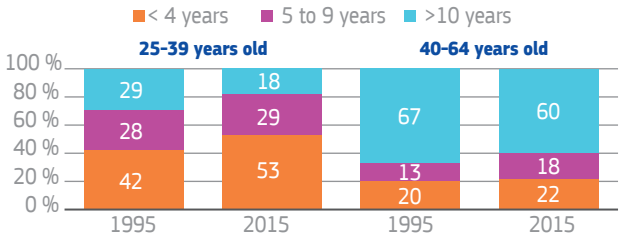
Learning how to learn is the most important skill of all.

- Most children entering primary school today are likely to work in jobs that do not yet exist.
- People change jobs – and even professions – much more often than a generation ago. **The average European worker has gone from having a job for life to having more than 10 in a career.**
- In an ageing society, with a workforce that is shrinking, Europeans will have to work longer. This means that those aged 40+ must be given substantial opportunities to update their skills.
- **Less than 11% of Europeans aged between 25 and 64 are engaged in lifelong learning**. On average, only 6% of older workers (aged 55 to 64 years old) currently participate in training and education schemes.[5]

A WORLD OF CHANGE

Both younger and older workers stay less long with the same employer

Percentage of workers employed in the same company by number of years; breakdown by age



Source: Eurofound

Demands for competences keep evolving. Investing in lifelong learning, including through more learning on the job, is the best promise to maximise future employability. Employers are already the biggest contributors to adult learning, accounting for roughly 50 % of all spending[6], and workplace innovation is key to acquiring and updating skills. Education establishments also need to teach the advantages of continuous learning, and work out more attractive, open and inclusive ways to bring people in different phases of their life and professional cycles back into education.

THE FUTURE IS ALREADY HERE

Towards universities that continue to educate beyond graduation and majors

A design team from Stanford University's d.school[7] worked with hundreds of students and administrators to explore how higher education could be reinvented to deal with the potential disruption posed by online learning, and respond to shifting needs and expectations of future employers and students. Their vision of the university of the future consisted of the following dimensions:

- **Open loop university:** instead of limiting access to an academic setting in early adulthood, offer opportunities to prime-age adults to return, pivot careers and reconnect with the community.
- **Paced education:** rather than four-year courses structured around semesters and mainly based on lectures, offer phases of interactive learning, of varied length based on the needs of the students.
- **Purpose learning:** students would be asked to 'declare a mission, not a major' when starting their studies. For example, instead of saying that she is studying biology, a student would say that she is learning human biology to cure cancer, or drug addiction. Based on these, faculty and students would tackle societal challenges through 'Impact labs' around the world.
- **Competence hubs:** Rather than separate academic departments and disciplinary-based teaching, the university would create multidisciplinary competency hubs mixing faculty, researchers and students in state-of-the art studio classrooms. Upon completion of their courses, graduates would receive a 'Skill-Print' summarising their skills, capabilities, talents, ability to learn and work on projects and with team-members, to be used with prospective employers, rather than a grade transcript.

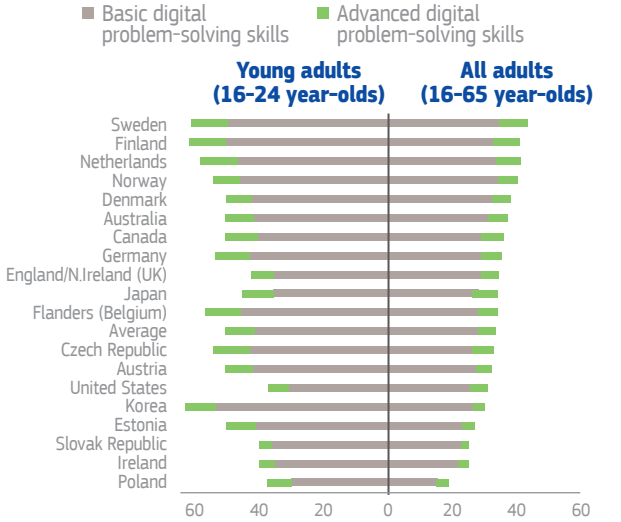
TREND 3

DIGITAL IS THE NEW LITERACY

Digital skills are becoming a core literacy. And young people are at an advantage.

A WORLD OF CHANGE

Younger adults outperform older ones on digital problem-solving



Source: Programme for International Student Assessment (PISA), 2012

- Today, 93% of European workplaces use desktop computers and **there is almost no job that does not require at least basic digital skills**. To illustrate, in 2016, half of European construction workers needed basic digital skills to perform their jobs.[8]
- And yet, a vast majority of workplaces (88%) have not taken any action to tackle the lack of digital skills of their employees.[9]
- **For the first time in history, young people are more proficient at a sought-after skill than their older peers**. This may have profound ramifications for labour markets that are still very much based on seniority and years of experience.
- Unequal access to digital skills and technologies often overlaps with known cracks in social protection systems. And, with the rise of e-government, online shopping, banking and smart mobility, lack of basic digital skills may lock individuals not only out of work, but also out of society.

Just as numeracy and literacy skills are fundamental for every citizen, regardless of discipline and profession, so too are digital literacy skills. They will become necessary to succeed in today's society and labour markets where ubiquitous connectivity is the new normal.

THE FUTURE IS ALREADY HERE

Poland's digital natives

As part of its 'Digital Poland' strategy[10], Poland has committed over 170 million euro by 2020 to develop and promote the digital skills of all Poles and all age groups. The strategy reaches out to people at risk of digital exclusion (people of 50+ age, from rural areas or with disabilities), while also supporting gifted ICT students/programmers, through its e-Pionier programme that organises competitions to develop innovative solutions with wider value for society or public policy. In addition, all pupils starting from their first year of primary education already have compulsory coding lessons, while all Polish schools will be connected to fast broadband by the end of 2018.

Poland has the fourth-largest pool of science graduates in the EU and a large workforce that is 'digitally-enabled', or in other words able to perform digitally-related jobs. Poland's IT sector has been growing fast in recent years, and the high availability of qualified professionals has drawn in multinational companies operating in the IT field. Estimates suggest that Poland could increase the economic value added of its economy by 13%-22% by means of digitisation, so investing in its populations' digital skills is the smart choice ahead.

TREND 4

HUMANS ARE NOT THE ONLY ONES LEARNING

Humans will increasingly compete with machines to gain novel insights.

THE FUTURE IS ALREADY HERE

Digital technologies are becoming ubiquitous even in the most traditional sectors

Intelligent devices, such as robots and drones, can help farmers to reduce crop losses caused by pests and diseases, while also decreasing agrichemical use, thanks to an earlier and more precise identification of crop enemies, enabling more precise chemical application or pest removal. Researchers predict drones, mounted with multispectral cameras, could take off every morning before farmers even get up, to identify pest problems so that the farmer could immediately address them. Similarly, wearable devices like those designed to track human health and fitness, are already being used to monitor cow fertility and detect early signs of illness, alerting the farmer via smartphone. As these technologies develop, so too will the role of the farmer, requiring new skills and certainly, digital competence.

Machine collaboration, human advantage

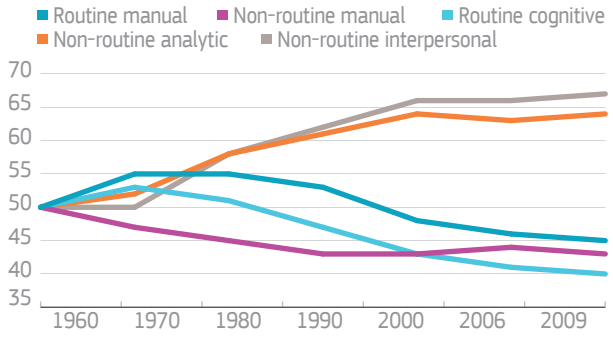
A recent comparison[11] of the ability of expert doctors and AI software to diagnose cancer found that doctors continue to perform significantly better than software. However, it revealed that doctors performed better still when working with the software. This suggests that **often AI does not replace human labour so much as it augments human capabilities**.

Human-machine collaborations are also being investigated within the US Defence Advanced Research Projects Agency, which developed a 'digital tutor' system to train recruits for IT jobs in the US Navy. The digital tutor prioritises conceptual learning and thinking, only allowing students to move on after passing a review test. An assessment of the programme found that students assisted by the digital tutor outperformed classroom-based graduates – including some who trained for twice as long.[12]

- Advances in high-performance computing are enabling an artificial intelligence revolution whereby machines can learn and take on ever more complex tasks.
- As **humans may increasingly find themselves competing with robots – and no longer only on routine tasks and low-skill jobs** – educational systems need to refocus on the very skills and competences that have been central to the success of the human species in the first place: creativity, problem-solving, negotiation, adaptability, critical thinking, working together, empathy and emotions, and cross-cultural communication.

INCONVENIENT TRUTHS

The skills that are easiest to teach are also easiest to digitise



Source: OECD

High-performance computing enables machines to learn faster than ever

Time-to-learn	Desktop	10-node spark cluster	Small GPU board	Large GPU cluster	Largest GPU cluster
Face recognition	1 year	4 months	4 weeks	4-5 days	12 hours
Demand prediction	3 weeks	4-5days	12 hours	3 hours	30 minutes
Machine translation	20 years				2-4 weeks

Notes: GPU stands for Graphics Processing Unit. The computational power of GPUs allows for very fast calculations to be performed.

Source: Gartner

TREND 5

FROM STANDARDISATION TO CUSTOMISATION

From industrial-era mass education to individualised, digitally-enabled learning paths.

- The industrial era required large numbers of workers with medium-level skills that could be acquired through standardised education systems. The rise of the knowledge-based economy saw a rise in the share of high-skilled occupations and a hollowing-out of medium-level skilled jobs.
- **Modern-day economies are increasingly built around human capital** (rather than industrial machines), **and there is therefore a much stronger need to maximise everyone's potential.**
- One-size-fits-all is unlikely to work in this new environment. Individualised learning paths can help students and workers to develop their innate talents and capabilities.
- **Personalisation of learning requires a major change in the organisation and delivery of education and on-the-job learning**, recentring it around personal progress.
- Up till now, high costs were considered as an insurmountable obstacle to scaling up such approaches because introducing a truly individual approach on a wide scale would mean hiring a significant number of teachers or learning coaches. Thanks to the emergence of new technologies and resources this may no longer be the case.

Learning can be transformed into a customised experience where individuals approach problems in their own way, acquire knowledge and skills at their own pace, maximising outcomes not only for the most talented students, but also helping to bring those lagging behind up to speed.

THE FUTURE IS ALREADY HERE

Personalising classroom learning using data analytics: the case of Singapore

With the average primary school class consisting of up to 40 pupils, teachers have typically found it hard to personalise learning for each individual student.

The Government of Singapore is exploring innovative use of emerging technologies to enrich the learning experience and enhance the quality of teaching, enabling everyone to achieve their full potential.[13]

A key feature includes personalised learning using analytics, whereby data relating to the student – on school attendance, test results, participation in class, as well as self-assessments and teacher assessments – is gathered and combined to draw out crucial insights into students' learning strengths and difficulties. The goal is to help teachers build better pedagogical programmes, empower students to take an active part in their learning, target at-risk student populations through personalised interventions, and assess factors affecting completion and student success.

TREND 6

FROM SILOS TO MASH-UPS

Towards interdisciplinary, technology-powered learning.

- **Local and global challenges**, such as addressing climate change, food, water and energy security, health, or governing culturally plural societies, **are increasingly complex and require interdisciplinarity**.
- Multidisciplinarity is critical to bridging across silos in order to understand the causes and complexities of modern-day challenges and develop innovative solutions.
- **It is at the intersection of different disciplines that novel insights emerge**. Yet, in their overwhelming majority, Europe's schools and universities remain organised in silo departments that do not sufficiently address the interconnectedness of today's world.

Technology can contribute to new ways of learning. It can be taught not only as a subject but rather used to convey the material learned in other subjects. For instance, learning about World War II becomes not just a study of history but an all-encompassing analysis of the sociological and economic angles, using technology to bring the subjects learned to life.

THE FUTURE IS ALREADY HERE

Phenomenon-based and interdisciplinary teaching: the case of Finland

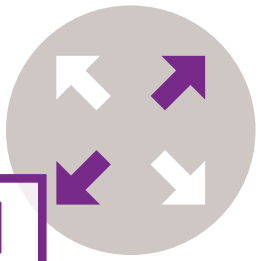
For the past 40 years, Finland has been one of the highest-performing school systems in the world, consistently ranking among the top scorers in the OECD's Programme for International Student Assessment (PISA), which tests and compares the global performance of 15-year-olds in reading, maths and science literacy. PISA does not assess what students know; it focuses on how students apply theory and thinking in answering questions - so how they solve problems and apply what they know.

Holding this leading position for so long, however, has not made Finland complacent. The country is faced with fast-paced technological, demographic and socio-economic changes that have led to concerns about increasing inequality and growing regional disparities. In 2016, it launched a national programme[14] aimed at improving primary and lower secondary education, further developing the phenomenon-based, interdisciplinary approach to teaching which the country has been experimenting with since the 1980s.

The new core curriculum for basic education focuses on transversal (generic) competences and works across school subjects; with collaborative classroom practices, where pupils may work with several teachers simultaneously – thereby also encouraging Finnish school teachers who have traditionally focused on a given topic to work together with their peers in school around multidisciplinary modules.

'Finnish schools will continue to teach mathematics, history, arts, music and other subjects in the future. But with the new basic school reform, all children will also learn via periods looking at broader topics, such as the European Union, community and climate change, or 100 years of Finland's independence, which would bring in multidisciplinary modules on languages, geography, sciences and economics,' Pasi Sahlberg, Adjunct Professor at the Universities of Helsinki and Oulu, and leading figure in education policy, explains.

TREND 7



MANY (NEW) FISH IN THE EDUCATION POND

Formal education provision is complemented by new entrepreneurial ventures.

- The number of actors offering new platforms and methods for training and learning has grown exponantially; it is no longer limited to formal education establishments.
- **Over 800 universities already offer lectures on app stores, making it possible to learn anything, anytime and anywhere** on a smartphone or tablet.
- Digital technologies are a catalyst for personalising learning and making it an increasingly active and flexible learning experience.
- Peer-to-peer platforms enable people from very diverse parts of society and the world, to engage and learn from each other.

The growing diversity of actors engaging in education opens up numerous new opportunities for people to train and retrain at different moments in their lives. They can also help to reach out to individuals that would otherwise be excluded.

New forms of partnerships between school actors, as well as between public and private actors are rejuvenating curricula, experimenting with new intersections between disciplines, and are already having an impact on employability.

THE FUTURE IS ALREADY HERE

Tech entrepreneur spearheads Europe's most successful coding school

In France, École 42[15] is a free, teacher-less, self-organised university set up by a tech entrepreneur. It is schooling thousands of programmers through project-based learning and peer-to-peer learning. Entry is totally merit-based as students are selected through a one-month, elimination-based test that they must endure to get a place at the school, and the curriculum is 'gamified'. Almost 80% of students have a job before they finish the course and 100% are employed by the end of it.

Going digital: Corporate training as a stepping stone to getting a job or a promotion?

More and more technology and software companies are creating learning platforms that individuals or companies can use to acquire valuable new digitial skills, providing certification that is globally recognised. The German multinational software company SAP has set up trainings through Enterprise MOOCs (Massive Open Online Courses) offering flexible and interactive courses on topics from procurement to how to collect, process and analyse data.[16] Its learning hub provides education content to support self-paced e-learning, as well as access to a community of learners through expert-led live online sessions and collaborative social learning rooms. The added value of these trainings is that they offer certification programmes by area of focus and skills levels that are globally recognised by all SAP partner companies and customers.

TREND 8

TRANSITION, INTERRUPTED

The link between formal school education and work is increasingly broken.

- **Formal education used to be a guarantee for a job. Today, this is no longer the case.**
- Europe has the most educated workforce in its history. Almost 40% of Europeans aged 25-39 hold a tertiary degree; just over a decade ago it was around 25%.[17] And yet, Europe struggles with persistently high levels of youth unemployment. Even though it has started falling, it is still more than double the overall unemployment rate, and far higher than in other developed economies.
- The transition from school to work is being jilted as young graduates have a harder time than ever to find employment and the vast majority of those who get a job do so in very different fields from what they have studied.
- Lack of skills is a common reason for entry-level vacancies. 40% of European employers report having difficulty finding people with the skills they need to grow and innovate.[18] **There is a twin crisis of high youth unemployment and shortage of skills**.

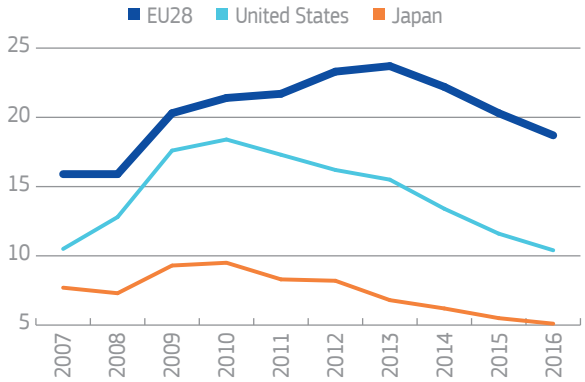
Education providers are not engaging sufficiently with employers, which often makes them oblivious to the realities of the labour market: 72% of them consider the graduates adequately prepared for the job market, whereas this view is held only by around 40% of employers and youth. At the same time, employers rarely interact with universities and schools, so their skill demands have a low chance of being translated into curricula. In effect, **a quarter of youth do not make a smooth transition to work**.[19]

INCONVENIENT TRUTHS

Young Europeans are at highest risk of being unemployed

Unemployment rate persons under 25 years old, 2007-2016

In %



Source: OECD

THE FUTURE IS ALREADY HERE

It's a match!

Technology-enabled tools with real-time information are already assisting schools and universities in offering career advice to their students. Personality tests can match students with potential university degrees and jobs based on their interests and personality type. From there, students are able to digitally map out different career paths and view information relating to the degrees and education levels of real people in these fields, average salaries, fluctuation of demand in the labour market. This enables them to make more informed decisions about their future studies and professional development, thus also contributing to addressing skills shortages and mismatches.

TREND 9

MEDIA LITERACY WANTED

Critical thinking is needed to make democracies more resilient.

- **Close to 8 out of 10 middle school students cannot distinguish 'fake' news from real news.**[20]
- With the emergence of automated accounts (bots), the spread of disinformation has never been easier.
- Through the use of algorithms, social media can create powerful echo chambers, entrenching pre-existing beliefs, views, visions and animosities, and they can also be used as platforms for the dissemination of external influence.
- The fake news phenomenon is likely not a short-lived one and requires media-literate citizens to discern fact from fiction.

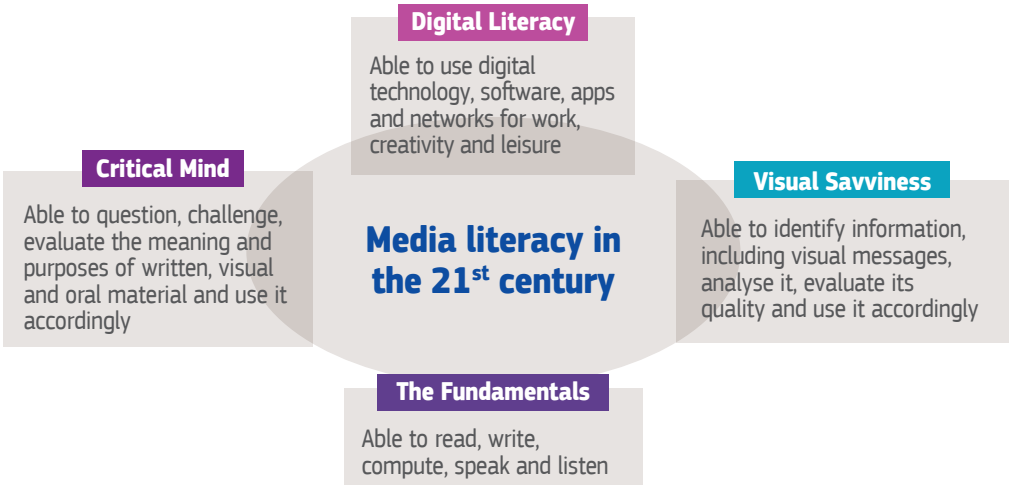
Consensus-building, the backbone of democracy, becomes a daunting challenge in such an environment. Some remedies can come from the social media providers. But more importantly, our **educational systems must integrate critical thinking, information evaluation and media literacy as some of the top skills for the 21st century** from very early ages.

THE FUTURE IS ALREADY HERE

Teaching kids to think when they swipe and click

The Italian government, in cooperation with leading digital companies, has started an experiment to train students in public schools to recognise fake news and conspiracy theories online.[21] Laura Boldrini, the President of the Italian lower house of Parliament, who has spearheaded the project with the Italian Ministry of Education, asserts that the web cannot be forfeited to the fringes, and that the government must teach the next generation of Italian voters how to defend themselves against falsehoods designed to play on their fears.

Four dimensions of media literacy for the 21st century



Source: European Political Strategy Centre

TREND 10

GROWING GLOBAL COMPETITION FOR UNIVERSITIES

Europe may have invented universities, but now it is time to reinvent them.

- The world's first universities were set up in Europe. But today, the highest ranking universities in the world are not European. **Dominated by US-based institutions and a handful of UK universities, no EU27 university is in the top 25 worldwide**.
- At a time when European universities risk falling behind, bringing more world-leading researchers to Europe could bolster European research excellence and global competitiveness.

THE FUTURE IS ALREADY HERE

Specialisation as a game changer

94% of graduates from the Turin-based Politecnico di Torino find employment within one year from graduation.[22]

The Politecnico managed to achieve this important result through a careful calibration between *specialisation, partnerships* and *innovation*:

- It focused on engineering, establishing strong partnerships with industry and local authorities, making the university a laboratory for experimentation of services;
- It pursued a policy of internationalisation, establishing exchanges with universities in other regions of the world and agreements for interships with national and international companies.

Turin is an example of how specialisation in institutional advantages - engineering knowledge as a service - can be turned into a competitive strength.

INCONVENIENT TRUTHS

No EU27 universities in the top 25

Top 25
Universities in the world 2016/17

1.	University of Oxford UK
2.	California Institute of Technology USA
3.	Stanford University USA
4.	University of Cambridge UK
5.	Massachusetts Institute of Technology USA
6.	Harvard University USA
7.	Princeton University USA
8.	Imperial College London UK
9.	ETH Zurich – Swiss Federal Institute of Technology Zurich Switzerland
10.	University of California, Berkeley USA
11.	University of Chicago USA
12.	Yale University USA
13.	University of Pennsylvania USA
14.	University of California, Los Angeles USA
15.	University College London UK
16.	Columbia University USA
17.	Johns Hopkins University USA
18.	Duke University USA
19.	Cornell University USA
20.	Northwestern University USA
21.	University of Michigan USA
22.	University of Toronto Canada
23.	Carnegie Mellon University USA
24.	National University Singapore Singapore
25.	London School of Economics and Political Science UK

Source: The Times Higher Education World University Rankings

Notes

1. European Commission.
2. European Commission, '*Parents at work: Men and women participating in the labour force*', 2014, http://ec.europa.eu/justice/gender-equality/files/documents/140502_gender_equality_workforce_ssr2_en.pdf.
3. European Commission, *Early childhood and primary education statistics*, http://ec.europa.eu/eurostat/statistics-explained/index.php/Early_childhood_and_primary_education_statistics.
4. European Commission, *Children at risk of poverty or social exclusion*, http://ec.europa.eu/eurostat/statistics-explained/index.php/Children_at_risk_of_poverty_or_social_exclusion.
5. European Commission, *Adult learning statistics*, http://ec.europa.eu/eurostat/statistics-explained/index.php/Adult_learning_statistics.
6. German Institute for Adult Education, 'Developing the adult learning sector', 2013, http://ec.europa.eu/dgs/education_culture/repository/education/.../adult-learning-g_en .pdf.
7. Stanford d.school, https://dschool.stanford.edu/.
8. European Commission, 10 May 2017, *'ICT for Work: Digital Skills in the Workplace'*, https://ec.europa.eu/digital-single-market/en/news/new-report-shows-digital-skills-are-required-all-types-jobs.
9. Idem.
10. Polish Ministry of Economic Development, Digital Poland Programme, https://www.polskacyfrowa.gov.pl/en/; National Centre for Research and Development, e-Pionier, http://www.ncbr.gov.pl/en/.
11. Knight, W., '*More evidence that humans and machines are better when they team up*', 8 MIT Technology Review, https://www.technologyreview.com/s/609331/more-evidence-that-humans-and-machines-are-better-when-they-team-up/, November 2017.
12. US Defense Technical Information Center, '*Accelerating Development of Expertise: A Digital Tutor for Navy Technical Training*', 2014, http://www.dtic.mil/docs/citations/AD1002362.
13. Singapore Infocomm Media Development Authority, Personalised Learning Through Analytics, https://www.imda.gov.sg.
14. Finnish National Agency for Education, http://www.oph.fi/english/current_issues/101/0/subject_teaching_in_finnish_schools_is_not_being_abolished.
15. Ecole 42, *'Born to code?'* www.42.fr.
16. SAP Learning Hub, https://www.sap.com/training-certification/learning-hub.html.
17. European Commission, *Tertiary education statistics*, http://ec.europa.eu/eurostat/statistics-explained/index.php/Tertiary_education_statistics.
18. European Commission, A New Skills Agenda for Europe, 2016, http://ec.europa.eu/social/BlobServlet?docId=15621&langId=en
19. McKinsey Centre for Government, '*Education to employment: Designing a system that works*', January 2013 http://mckinseyonsociety.com/downloads/reports/Education/Education-to-Employment_FINAL.pdf.
20. Wineburg, S. and McGrew, S. (2016), *'Why Students can't Google their way to the Truth'*, https://www.edweek.org/ew/articles/2016/11/02/why-students-cant-google-their-way-to.html.
21. New York Times, '*In Italian Schools, Reading, Writing and Recognising Fake News'*, 18 October 2017, https://www.nytimes.com/2017/10/18/world/europe/italy-fake-news.html.
22. Politecnico di Torino and Graduate Employability Rankings 2018, http://www.politocomunica.polito.it/en/press_room/press_releases/new_materials_for_near_future_aeronautic_engines/qs_graduate_employability_rankings_2018_politecnico_di_torino_is_the_top_ranked_world_s_leading_university_for_graduate_employment_rate.

European **Political Strategy** Centre

The European Political Strategy Centre (EPSC) is the European Commission's in-house think tank. It reports directly to President Juncker and operates under his authority.

The mandate of the EPSC includes: **strategic analysis and policy advice**, both short and long-term, to the President and the College on issues related to the policy priorities of the Juncker Commission (as defined by the President in his political guidelines presented to the European Parliament on July 15 2014); and **outreach** to decision-makers, think tanks and civil society at large.