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Role of education in the digital era: from "digital natives" to "digital citizens"

Report[1]
Committee on Culture, Science, Education and Media
Rapporteur: Mr Constantinos EFSTATHIOU, Cyprus, Socialists, Democrats and Greens Group

Summary

The rapid development of digital technologies requires redesigning education systems to give children the skills they need to handle the new digital environment and stay safe online, become responsible digital citizens and boost Europe's economic competitiveness.

European governments should overhaul teaching and improve coordination at all levels to reduce disparities in education systems, ensure equal access to digital education and fight against digital exclusion. Re-training teachers, rethinking curricula and new digital-based learning methods, as well as equipping schools with up-to-date facilities, should also be raised higher on government agendas.

The report hails the European Union's leadership role and ambitious plans for modern quality education and urges extending funding in this area to non-European Union countries in order to avoid a two-tier Europe that might have drastic consequences in terms of brain-drain and migration. It also encourages the Council of Europe to promote its digital citizenship education policies more widely and explore the implications of the use of artificial intelligence in education.

1. Reference to committee: Doc. 14042, Reference 4216 of 20 June 2016.

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A. Draft resolution[2]

1. The 21st century needs education systems that promote skills and competences for the future, not least creativity, critical thinking, collaboration and communication, and reflect Europe's demands for economic innovation and growth, the adaptability of labour markets and the necessities of the society at large.

2. Digital technology offers unprecedented opportunities to complement, enrich and transform education to meet these new challenges. In addition, Information and Communication Technologies (ICT) are a key tool to facilitate equitable and inclusive access to education, bridge the learning divides, open new perspectives for teachers and for their profession, enhance the quality and meaning of learning, and improve education administration and governance.

3. Education systems all over Europe have however been slow to adapt to the new circumstances. Currently, some 44% of adults in the European Union member States are estimated not to have sufficient digital skills and nearly 20% have no digital skills at all. Less than half of the children are in digitally equipped schools today and only 20-25% of students are taught by teachers who are confident using technology in the classroom. The divide is even wider in the greater Council of Europe area.

4. Digital natives, albeit proficient in the informal use of hi-tech tools and social media, do not necessarily learn to make systematic use of ICT in academic settings. To date, as many as 50% to 80% of schoolchildren have never used digital textbooks, exercised software or learning games.

5. Education of digital skills starts at school, yet a large proportion of schools are not connected. One of the goals of the EU European Education Area project is to ensure that by 2025 all schools in the European Union should have access to high-capacity broadband networks, and this with adequate financial backing; other Council of Europe member States do not benefit from similar aid resources and support structures. The Parliamentary Assembly is concerned that such substantial disparities risk creating new social divides both within and between European countries.

6. Many countries outside the European Union have made heavy investments into ICT to equip schools. The Assembly recalls however that technological investments without blending ICT meaningfully into teaching and learning processes will not bring about the desired transformations in education. A major paradigm shift is paramount to refocus education from knowledge transmission to knowledge creation and from the teacher's teaching process to the student's learning process. This paradigm shift should be accompanied by properly defined strategic goals, enhanced autonomy of schools and of teachers, introduction of new hybrid forms of learning where mobile, digital, virtual, social and physical learning spaces merge, and substantial reforms in student assessment.

7. In this process, young people need to be equipped with appropriate skills and competences to become efficient and responsible actors in the ever-digitalised world. The Assembly commends the European Union institutions for their work in this domain, and in particular for the adoption of the European Commission's Digital Education Action Plan in 2018 and for having worked out the comprehensive Digital Competence Frameworks for Citizens and for Educators, which together offer an in-depth reference model to systematically promote digital competence.

8. Acquiring digital skills needs to start from the earliest age and carry on throughout life. Learning about robotics, coding, cybersecurity, blockchain and artificial intelligence will form the backbone of future education and training schemes. Active, problem-based learning that covers various subject areas will benefit creativity and innovation. The Assembly stresses the urgency to draw up a minimum level of digital competences that students should acquire during their studies and the criteria to assess them. In this regard, the Assembly commends the Council of Europe guidelines to respect, protect and fulfil the rights of the child in the digital environment, which provide comprehensive guidance in this area, notably concerning to the promotion and development of digital literacy, including media and information literacies and digital citizenship education.

9. The Assembly regrets that, whereas a similar share of young women and young men feel sufficiently skilled to use digital technologies in their daily lives, there is still a considerable gender gap when it comes to young women's representation in ICT and science, technology, engineering and mathematics (STEM) studies and careers. The Assembly recalls its Resolution 2235 (2018) "Empowering women in the economy", which emphasised that greater efforts should be made to enhance the use of information and communication technology by girls, and motivate young women to pursue technical professions, the latter being necessary to unleash Europe's digital potential and ensure that women take an equal share in shaping the digital world.

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2. Draft resolution adopted unanimously by the committee on 24 June 2019.

10. Digital transformation creates numerous challenges for online safety and cyber hygiene. The digital natives are particularly vulnerable to a wide range of dangers; they are exposed particularly but not exclusively, to risks of harm from sexual exploitation and abuse, cyber bullying and harassment, indoctrination, cybersecurity threats and fraud. They need to be trained in critical thinking and media literacy. It is the role of education systems, the media and other stakeholders to help them become competent and responsible digital citizens and actors both in digital economy and digital society. In this context, the Assembly pays tribute to the Council of Europe's Digital Citizenship Education project, which provides competences that help them engage positively and critically in the digital environment.

11. The Assembly is conscious that the excessive use of ICT equipment may cause problems related to health and well-being, including sleep deprivation, sedentary lifestyle and addiction. It is therefore particularly important in curriculum design to balance the daily classroom use of technological and ICT equipment with adequate physical exercise and training. It is also vital in the learner-focused approach to education to encourage teamwork, personal contact between students and teachers and to prioritise the well-being and healthy development of children and adolescents.

12. For the educational transformation to be successful, teachers, educators and school leaders need to be properly assisted and trained. Their training should take place at two levels: training in ICT, so that digital skills can be transmitted to students effectively, and training in the integration of ICT into teaching methods so that digital technology becomes not just an objective but also a vector of teaching across all subjects. Governments must find ways to make appropriate and sustainable investment in both initial teacher training and in-service development. Competent, digitally confident and motivated teachers in a reform-supportive environment are the best guarantors for creating innovative and engaging learning environments. For this, teachers must be effectively involved in curriculum design and development, they should be empowered to enjoy the autonomy to choose and to vary methods of instruction, pedagogical approaches, selection of teaching materials and evaluation methods.

13. In the light of the above, the Assembly calls upon the governments of its member States:

13.1. When devising digital education and skills development policies, to take into consideration the above-mentioned concerns and principles, alongside those stipulated in:

13.1.1. the UNESCO 2015 Qingdao Declaration "Seize digital opportunities, lead education transformation", signed by all member States;

13.1.2. the recent European Union policy documents, in particular in the Council recommendation of 22 May 2018 on key competences for lifelong learning and the Council conclusions of the same date on moving towards a vision of a European Education Area, the European Commission communications on the Digital Education Action Plan (COM/2018/0022), improving and modernising education (COM(2016)0941) and new Skills Agenda for Europe (COM(2016)0381), its report "DigComp 2.1: The digital competence framework for citizens", the recent European Parliament resolution on modernisation of education in the European Union and the Committee on Culture and Education report on education in the digital era: challenges, opportunities and lessons for European Union policy design;

13.1.3. the Council of Europe reports on "Digital Citizenship Education" (Volume 1 "Overview and new perspectives" and Volume 2"Multi-stakeholder consultation report;

13.1.4. the Council of Europe "Reference Framework of Competences for Democratic Culture";

13.1.5. the Council of Europe Guidelines to respect, protect and fulfil the rights of the child in the digital environment.

13.2. to develop and implement complementary policies to combat digital exclusion, and to ensure that these policies reach all population groups, especially the most vulnerable ones;

13.3. to review the role of teachers and educators in the society, offering them both initial and in-service training and development opportunities, to improve their digital skills and competences so that digital technology could be integrated in learning processes in pedagogically meaningful ways, enriching the processes and enabling new pedagogical solutions that are motivating for teachers as well;

13.4. to empower schools with more autonomy to develop new learning methods that can be tested and adapted to various new settings, because future Europe needs creativity, not uniformisation;

13.5. to invest in ICT facilities and digital resources to support learning, including hardware, software, connectivity and adequate bandwidth;

13.6. to further integrate digital citizenship education in formal and non-formal education as defined in the digital citizenship education project of the Council of Europe;

13.7. to increase dialogue and joint action between government, educational, training and research institutions, local communities and businesses, notably in content development, keeping in mind the risks of over-commercialisation of education content;

13.8. to share their experiences and best practices through the various international forums.

14. The Assembly acknowledges the lead role that the European Union has assumed in pushing the digital education agenda as an investment strategy for Europe's future, promoting economic growth, employability, competitiveness, innovation and social cohesion. This is an ambitious plan to provide modern quality education for all. In order to ensure that nobody is left behind in this process and to avoid creating new dividing lines within and between European nations, the Assembly urges the European Union institutions to:

14.1. consider including the development of digital skills and competences and technical support to schools as a priority area of project funding in non-European Union countries;

14.2. develop a comprehensive digital education strategy that defines the steps toward enhanced formal and informal education and training, maps the full range of digital skills and competences required, provides clear guidance for teacher training and develops a harmonised method for the assessment and certification of digital skills and competences.

15. The Assembly welcomes the project of the OECD to develop a digital module for PISA 2024 in order to test the ability of students to learn in a digital world. It hopes that this new module will incorporate novel formats for benchmarking and assessing interdisciplinary, complex skills such as problem solving, collaboration, critical thinking and creativity. It urges the OECD to further develop peer learning online platforms that can facilitate direct sharing of educational methods and best practices between practitioners around the world.

B. Draft recommendation[3]

1. Referring to its Resolution … (2019) on "The role of education in the digital era: from "digital natives" to "digital citizens"", the Parliamentary Assembly emphasises the role and value of education in today's increasingly digitalised societies. As society modernises, so must school systems undergo a substantial strategic rethinking of teaching and learning processes, content, learning spaces, partnerships and evaluation in the digital era. Modern education has not only the responsibility to live up to the fast-evolving labour market needs, providing the "digital natives" the appropriate skills and competences, but it must also help them become responsible digital citizens. The Council of Europe has a major role to play in this.

2. The Assembly appreciates the instruments that the Council of Europe has put in place to promote safe, effective, critical and responsible participation of children and young people in modern society, notably the Reference Framework of Competences for Democratic Culture and the Indicator Framework on Culture and Democracy. It further notes and values the Council of Europe Guidelines to respect, protect and fulfil the rights of the child in the digital environment in its promotion of children's safety, educational, participative and other rights when online and using ICTs. The implementation of these instruments would need to be more widely promoted in member States and beyond.

3. The Assembly also values the tools and handbooks that have been issued within the framework of the Digital Citizenship Education project aiming to promote the acquisition by all children of the competences they need as digital citizens to participate actively and responsibly in a democratic society. There is, however, a pressing need for laying out a proper policy framework and a digital citizenship education strategy.

4. International multi-stakeholder co-operation is key in the connected world. In this respect, the Assembly welcomes the co-operation of the Council of Europe with the private sector to develop a set of guidelines on partnerships between educational institutions and the private sector.

5. The Assembly also encourages the Council of Europe to further work on digital developments that impact the education sector, exploring ways to fill the gap in digital exclusion and to face the new challenges posed by the use of artificial intelligence in education.

6. In this context, the Assembly recommends that the Committee of Ministers:

6.1. promote more widely the implementation of the Council of Europe Reference framework of competences for democratic culture, in particular through targeted action within the campaign "Free to speak, safe to learn – democratic schools for all" that would enable the creation of a Democratic Schools Network for sharing good practices, including activities promoting digital skills;

6.2. promote the implementation of the Council of Europe Guidelines to respect, protect and fulfil the rights of the child in the digital environment and ensure that the evaluation of the effectiveness of measures taken, planned in 2023;

6.3. speed up the adoption of a recommendation on the Digital Citizenship Education and a policy framework that should accompany it;

6.4. deliver model guidelines for governing partnerships between the educational institutions and the private sector, to create a rights-based, pedagogical and ethical framework and to harness the contributions the internet industry can make to the education of young people in schools;

6.5. explore the implications of the use of artificial intelligence in education, including: adaptive learning, learning opportunities for children with special needs, enhancing inclusive education and educating young learners about artificial intelligence and other advance digital technologies.

3. Draft recommendation adopted unanimously by the committee on 24 June 2019.

C. Explanatory memorandum by Mr Efstathiou, rapporteur

1. Introduction

1. Digital technologies have a profound impact on economies and societies and are changing the way we live, study, work, interact, engage in social activities and enjoy ourselves. They are also shaping future jobs and workplaces. This makes investing in one's digital skills, and notably those of the young generations, of the utmost importance. The new digital skills require critical thinking, creativity and imagination, and can be fostered through appropriate teaching/learning and practices.

2. There is however a growing concern that our educational systems are out-dated and are failing to promote the necessary skills that will adequately prepare our children for the future. A 2016 OECD report "Innovating Education and Educating for Innovation"[4] confirms that to date education has not managed to harness technology to raise productivity, improve efficiency, increase quality and foster equity in the way other public sectors have. A further 2017 European Commission report "Strengthening European Identity through Education and Culture"[5] paints an even gloomier picture: whereas 90% of future jobs require some level of digital skills, 44% of Europeans (in the European Union member States) equal to about 170 million people do not have sufficient digital skills[6]. European governments will have to develop new smart strategies for education to help young people to become competent and responsible actors in the ever-digitalised world, and to breach the current gap between their informal knowledge and social media practices, the real-world needs and the practices of educational institutions. In this process, it is however important to underline that a primary role of schools is to foster a social environment that no digital device can reproduce; this role should be preserved, regardless of technological progress.

3. In this respect, this report is a contribution to the international debate on how to reform school systems to provide "digital natives" all over the European continent with the necessary competences and learning experiences, and teachers with a new set of teaching competences.[7]

4. The report looks at two important aspects: first, the need for modern education systems which could provide the skills and competences that would match the demands of the labour market through the next decades. The second aspect is the need for the "digital natives" to become responsible "digital citizens". The generation of young people who were born around the 1990s may be called "digital natives" since they have not known the world without digital technologies, and yet, being a "digital native" does not necessarily indicate effective or sophisticated understanding of technology in educational settings. Rather, there is often a gap between their informal knowledge and media practices and the practices of educational institutions. In addition, although social media provide a strong sense of belonging to this community, they are vulnerable to cyber bullying and harassment, predatory behaviour or disturbing online content.

5. Citizenship in the digital world demands competences that include values, attitudes, skills and knowledge and critical understanding pertaining to issues such as digital rights and responsibilities, law, etiquette, literacy, communication, commerce, access and security as well as digital health and wellness. "Digital citizenship" translates into the norms of appropriate, responsible behaviour with regard to technology use. It is a way to prepare all technology users (and not only schoolchildren and students) for a technological society, in particular to equip them with the knowledge on how to act on cyberspace and digital social networks.

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4. https://www.oecd-ilibrary.org/education/innovating-education-and-educating-for-innovation_9789264265097-en.
5. https://ec.europa.eu/commission/sites/beta-political/files/communication-strengthening-european-identity-education-culture_en.pdf.
6. Source: The Digital Economy and Society Index (DESI) indicator on "digital skills", 2015 Eurostat data: http://digital-agenda-data.eu/datasets/desi/indicators.
7. I wish to wholeheartedly thank the Estonian and the Finnish delegations and their respective ministries of education for having facilitated my visits in the two countries (28-30 November 2017 to Tallinn and 12-14 February 2018 to Helsinki) to look at the digital education challenges and the proposed solutions in these two technologically innovative countries. My gratitude also goes to Mr Konstantin Scheller from the European Commission and Mr Hans Martens from European Schoolnet, and to Mr Villano Qiriazi, Head of the Council of Europe Division of Education Policy of the Education Department of DG II – Directorate of Democratic Citizenship and Participation, for their contributions to this report.

2. Key challenges

6. Eurostat (2016) statistics indicate that less than 50% of children are in digitally equipped schools today and only 20-25% of the students are taught by teachers who are confident using technology in the classroom. Between 50% and 80% of the students have never used digital textbooks, exercised software or learning games, and 18% of primary and secondary students have never or almost never used a computer in their school lessons. If non-European Union members of the Council of Europe were to be added, the picture would be even gloomier.

7. Recent academic research and international policy documents, such as the European Parliament "Innovative schools: teaching and learning in the digital era",[8] underline many challenges to introducing digital technologies in the classroom.

8. First, there is very little research data available today that can objectively tell us what the most beneficial way would be to move forwards. The problem goes far beyond technology; education today needs a whole paradigm shift from an individualistic knowledge acquisition culture towards a collaborative knowledge creation culture of learning, i.e. from the teacher's teaching process to the students' learning process. When designing digital learning, the starting point must genuinely be designed based on the learner's learning process. Modern education should promote competences such as critical thinking, collaboration, creativity and learning skills. The students should participate in processes that require setting goals, choosing methods to study, evaluation and reflection. These soft skills are needed while many of the hard skills (e.g. memorising facts, basic calculation) will be carried out more or less by computers in the future. However, there is still very little known about how to put this paradigm change into practice, with education ministries and agencies struggling to experiment with the knowledge that they have.

9. Second, in recent years, governments have invested heavily in information and communications technology (ICT) in schools. The OECD, for example, considers that over-emphasising the focus on technology and connectivity – both among suppliers and policy makers – is one of the reasons for the current limited success. Gaps in the digital skills of both teachers and students, difficulties in locating high-quality digital learning resources and software, a lack of clarity over learning goals, and insufficient pedagogical preparation on how to blend technology meaningfully into teaching, accentuate the difference between expectations and reality.

10. The "digital natives" are competent in informal practices, but they do not necessarily learn how to systematically make use of technology in academic activities. Teachers do not feel sufficiently skilled to use ICT effectively; at best they are "digital migrants" using digital technologies to complement prevailing teaching practices. Technological innovations are often pedagogically weak as fundamental structures remain the same. It is therefore urgent to find new innovative pedagogical solutions to refocus from knowledge transmission to knowledge creation, and to introduce new hybrid forms of learning where mobile, digital, virtual, social and physical learning spaces merge. Meaningful learning both in physical and digital space seems key to successful education in the 21st century.

11. Third, there is great disparity in schools and education systems. The lack of equal access to technology and knowledge is conducive to an increase of inequalities and puts entire communities and populations of school children and young people at a disadvantage, especially minorities and learners in poor neighbourhoods or sparsely populated or geographically remote areas. Digital skills generate a significant return in terms of employment, income and other social outcomes for those who have them, but they set up further barriers to those without. It remains a major challenge to make the same skills and competences accessible for all young people and also to inspire them to develop their interest and digital creativity and get them creating technology and not just consuming it.

12. When it comes to economic equity, there are currently several discussions being held regarding how parents and families should contribute to buying technologies for schools. BYOD discussion (Bring Your Own Device) is one example of this, indicating that each pupil could use their own devices at school, widely used in Estonia, for example. However, in many countries it is forbidden to use one's own mobile devices at school. France, for instance, has banned "all connected objects", including phones, tablets and smartwatches, from schools for students up to the age of 15. Education professionals tend to agree though that, instead of banning technological tools, schools should teach how to use them in socially and pedagogically acceptable ways. The "digital natives" need to learn how to regulate their own use of mobile devices inside and outside school.[9]

8. http://www.europarl.europa.eu/RegData/etudes/STUD/2015/563389/IPOL_STU%282015%29563389_EN.pdf.

13. Fourth, a generally worrying trend is disengagement at school. Emotional engagement is thought to play a central role in adolescents' academic achievement and adjustment. Finnish research, for example, indicates that the pupils with the best skills in technology are however also the ones who are most bored and disengaged at school. An OECD study in 2013 revealed that the same Finnish adolescents achieving top results in PISA tests ranked at the bottom of the countries for how much they liked school. This brings up the increasing relevance of personalised learning[10] but also that of Social and Emotional Learning (SEL)[11] for teachers, pupils and parents alike. The latter is at least as important as media literacy, cultural awareness, and complex problem solving. Arts, music, handicraft and sports are also important for balanced emotional and cognitive development and need to be promoted in interaction with acquiring digital skills and competences.

14. Home schooling is also related to disengagement from school, especially of the more talented users of digital technology, who increasingly perceive this method of education as more suited for their individual progress and the development of their competences. Home schooling, however, bears the risk of leading to isolation and seclusion from the classroom environment where children normally interact. This can be a negative development. We should avoid creating digital citizens who have lost their ability to interact and communicate with other humans and who can only engage with digital media. In order to responsibly utilise new technology as an empowering education tool, we should not be excessive and create virtual realities based on artificial intelligence and automation, gradually replacing human norms and values.

15. Fifth, innovation in education depends greatly on empowering and connecting teachers, educators and education leaders. They need a totally new set of competences and also the right environment, infrastructure, devices and leadership support. Making digital technology benefit educators requires an approach that combines teacher training, curricula and educational materials that are fit for digitally-supported teaching models. There is a need to work for creating a new content for education, enriching e-materials for artistic subjects, multimedia resources for foreign languages books. However, today the pedagogical shift is not the only factor that is challenging the operative working culture in school context: also the amount of digital administration and responsibilities (e-grade books in schools, campus information systems, etc.) has increased and thus reduced the time available for pedagogical development work.

16. Sixth, schools and educational institutions need a systemic change of operational culture and a new pedagogical leadership. A change can only be made by ensuring that pedagogical leadership is actively oriented towards the future. This is a great challenge and at the same time an opportunity to educational leaders – they have to go against old schooling traditions that persist very strongly among teachers. Educational leaders have to lead teachers to their new profession to be activators and facilitators of students' personalised learning processes.

17. That being said, new motivated leadership alone, especially in top down contexts, does not suffice. Developing new learning environments from the earliest age and putting them into operation requires leadership and know-how but also a corresponding supportive atmosphere and innovation-friendly culture. Teachers and learners need to be given a voice by involving them in decision making and choosing the tools that fit. The new approaches need holistic thinking, including technical support but also teaching parents and the community. Most important, however, is to remember that digital education is about learning new competences and not about teaching fear or obedience. Pupils should be equipped to use information technology to create programs, systems and a range of content and moreover, they should be able to use, and express themselves and develop their ideas through information and communication technology (not only reproduce them).

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9. In this context, there is also the question of cheating at tests and exams. WhatsApp, smartwatches and phones have created new opportunities for cheating. Reportedly, British universities have seen a 42% rise in cheating cases involving technology over the last four years. However, this is not only a problem for students. Whereas malpractice penalties among students increased by 25% at England's General Certificate of Secondary Education (GCSE) and A-level exams from 2017-2018, mostly by mobile phone use, those by staff was increased by 150%.
https://www.studyinternational.com/news/cheating-cases-rise-exams-mobile-phones/.

10. See more on personalised learning at https://medium.com/personalizing-the-learning-experience-insights/what-is-personalized-learning-bc874799b6f.

11. According to CASEL, social-emotional learning can be defined as: "the process through which children and adults acquire and effectively apply the knowledge, attitudes, and skills necessary to understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions." https://medium.com/inspired-ideas-prek-12/5-guiding-principles-of-social-emotional-learning-2f9fb554edad.

18. Seventh, most studies, if not all, or the studies that address the impact of technology on academic achievement do so by using standardised tests developed in the 20th century. Whether these tests are valid tools to evaluate how well the educational system prepares children for the demands of the 21st century economy remains largely unaddressed. It may prove to be a significant challenge, as digital literacy is likely to become a key determinant of productivity and creativity.[12]

19. Eighth, access to the internet and technology has also revolutionised the teacher-learner process. From antiquity to the start of online education, a teacher would embody the wealth of knowledge that children had to learn from (and reproduce), having no immediate way to verify the accuracy of the knowledge transmitted to them, or to contest it. This has changed and children who are digitally literate can now challenge the source, accuracy and applicability of the information they receive, by simply performing a background check online.

20. Last, but not least, the question of security and data protection is also an important element in this discussion. Most children are unaware of how their data and information is processed and do not realise how to exercise their right to privacy and data protection. Cyber security and data protection are among the most crucial issues today. Children, especially those who have no experience or little experience with digital tools can be mostly exposed to phishing and hacking attacks. Furthermore, in the era of fake news and omnipresence of hate speech, the competence of critical thinking and the ethical use of the internet become essential among children and youngsters. Clear, targeted guidance and educational materials need to be designed to give children and young people the tools, knowledge and skills they need to navigate their services safely. All in all, I think that the best approach to face the various challenges is the one that could be named in Greek "*Μηδέν άγαν*": "no excess", or "with moderation". We need to be aware of the limits and threats of the use of digital technologies in education. The focus should rather be on the new types of instruction that are adapted and adaptable to the modern society, rather than focusing on digitalising education to the maximum extent.

3. Popular fears and advantages of use of digital means in education

21. The effects of technology on children are complicated, with both benefits and disadvantages. There are a lot of popular fears about how the growing pervasiveness of modern information technology in young people's everyday lives affects their developing brains. A lively public debate has given rise to claims that extensive technology use might lead to a decline in mental ability, seen as an inability to focus or think deeply. Although polarised opinions are voiced in the public sphere with great conviction, very little actual scientific evidence exists to substantiate these claims. Only a handful of experimental studies have examined the relationship between technology use and cognitive functioning, and these studies have produced conflicting results. For example, a study which is often cited in popular media showed an association between chronic media multitasking and increased distractibility in adults whereas a follow-up study, conducted by a different research group, failed to replicate these results.

22. Just as the emergence of reading encouraged our brains to become focused and imaginative, the rise of the internet is strengthening our ability to scan information more rapidly and efficiently. Reading develops reflection, critical thinking, problem-solving, and vocabulary better than visual media. However, research shows that, for example, video games and other screen media improve visual-spatial capabilities, increase attention ability, the speed of reaction, and the capacity to identify details among clutter. The ubiquitous use of the internet search engines is causing children to become less adept at remembering things but more skilled at remembering where to find things. Given the ease with which information can be found these days, it only stands to reason that knowing where to look is becoming more important for children than actually knowing something. Not having to retain information in their brains may allow them to engage in more "higher-order" processing such as contemplation, critical thinking, and problem solving.[13]

23. The impact of digital technologies on education is at this stage not easy to assess. A recent European Parliament report stresses the importance of taking into account neurological research into the effects of digital technology on brain development and calls for investment in unbiased and interdisciplinary research into the various impacts of digital technologies on education, linking education sciences, pedagogy, psychology, sociology, neuroscience and computer science so as to achieve "as deep an understanding as possible of how the minds of children and adults are responding to the digital environment".[14]

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12. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3170902/.
13. https://www.psychologytoday.com/us/blog/the-power-prime/201212/how-technology-is-changing-the-way-children-think-and-focus.

24. We can also add the polemics around the fear that technology replaces jobs. McKinsey Study predicted that by 2030, as many as 800 million jobs could be lost worldwide to automation. The study says that advances in artificial intelligence and robotics will have a drastic effect on everyday working lives, comparable to the shift away from agricultural societies during the Industrial Revolution. In the United States alone, between 39 and 73 million jobs stand to be automated – making up around a third of the total workforce.[15] There are other, more optimistic scenarios and authors convinced that new jobs will appear to replace those which will be lost. This is not the report to discuss the question itself; nevertheless, whatever the scenario, it is clear that we need to think about how we manage the upcoming workforce transitions and how we need to prepare our children for it.

25. One thing is very clear: education, social skills and entrepreneurial skills are becoming vital elements to promote in response to the challenges presented by the digitalisation. Promoting a culture of innovation alongside digital and social skills (e.g. the abilities of critical thinking, adaptation to change, managing risks and difficulties) is a key to success. If properly applied, digital technology can facilitate access to education, bridge learning divides, raise the quality and relevance of learning, raise the qualifications of teachers and improve school administration and governance.

26. Online education comes with increased flexibility. Traditional education has forced the youth to reside in one place and to adjust everything to the schedule of classes. However, online education and e-schools make it possible to take any programme or course that is available in the home curriculum. They also enable students to complete the targets at any time, and to arrange a learning schedule that meets their individual needs. Self-paced learning has a lot of positive aspects and makes students more mobile and independent.

27. Online education directly connects people from all over the world. With discussion forums, email, video webinars, group chat rooms, live Q&A sessions, the students can enjoy nonstop communication with other fellow students, tutors, and inspiring professionals. The relationships they develop could turn out to be invaluable when it comes to changing jobs or advancing in their current role.

28. Finally, online materials and digital education have great value for students with “special needs” and children with disabilities to help them with their individual specificities and give them a possibility to acquire the skills and competences for independent life afterwards.

4. European Union priorities and policies

29. European Institutions and notably the European Union Commission are the frontrunners today for modernising education and training, providing funding for research and innovation in order to promote digital technologies used for learning and to measure the progress on digitalisation of schools. Making sure that European Union citizens have the necessary skills to succeed in the labour market and competences to function in the digital world is a priority for the European Union.

30. In 2009, the European Union Council adopted a strategic framework for education and training (ET 2020), which defined the objectives and organisation of European co-operation in the fields of education and training until 2020.

31. Since 2015, it has adopted several landmark resolutions, recommendations and programmes,[16] including:

– Work programme for 2016-2021 (November 2015), focusing on six priority areas:

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- developing relevant and high-quality skills through lifelong learning;
- promoting inclusive education, equality and non-discrimination;
- more open and innovative education, fully embracing the digital era;
- strengthening support for teachers and trainers;
- improving the transparency of skills and qualifications, to facilitate further learning and mobility;

14. European Parliament Committee on Culture and Education report of 26 November 2018 on education in the digital era: challenges, opportunities and lessons for European Union policy design (2018/2090(INI)) (Rapporteur: Yana Toom), http://www.europarl.europa.eu/doceo/document/A-8-2018-0400_EN.html.
15. McKinsey Global Institute, https://www.mckinsey.com/featured-insights/future-of-organizations-and-work/Jobs-lost-jobs-gained-what-the-future-of-work-will-mean-for-jobs-skills-and-wages.
16. Source: https://www.consilium.europa.eu/en/policies/education-economic-growth/.

- promoting sustainable investment, quality and efficiency in education and training systems.

– The Council resolution on socio-economic development and inclusiveness in the European Union through education (February 2016), focusing on measures to ensure targeted investment in education, how best to address skills gaps in order to restore jobs and support economic growth in Europe and the role of education in promoting citizenship and social inclusion.

– The Council conclusions on developing media literacy and critical thinking through education and training (May 2016), which stressed the fundamental role of education and training in helping young people to become media-literate and responsible citizens of the future.

– The Council resolution on a new skills agenda (November 2016), which highlighted the main aspects that would guide Council work in this field. It aimed to promote lifelong investment in people and it covers areas such as skills development, mutual recognition of qualifications, support for both vocational education and training and higher education and ways of exploring the full potential of the digital economy.

– The Council recommendation on the European qualifications framework for lifelong learning (May 2017), which aimed to improve the transparency, comparability and portability of qualifications across Europe by establishing a common reference framework for national qualifications systems. The recommendation also sought to modernise education and training systems and increase the employability, mobility and social integration of workers and learners.

– The Council conclusions on school development and excellent teaching (November 2017) highlighted a number of priorities, including ensuring high-quality and inclusive education for all; empowering teachers and school leaders and shifting towards more effective, equitable and efficient governance.

– The Council conclusions on a renewed agenda for higher education (November 2017), the overall aim of which is to modernise higher education so that it keeps pace with the rapidly evolving environment.

– The Council conclusions on moving towards a vision of a European education area (May 2018) on promoting common values, inclusive education and the European dimension of teaching.

– The Council recommendation on key competences for lifelong learning (May 2018), the aim of which is to update the current recommendation from 2006 and to take account of the changes in digitalisation and constantly evolving labour markets.

– The Council conclusions on gender equality, youth and digitalisation (November 2018), which focused on diminishing gender gaps and gender stereotypes and promoting the diversity of voices, calling on member States to incorporate gender perspective to all digital youth initiatives.

4.1. Developing digital skills and competences

32. In January 2018, the European Union Commission updated the definition of digital competence to reflect the changing nature of digital technology in working life and society more broadly. It now reads:

> *Digital competence involves the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), and problem solving.*

33. On the same occasion, the Commission adopted a Digital Education Action Plan,[17] which shows how education and training systems can take better advantage of digital technology and innovation and support the development of relevant digital competences which are required for life and work in the present age of rapid digital change. Digital Education is mostly seen from an economic perspective and this Action Plan thus focuses on implementation and the need to stimulate and scale up purposeful use of digital and innovative education practices. However, the purpose is not to meet the specific needs of the labour market but to educate for life.

34. The Digital Education Action Plan has three priorities, setting out measures to help European Union member States to meet the challenges and opportunities of education in the digital area:

– Making better use of digital technology for teaching and learning;

– Developing relevant digital competences and skills for the digital transformation;

17. https://www.consilium.europa.eu/en/policies/education-economic-growth/.

– Improving education through better data analysis and foresight.

35. For each priority, the Action Plan proposes a range of concrete measures and initiatives that the European Union Commission, in partnership with member States, stakeholders and society, will implement by the end of 2020. These include: boosting media literacy through the Key Competences Recommendation for Lifelong Learning[18]; increasing blended learning combining mobility and online co-operation (e-Twinning); strengthening the digital skills and jobs coalition by boosting the number of training courses; reaching out to more schools and young people with a target of at least 50% of schools participating by 2020, and the launching in 2018 of the 'Digital Opportunity scheme', a voucher-based system worth a total of EUR 10 million offering cross-border traineeships to students and recent graduates to develop their digital skills.

36. The Commission has, in consultation with the member States, developed a number of frameworks to help policy makers, learners and organisations in assessing digital skills and competences. Frameworks have been developed for citizens, organisations and most recently educators.

4.1.1. Digital skills and competences framework for citizens

37. The European Digital Competence Framework for Citizens[19] sets out the wide mix of digital skills and competences which are needed by all learners (5 areas, 21 competences). It was first published in 2013 and has become a reference for many digital competence initiatives at both European and member State levels. The framework was updated in 2016.

4.1.2. Digital skills and competences framework for educators

38. The Digital Skills and Competences Framework for Educators[20] was published in December 2017. It maps digital competences for educators at all levels of education, from early childhood to higher and adult education, including general and vocational training, special needs education, and non-formal learning contexts.

4.1.3. Digital skills and competences framework for educational organisations

39. The purpose of the European Framework for Digitally Competent Educational Organisations[21] (published in December 2015) is to allow organisations to assess their progress in integrating digital learning and pedagogies and to help policy makers to design, implement and evaluate policy interventions for the integration and effective use of digital learning technologies. The framework was the conceptual basis for the SELFIE (Self-reflection on Effective Learning by Fostering Innovation through Educational Technologies)[22] for schools which is currently being scaled up across Europe.

40. The European Union Commission puts a lot of emphasis on helping the future generations to become active digital creators and innovators. To this end, it launched the Digital Opportunity traineeship initiative, which facilitates cross-border traineeships in digital areas for 6,000 students and graduates between 2018 and 2020. Another example of a good initiative is the EU Code Week, promoting computational thinking, coding, and tech-related activities, especially with last year's record participation of 1.2 million people in more than 50 countries. It is expected that by 2020, 50% of schools across Europe will participate.[23]

41. The Digital Education Action Plan will also provide a framework for digitally-certified qualifications that will allow all learners, teachers, and workers across borders, see their skills and qualifications quickly and easily recognised. This is essential not only to raise skill levels but also to increase employability.

42. Digital well-being is threatened inter alia by misinformation, cyber bullying and data privacy issues. The European Union is also introducing a cyber-security teaching initiative which will support educators in understanding the risks involved and teaching pupils to use new technologies safely and confidently. Several Knowledge and Innovation Communities supported by the European Institute of Innovation and Technology will run a "Teach the teachers" programme, training 6,000 teachers by 2020 through online and face-to-face

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18. https://ec.europa.eu/transparency/regdoc/rep/1/2018/EN/COM-2018-22-F1-EN-MAIN-PART-1.PDF
19. http://publications.jrc.ec.europa.eu/repository/bitstream/JRC101254/jrc101254_digcomp%202.0%20the%20digital%20competence%20framework%20for%20citizens.%20update%20phase%201.pdf.
20. https://ec.europa.eu/jrc/en/digcompedu.
21. https://ec.europa.eu/jrc/en/digcomporg.
22. https://ec.europa.eu/jrc/en/digcomporg/selfie-tool.
23. Interview with Mariya Gabriel, European Commissioner for Digital Economy and Society, 11 September 2018 https://www.openaccessgovernment.org/digital-future/51932/.

courses. In addition, the European Union Commission has set up an e-Platform for Adult Learning in Europe (EPALE), a multilingual open membership community for teachers, trainers, researchers, academics, policy makers and anyone else with a professional role in adult learning across Europe.

4.2. Financial support to digital education programmes

43. The European Union is a key funder for countries and their governments, different non-governmental organisations, think-tanks and other groups carrying out activities in the area of ICT and technology in education. It appears that more than 48,000 schools in Europe lack a broadband connection. Thanks to the Connected Schools Programme over 16,500 primary and secondary schools will get ultra-fast broadband access in Spain. This project is most active in South West Europe and co-financed by the European Regional Development Fund. On the other hand, the European Union supports developing co-operation between countries for example through European Schoolnet – EUN Partnership. European Schoolnet is an international think-tank, the network of 34 Ministries of Education from across Europe and its mission is to support educational innovation at European level, to bring into contact all education stakeholders in Europe and enhance the mainstreaming of teaching and learning practices aligned with 21st century standards for the education of all students.

44. While in full appreciation of the progress that has been made by the different European institutions and financial support available to European Union member States, I am seriously concerned that similar aid is not available to the member States outside the European Union. This may create new substantial disparities and social divides within wider Europe. I therefore deem it necessary that the European Union funding schemes of projects outside the EU-28 area would make it a priority to include the development of digital skills and competences and technical aid to schools within their financial support plans.

45. That said, I recall that all member States of the Council of Europe are signatories of the UNESCO 2015 Qingdao Declaration "Seize digital opportunities, lead education transformation" which underlined the key concerns raised in this report and which encouraged governments, industry partners and all other education stakeholders "to join forces and share resources to create equitable, dynamic, accountable and sustainable learner-centred digital learning ecosystems in line with the Sustainable Development Goals and Education 2030 programme[24].

4.3. The European Union perspectives

46. In a longer term 2025 perspective of building the European Education Area, the European Union plans to:

– mainstream innovation and digital education in all learning contexts;

– introduce personalised digital education for all in every member State: acquisition of skills through a tailored learning experience for all individuals;

– introduce European Union scholarships for masters' programmes in computing aiming at increasing the number of specialists in cybersecurity, big data, artificial intelligence and machine learning; earmarking some of these scholarships for women;

– guarantee high connectivity for schools in the European Union, providing ultra-fast broadband access to all.

47. In its recent report,[25] the European Parliament Committee on Culture and Education regretted that there was no overarching digital skills strategy developed at European Union level, underlining that disparities among member States illustrated the need for such a strategy.

48. The report also regretted that currently there was no coordinated system to assess the level of digital skills of students. Tools such as the Digital Competences Framework and SELFIE existed, but they functioned on self-evaluation basis. It therefore emphasised the need for the development of a general ICT assessment module of a minimum level of digital competence to be acquired by students during their studies, and as a first step called upon the OECD to develop a PISA module for testing the actual level of digital skills. I fully agree that this could serve everybody as a way to provide insight into educational methods used and create new opportunities for the exchange of best practices. I note with satisfaction that OECD has already launched a project to test in 2024 the ability of students to learn in a digital world.

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24. http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/ED/pdf/Qingdao_Declaration.pdf.
25. http://www.europarl.europa.eu/doceo/document/A-8-2018-0400_EN.html.

5. Digital education focus and practices in member States

49. In the course of my first preliminary work for this report, I travelled to Tallinn, Estonia, and to Helsinki, Finland, to look at the digital education challenges and the proposed solutions in these two technologically innovative countries. Both countries are top achievers in the OECD PISA tests, both can boast about their digitally advanced education systems, yet the two countries have passed through different educational models in the past and have followed diverse approaches in integrating digital technologies in schools today.

50. There is much to learn from the Estonian and Finnish experiences, and also by other country experiences. However, even the best practices could not be easily transposed everywhere. All European countries have very different education systems related to school autonomy, curriculum design, status of teachers, attitudes to learning, etc. Those differences are valuable as they contribute to the diversity and multiculturalism of our societies. However, adaptability and openness are keys to motivating students and teachers and learning from different experiences brings huge benefits.

51. At first glance, Estonia has placed more priority on the bringing of new technologies into the classroom, 76% of Estonian schools teach informatics, robotics or similar subjects; schools are well-equipped (0,77 computers per student); free wifi is commonplace; school administration is highly digitalised, and the state provides funding for updating technological infrastructure. However, the Lifelong Learning Strategy 2020 is focusing on a change in the approach to learning and introducing digital competency models for students and teachers. Using digital and smart devices is widely used but not considered as a goal itself. Estonia is very strong on promoting co-creative projects in collaboration between schools, universities, industry and research partnerships. Students can work in real-life settings with real industry and academy partners in the Living Labs format, where they are encouraged to co-design new learning methods and research processes or collect data to establish evidence of impact. Many university-industry partnerships also jointly bridge formal and informal learning scenarios.

52. Finland is home to some of the world's most forward-looking innovations in education: school autonomy instead of school rankings; portfolios instead of exam grades; inquiry-based learning instead of memorisation and real-world context topics next to traditional subjects. Its National Curriculum Framework emphasises the importance of a multi-disciplinary approach to education and introduces the concept of "phenomenon-based" teaching and learning. This approach resembles real-life problem-solving much more closely and will give students a clearer understanding of the complexity of the world. ICT is not a subject of its own in the Finnish national curricula but is one of the seven transversal competences which should be included in all subjects. The use of ICT is systematically embedded throughout the 9 years of general basic education in different subjects. The final matriculation exams are fully computerised, which requires high technical skills from both students and teachers. The digital examination allows embedding of examination tasks of various authentic materials, such as YouTube videos or webpages. A sense of community and networking are key elements for the development and modernisation of teacher training. Finland has introduced a peer support and mentoring system of teachers in ICT, which seems to be working very efficiently. Local solutions, creativity and experimentation are widely encouraged. The objective of national digital education policies is to turn the Finnish comprehensive school into a learner-centred education system with the most competent teachers in the world and an open and collaborative school culture.

53. In Belgium, digitalisation of education was one of the main cores of "*Pacte pour un Enseignement d'excellence*", which is the final document of the work of various education-related environments. Among others, it was about the deployment of a digital pedagogical platform for education actors (sharing of resources), digital work spaces in each school, improving the digital skills of teachers and pupils and increasing digital governance in schools and administration. Also, as part of the "Digital Wallonia" digital strategy 2016-2019, the Walloon Government intends to extend and perpetuate the "Digital School" system by launching a call for projects every year that support digital projects at all levels of education. In the report "*Baromètre Digital Wallonia. Éducation & Numérique 2018*"[26] we discover that the implementation strategy of a digital media is driven mostly by the headmaster of the school.

54. In Georgia, one of the goals of the education reform is to create educational resources which will allow students to get used to modern technologies and their uses; provide a rich technological learning environment and widen teachers' professional development in-line with the modern requirements, etc. ICT are included in the national curriculum. Teachers will be re-trained according to the new Action Plan and they will receive a monetary motivation (likewise in Poland: conferences and grants for teachers to develop teaching programmes).

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26. https://www.digitalwallonia.be/fr/publications/education2018.

55. Digitalisation is a pivotal development in Germany. The Federal Government and the *Länder* co-operate in all areas of education, in particular, with regard to modernisation and digitalisation. The infrastructure developed through the Digital Pact for Schools will be in place nationwide in early 2019.

56. The 16 *Länder* ministers responsible for education in the Standing Conference of the Ministers of Education and Cultural Affairs of the *Länder* (KMK) decided in autumn 2016 that all pupils starting school or moving on to lower secondary level in 2018 will by the end of their schooling have acquired digital competences in a comprehensive set of skills in six areas. Also, instruction in all subjects will be enhanced with digital educational media, which will require curricula to be modernised. As there is little funding available for such training at the *Länder* level, the Federal Ministry of Education and Research (BMBF) has launched measures to upgrade teachers' digital literacy. The BMBF supports the *Länder* under the National Programme to Improve the Quality of Teaching (*Qualitätsoffensive Lehrerbildung*) to make lasting improvements in the learning contents and structure of the entire teacher training process.

57. In the Netherlands in line with freedom of education and the way the funding system works, schools are free to choose the method they want to use in their teaching, and to spend more or less money on that aspect. Each school individually decides which ICT tools to use, if any, and in what way (at school or at home). This predominately results in varying ICT usage in the different educational sectors, but also in very different ICT uses between schools and even between teachers (as teachers are often also relatively free to apply whatever tools they want to use in their classrooms). Besides having a national training programme aiming to strengthen the digital skills of primary school teachers, the Netherlands also boasts a successful programme linking ICT professionals to a secondary school to provide a guest lecture. In these guest lectures, professionals talk about working in the ICT sector or address a specific subject, such as big data, cyber security or programming. Moreover, the government, together with network partners and a centre of expertise, organises public campaigns, carries out research and offers educational services, with the aim of making young people, teachers and educators more aware and critical of digital technology.

58. In 2006 Norway implemented a new national curriculum which increased the status of digital competence to be the fifth basic skill in the Norwegian elementary school (stage 1-13). With the new General Plan for Teacher Education, a digital competence has become the fifth basic skill in all subjects. Also in the National Strategy for Quality and Cooperation in Teacher Education 2017, funding is promised to particular digital skills programmes for teachers. Moreover, the Ministry of Education has published a digitalisation strategy for primary, secondary and vocational education for 2017-2021. This strategy has a dual goal concerning the development of the digital skills of the pupils and to increase the technological offer and resources provided by the schools.

59. The Digital Poland Operational Programme 2014-2020 is aiming at strengthening digital foundations for national development: common access to high-speed internet, effective and user-friendly public e-services and a continually rising level of digital competences. The Ministry of Education with the participation of the Centre for Education Development works towards creating a new content for education, enriching e-materials for artistic subjects and multimedia resources for foreign languages books. It is also worth mentioning the activities of foundations and non-governmental institutions in the field of education through the media and digital education.

60. In Portugal, the curriculum is defined at national level and is goal-oriented and ICT has been integrated as a tool across the entire curriculum. In 2015, learning targets for ICT started being defined for all curriculum areas of the education system. A voluntary programming initiative is underway. The following projects are promoting the integration of ICT in curricula across school levels. The project of a distance school (*Escola Móvel*) has been designed and developed by the Ministry of Education, and initially sought to respond to the needs of students from families of showmen and circus artists and workers who would have to change schools throughout the year as a result of their families' professional activities, leading to high dropout and failure rates. *Escola Móvel* seeks to prepare students for the challenges of the digital age by combining the use of technology with the development of different literacies – basic (language and numeracy), scientific, visual, artistic, multicultural – through the subject areas. This example highlights how virtual classrooms and distance-learning can address the educational needs of those who are unable to attend regular classroom instruction.

61. In Romania, Law no. 1/2011 explicitly addresses (key) digital competences. The school curriculum for primary education provides integrated teaching and correlation of technology with other disciplines. Professional standards/teacher evaluation sheet provides the use of new technologies in teaching. The digital textbooks are developed for primary education. The Government Programme and strategies for education

development, aims towards rapidly achieving full computerisation of the educational process in the country. The approach involves providing all education institutions with high performance IT equipment, so as to put in place the organisation of a quality educational process.

62. In North Macedonia, the curricula stipulate mandatory use of information and communication technologies in schools as part of the educational process (30% of the classes need to be delivered with ICT), so the use of computers and others ICT equipment are essential and part of the daily plans of the teachers. The State Education Inspectorate monitors the application of ICT in the education process.

63. In Turkey, the Ministry of Education has undertaken several significant initiatives. In 2010, it launched the FATIH project, which foresees a high-speed broadband internet connection in all classrooms, interactive whiteboards in all basic education (grades 1–8) and high school classrooms, tablet PCs for all students – starting from the fifth grade – and a comprehensive online support and training courses to teachers and trainers to become digital content creators. Since 2013, 190,543 teachers have been trained in this respect.

64. Educational Information Network (EBA) is another government initiative geared to support the use of effective digital educational materials through information technologies and to ensure the integration of technology into education. It offers digital educational materials (such as videos, educational software and educational games) and tools to create multimedia resources (ideaLStudio, EBA Sunum, Eutdyo and Xerte) and is free of charge to students and teachers. EBA is also a gateway to other online platforms such as the Khan Academy, Da Vinci Learning and Lingus. EBA provides digital educational materials for students at school, at home at any time and place.

65. In an emphatic way, the Ministry of National Education has launched a curricula renewal process that acknowledges and enhances digital skills and competences as key competences for all students, including those in vocational education and training. Finally, Turkey collaborates actively in the digital citizenship projects of the European Schoolnet.

66. The United Kingdom was the first European Union country to introduce computer coding in primary and secondary curricula (in 2014), whereby the pupils have computing lessons starting from the age 4-5. Moreover, “the United Kingdom Digital Strategy”, presented in March 2017, announced reducing the barriers faced by schools in regions not connected to appropriate digital infrastructure and investments in the Network of Teaching Excellence in Computer Science, to help teachers and school leaders build their knowledge and understanding of technology. This network of over 350 master teachers provides continuing professional development for teachers to support the implementation of the computing curriculum. The strategy also aims to encourage computing graduates into teaching, through generous bursaries. Education specialists are also developing the role of libraries in improving digital inclusion to make them the ‘go-to’ provider of digital access, training, and support for local communities. In the United Kingdom, libraries give support for transformative initiatives like code clubs (over 5,000 code clubs, using volunteers and top-quality online material to give young people the opportunity to learn how to code).

6. Digital citizenship education and the Council of Europe

67. One of the key questions in digital education is about its ultimate goal: is it sufficient to develop modern education systems that promote skills and competences to face the demands of the labour market, or is it about educating the “digital natives” to become responsible “digital citizens” who know how to operate in the digital world in an appropriate, responsible and intelligent manner and be aware of the consequences of their online activity – both good and bad? Both aspects demand joint action at both governmental and intergovernmental level, through coordination and complementarity.

68. The Council of Europe has for years dealt with democratic citizenship education, which is manifested in its Reference Framework of Competences for Democratic Culture. Its action with regard to the lives of persons, and in particular children, in the digital environment has evolved from addressing their safety and protection to empowering them through education to participate safely, effectively, critically and responsibly in a world filled with social media and digital technologies. In 2016, the Steering Committee for Educational Policy and Practice (CDPPE) of the Council of Europe launched a new intergovernmental project entitled “Digital Citizenship Education” (henceforth DCE), the aim of which is to contribute to reshaping the role that education plays in enabling all children to acquire the competences they need as digital citizens, to participate actively and responsibly in a democratic society, whether offline or online.

69. The DCE project identifies a number of challenges, which are related to the need for transversal competences for accessing, communicating, participating and creating on line; to the digital gap due to access and marginalisation from the "digital life" due to lack of competences. A general lack of awareness of the importance of digital citizenship prevails – by teachers, families, senior leadership of schools, training institutions and public authorities.

70. The DCE project builds on the achievements of the Council of Europe's longstanding programme on Education for Democratic Citizenship and Human Rights Education (EDC/HRE) and the initial results of the project on Competences for Democratic Culture. The project's starting point was the question whether it was right for children to have two lives – a relatively digitally unplugged life at school and a digitally saturated life away from school – or whether they could have one life that integrated their lives as students and digital citizens.

71. In order to enable all children to develop their full potential as learners and citizens in a digitally rich world, the DCE project decided that a shift was needed from policies aimed solely at safety and protection or controlling behaviour to policies that promote positive measures and empowerment. Moreover, the responsibilities of the education sector and its major stakeholders needed to be reshaped.

72. One of the major issues that the DCE project has identified is the lack of shared definitions of key concepts and protocols for investigating and educating about digital citizenship. Following discussions with a group of experts, the project defined DCE as something that refers to the acquisition of necessary competences (values, skills, attitudes, knowledge and critical understanding) to engage positively and critically in the digital environment and to practice forms of social participation that are respectful of human rights and dignity through the responsible use of technology.

73. Thus far, the DCE project has set up an expert group, produced a literature review, conducted multi-stakeholder consultations and, in September 2017, organised a working conference in Strasbourg. As a result of this work, a conceptual model has been developed based on ten digital citizenship domains that are relevant to the education sector. These ten domains are divided into three clusters:

– being online (access and inclusion; learning and creativity; media and information literacy);

– well-being online (ethics and empathy; health and well-being; ePresence and communication);

– rights online (active participation; roles and responsibilities; privacy and security; consumer awareness).

74. These activities have led to a range of recommendations, one of which is sharing a definition for DCE to allow governments, civil society, industry, and academia to work on a common base and further develop an integrated and multi-stakeholder approach. Massive Open Online Courses (MOOCs) and online/offline resources are also needed to teach the responsible use of new technologies. Other recommendations include:

– making greater efforts to engage families in digital citizenship initiatives;

– appointing a Digital Policy Officer in schools;

– publishing lesson plans and illustrating learning opportunities for the most interesting resources;

– implementing solid monitoring mechanisms to detect emerging trends and positive and negative secondary effects;

– conducting research to better understand the developmental windows for teaching and inculcating values, attitudes, skills and knowledge and critical understanding.

75. The DCE project is currently working on the development of a policy framework, scheduled to be submitted to the Committee of Ministers towards the end of 2019. It will serve as a guide for member States to develop national DCE frameworks. The project has published the *Digital Citizenship Education Handbook* which is intended for students, teachers, parents as well as education decision makers. The handbook offers information, tools and good practice to support the development of these competences in keeping with the Council of Europe's vocation to empower and protect children, enabling them to live together as equals in today's culturally diverse democratic societies, both on- and offline. The project has been fostering co-operation with the private sector to develop resources and implement joint projects to promote digital citizenship. A set of guidelines for governing partnerships between the education institutions and the private sector will be finalised this year. A trainer's pack has also been developed to support teacher trainers in training teachers on digital citizenship education. Focus group meetings with parents in five member States (Croatia, Greece, Belgium, France and Germany) were organised to take stock of parents' knowledge on and understanding of digital citizenship and to explore ways of properly reaching parents and informing them.

76. In this context, it is also worth mentioning the Council of Europe “Free to speak, safe to learn – Democratic Schools for all" campaign, which is a key tool for the implementation of the Reference Framework of Competences for Democratic Culture. A core component of this project is the Democratic Schools Network which will consist of hundreds of schools in all member States that will be able to share their good practice of RFCDC implementation, including activities promoting digital skills.

77. Finally, the Council of Europe guidelines to respect, protect and fulfil the rights of the child in the digital environment were adopted in July 2018. The purpose of the guidelines is to assist states and other relevant stakeholders in their efforts to adopt a comprehensive, strategic approach in building and containing the often complex world of the digital environment. Among the many topics covered is children’s right to education, which covers the dual heads of digital literacy education (including media and information literacies and digital citizenship education) and educational programmes and resources which benefit children’s functioning in the digital environment and supports their education in all forms.

7. Conclusions and recommendations

78. The state of the development in the use of digital technologies in education varies across member States and regions, and sometimes even across the different communities within one country. There are also large disparities between different sectors of education. The best practices are not easily transposed. It is therefore very difficult to make generalised recommendations to member States in this context. Nevertheless, certain guiding lines on principles and policies may be defined.

79. I would start by stressing the need for sufficient and sustainable investment in public education. State education policies must be built on the principle of inclusive education and seek to reduce inequalities at every level: social, gender, economic, cultural and geographical. ICT equipment, hardware, software and other technical facilities and their regular renewal must be funded by the state in order to guarantee equal access to education. In the short term, every education institution should provide digital based learning for every student and team of teachers. In the long term, it is essential that teachers are trained to acquire the skills and competences they require in order to be a role model for their pupils.

80. Any transformative power of any technology in schools depends on human choices and circumstances. The challenge of achieving digital transformation is more about integrating new types of instruction than overcoming technological barriers. In this respect I observe that digital education has taken most successfully in countries with considerable autonomy and academic freedoms.

81. The use of digital technologies alone will not transform education, yet they do have an enormous potential to transform teaching and learning practices in schools and to open up new learning environments. They can facilitate innovative pedagogical models, simulations such as remote or virtual online laboratories, international collaborations, real-time formative assessment and skills-based assessment, allowing teachers to monitor student learning as it happens and adjust their teaching accordingly, as well as e-learning, open educational resources and massive online courses. However, using ICT, robotics, artificial intelligence or any smart technology should be seen as a means for teaching and learning, and not as an educational goal itself. I would advocate for an education model (like the Finnish one) whereupon ICT is not a subject of its own in the national curricula but one of the transversal competences which is included across subjects.

82. Overcoming the socio-digital divide is crucial. ICT can support personalised learning and promote individual learning opportunities for all. Developing digital skills and competences should be considered as a complement to the acquisition of other key social, civil and intercultural competences; they should help students to critically identify and handle the relevant information both when working individually, in-team or for project-based learning and help students become digitally conscious and sensitive as well as active democratic citizens.

83. It is essential that the new learning models are focused on quality education. The “commercialisation” of education risks jeopardising the quality, and lead to de-professionalisation of teaching. Quality education including ICT requires focusing on the community in which students learn. Problem-solving skills and critical thinking are best developed within teams, classes and in exchange with other students in the learning community. Teachers have the key role in creating a learning environment that is conducive to a community in which students engage with each other.

84. Governments must also pay serious attention to on-line safety, cyber-safety as well as teaching media literacy and the potential risks of a digitalised society. They should also address other digital challenges such as the promotion of critical thinking, the prevention of cyber-bullying, “netiquette” and the prevention of

indoctrination through the Internet and social networks. In this context, I welcome the Council of Europe's efforts in promoting digital citizenship education principles and tools in order to provide children and youth the tools, knowledge and skills they need to navigate their services safely.

85. Teachers and educators have the biggest brunt to bear in transforming digital schools. They need a totally new set of competences and also the right environment, infrastructure, devices and leadership support. In order to make teachers and educators competent as well as digitally confident and motivated, governments need to find ways to make appropriate and sustainable investment in both initial teacher education and continuous professional development. I believe that all teachers need competences in ICT training which is particularly valuable when considered in a cross-sectoral way. In addition, teachers should be effectively involved in the development and assessment of new programmes, courses, curricula, validation and educational resources. Therefore, every teacher should have the autonomy to choose and vary methods of instruction, selection of teaching materials, pedagogical approaches and evaluation methods.

86. Also, I deem it important to promote the idea of enhancing the gender perspective of digitalisation. The elimination of the gender gap in this context is crucial. Women are significantly less represented in science, technology, engineering or mathematics (STEM) related academic and educational fields. Targeted efforts must therefore be made to attract girls and women into the STEM sectors from their earliest age. Innovative teaching techniques through robotics, artificial intelligence, but also acquiring through practical projects and team-work coding, computational, programming or cyber-security skills, may offer them good employment perspectives. Reducing career segregation and fair and better work-life balance policies through digital education are crucial to foster female participation in the labour market.

87. To conclude, in order to maintain its relevance in the world of fast developing technologies and competitive markets, education across Europe needs to become much more participative, transversal, connected to real life, and most importantly, the development of digital education must not trigger social isolation. To this end, European governments and institutions must design innovative and engaging learning environments from earliest childhood to university level and beyond. This requires rethinking the entire role of education, investment in infrastructures, organisational change, remodelled teacher training, the creation of digital educational resources and high-quality educational software.

88. Digital transformation requires individuals, schools, organisations and societies to learn constantly new ways of working and managing everyday affairs. It is therefore of utmost importance to develop learners' lifelong learning, inquiry skills and co-creative projects in collaboration with industry, research and educational partners.

89. We are only at the beginning phase, with different countries testing different approaches and models. In this respect, the Council of Europe, in co-operation with the European Union and other national and international stakeholders, could play a key role in developing the tools which would help monitoring their implementation and assessing their impact.