



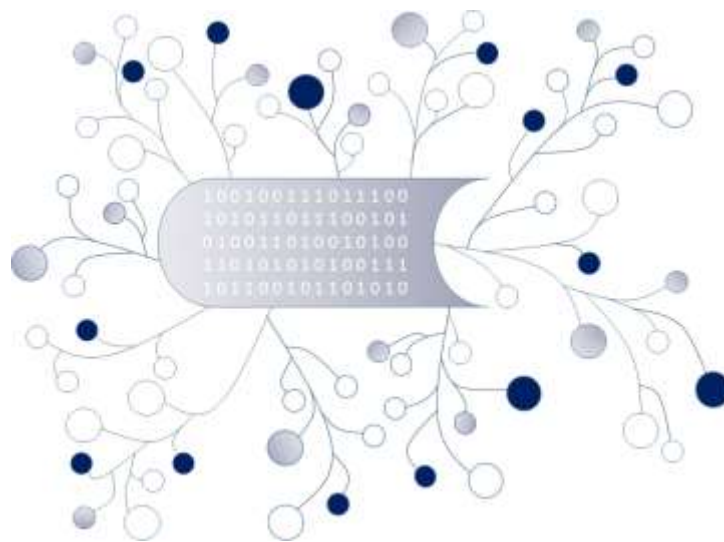
Digi-VET Fostering Digitisation and Industry 4.0
in vocational education and training
2018-1-DE02-KA202-005145
IO 4 – O4-A3-P4
Teaching and learning materials

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Digi-VET

Fostering Digitization and Industry 4.0 in vocational education

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IO4 – Didactical and teaching materials

Module 4 - The need of digitisation in today's world of work and insights into future developments

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1. Industry

Modern 21st century's technological advancement has contributed with numerous innovations challenging both the education and the industry. However, said that, challenges lead to greater good of society. Industry often works along education, thus digitisation affects both sectors simultaneously, binding the industry and education closer together. Cisco and Intel launched partnership with University of Melbourne (Australia) in 2008 to identify skills that students need attain for a fruitful career and life. Thus, the partnership (ATC21S – Assessment and Teaching of 21st Century Skills¹) focuses on making the students acquire skills needed for 21st century which is increasing the knowledge of younger work generation. Another example is the Energy Biosciences Institute (EBI), a partnership created in 2007 that led to overcoming new emerging energy complications. More than 300 scientists research with a goal to provide a feasible way to reduce impact on fossil fuels, leading the investigation using technologies, the digitised data. It was supported by BP providing a 10 years \$500 million grant. This provides the evidence portraying how industry works together with education along with continuous process of digitisation.²

However, despite the mentioned advantages, the main dilemma industry and digitisation faces is the maintenance of human labour force. As previously mentioned, we have outlined and discovered that digitisation affects industry by making it cost efficient. However, there is a risk of technology taking over human manpower. Current statistics show that the issue arises not because robots or machines change human labour, but because individuals do not possess set skills to work the complex machinery. According to European Commission, in the ICT (Information Technology) sector will be around 756.000 unfulfilled job vacancies.³ Current statistics indicates that digital sectors contribute to big percentage of the GVA (Gross Value). In 2015, over 7% in UK's GVA was with the digital sectors with a massive sum

¹ Edmondson G./ Valigra L./ Kenward M./ Hudson R./ Belfield H./ Koekoek P. (2012): Making Industry-University Partnerships Work. Available at: <https://sciencebusiness.net/sites/default/files/archive/Assets/94fe6d15-5432-4cf9-a656-633248e63541.pdf>

² Edmondson G./ Valigra L./ Kenward M./ Hudson R./ Belfield H./ Koekoek P. (2012): Making Industry-University Partnerships Work. Available at: <https://sciencebusiness.net/sites/default/files/archive/Assets/94fe6d15-5432-4cf9-a656-633248e63541.pdf>

³ Milano M. (2019): The digital skills gap is widening fast. Here's how to bridge it. Available at: <https://www.weforum.org/agenda/2019/03/the-digital-skills-gap-is-widening-fast-heres-how-to-bridge-it/>



close to £118 billion.⁴ These numbers depict a significant impact of trainings to provide set of needed skills to work with newly introduced technologies. Thus, number of spare job vacancies would decline and the GVA could have exponential increment .

In their book „Digitization, Digitalization, and Digital Transformation.” The authors VIOREL IULIAN TĂNASE and RUXANDRA VICTORIA PARASCHIV say: The Digitization process marks the beginning of the fourth industrial revolution with significant implications in industry, economy, science and society. A new philosophy comes with digitization, AI, and biotechnology that aims to orient the results for the good of the human being. The collaborative but competitive relationship between man and machine, but also between the machines, leads to important mutations on the labor market and the irrelevance of work in the next period.

I believe in the face of new technologies, humanity will be able to use them to benefit us - Huawei CEO Ren Zhengfei said during a Davos tech session focused on the Fourth Industrial Revolution.

Smart products will be everywhere, from smart clothing, watches, and phones, to smart machine and equipments, buildings and smart cities.

Adding digitised sources into the learning process increases productivity: It makes documents more accessible and reduces learning time, increasing efficiency.

1.1. The fundamental features of Industry 4.0 are: (1) IA and Machine Learning; (2) Blockchain; (3) IIOT, Internet of Things in industry; (4) virtual reality; (5) augmented reality; (6) mixed or hybrid reality; (7) robots and robots; (8) autonomous cars.

Specific concepts

⁴ Great Britain. Department for Digital, Culture, Media & Sport (2017): The Digital Sectors – making the UK the best place to start and grow a digital business. Available at: <https://www.gov.uk/government/publications/uk-digital-strategy/3-the-digital-sectors-making-the-uk-the-best-place-to-start-and-grow-a-digital-business>



1. AI and machine learning. By composing AI they can understand the human limit, they can recognize objects, sounds, they can also offer stimuli from the external environment, they can learn, plan and solve problems. Gartner defines the smart digital network that can be the interaction between people, layout, content and services. AI contaminates all technologies to achieve dynamic, flexible and autonomous systems. Intelligence involves: AI fundamentals, intelligent analytical applications and services, and intelligent objects. Digital assumption digital mirrors, cloud technologies to the Edge, conversational platform and immersive experience. The network involves Blockchain, designed for events, risk assessment and continuous and adaptive trust. Machine Learning (ML) is a way of caring for the principles of caring for information; ML The description of applications for the care of a computerized on-site system in terms of care allows them access to pregnancy programs. The system does not learn by leaving an algorithm but builds an algorithm while learning through: pattern recognition (patterns) and statistical analysis methods applicable to quantities in the country. The most well-known applications of ML are: estimating the exchange rate of shares and decisions on transactions and investigations; diagnostic in medicine; automatic analysis generates vehicles in dynamics, identifying a behavior for traffic flow; identifying consumer preferences and personalizing advertising and recommendations.

2. The Blockchain concept. Blockchain gained popularity after 2009, with the advent of Bitcoin. Stuart Haber and W. Scott Stornetta created a concept of blockchain (Internet of Values), which are stored in chained blocks and cryptographically secured. In 2009, blockchain has fast solutions for fast, secure and decentralized transactions. Blockchain technology for fast solutions for fast, secure and decentralized transactions. Blockchain technology redefines the concept of transaction. In its absence, there are central enterprises that store, manage and tax their information, that information, keeping technology in the equation only the subjects of the transaction, the originator and the beneficiary, eliminating the parties. If transaction cost blocking technologies are needed, only infrastructure costs; blockchain redefines the concept of change, excluding intermediary transactions, but they are only the sender (producer) and the recipient (is).

3. Internet of Things (IIOT). In the industrial field, IoT integrates intelligent machines, in order to direct information about a high-performance and fluent ecosystem.



4. Virtual reality (Virtual reality / VR). RV technology emulates the experience of interacting with the environment, bringing it closer to known reality. Through visual, auditory and kinesthetic simulation, RV does not allow us to leave the real environment and become an integral part of making alternative reality, to interact with the elements of care or make up; Technology creates a real version of brain care that can be considered real and untrue. RV redefinition is learnable, facilitating access to specialized information in real time, eliminating the constraint of physical nature. Viorel Iulian Tănase, Ruxandra Victoria Paraschiv 90 6

5. Augmented Reality (Augmented Reality / AR). AR technology resembles RVs but they are not really effective captivity, using a loss of contact with the environment. RA builds an alternative reality starting from the real environment for the care of enrichments with computer-generated elements.

6. Mixed reality (Mixed Reality / MR) or is hybrid is a newer technology in AR and VR, which creates predominant virtual spaces, in terms of care of objects and people in the real world integrates dynamically with designed worlds, thus producing new environments and realities, where there are digital and physical objects coexist and interact.

7. Robots and co-robots or robots (collaborative robots create after theoretical games) industrial and have AI, autonomous abilities of cognition, decision, learning and adaptation. They are equipped with sensors, technologies and intelligent systems that can be connected to other ecosystems. Thanks to the sensors and functions of using MLs, they are aware of the presence of people, a degree of proximity, a place and a context in the care of seeing.

8. Autonomous Driverless. The driverless technology offers users a high degree of autonomy, the car is completely autonomous.

conclusions

1. Digitization redefines technical and speculative disciplines, with economies, industries and society having an unprecedented impact on the way we work, live, behave and act in society.

2. The next generation of digital business models and ecosystems is determined by AI, immersive experiences, digital mirrors, event-focused thinking, continuous adaptive security.

3. Despite the potential positive impact of technology on economic growth, it is nevertheless essential to address its possible negative impact, at least in the short term, on the labor market. Fears about the impact of technology on jobs are not new. In 1931,



economist John Maynard Keynes warned in particular about widespread technological unemployment "due to the discovery of labor-saving means that go beyond the pace at which we can find new uses for work." This turned out to be wrong but what if this time it was true? In recent years, the debate has been reintroduced through computer evidence replacing a number of jobs, especially authorizing officers, cashiers and telephone operators.

4. The reasons why the new technological revolution will cause more upheavals than previous industrial revolutions are those already mentioned in the introduction: speed (everything happens at a much faster pace than ever), width and depth (so many radical changes produce simultaneously), and the complete transformation of entire systems. In the light of these driving factors, there is certainty: new technologies will dramatically change the nature of work in all industries and occupations. The fundamental uncertainty is related to the extent to which automation will replace the workforce. To understand this, we need to understand the two competing effects that technology has on employment. First, there is a destructive effect, as technology-driven disruptions and automation replace capital with labor, forcing workers to become unemployed or relocate their skills elsewhere. Second, this destructive effect is accompanied by a capitalization effect in which the demand for new goods and services increases and leads to the creation of new occupations, enterprises and even industries. As human beings, we have an amazing ability to adapt and ingenuity. But the key here is when and to what extent the capitalization effect replaces the destructive effect and how quickly the replacement will be.

5. There are about two opposing sides to the impact of emerging technologies on the labor market: those who believe in a happy ending - in which technology-displaced workers will find new jobs and in which technology will usher in a new era of prosperity. ; and those who believe it will lead to a progressive social and political Armageddon by creating technological unemployment on a massive scale. History shows that the result will probably be somewhere in the middle. The question is: What should we do to stimulate more positive outcomes and help those trapped in transition? It has always been the case that technological innovation destroys some jobs, which in turn replaces them with new ones in a different activity and possibly in another place. Take agriculture as an example. In the US, people working in the field accounted for 90% of the workforce in the early 19th century, but today it accounts for less than 2%. This dramatic reduction took place relatively well,



with minimal social disruption or endemic unemployment. The application economy provides an example of a new job ecosystem. It only started in 2008, when Steve Jobs, the founder of Apple, let external developers create iPhone applications. By mid-2020, the global application economy should have generated revenues of more than \$ 125 billion, surpassing the film industry, which has existed for more than a century.

6. Technology can be disruptive, but it maintains that improving productivity and increasing wealth always ends, which in turn leads to a greater demand for goods and services and new types of jobs to satisfy it. The substance of the argument is as follows: Man's needs and desires are infinite, so the process of supplying them should also be infinite. Barring normal recessions and occasional depressions, there will always be work for everyone. Early signs point to a wave of innovation that is replacing the workforce in several industries and job categories that is likely to happen in the coming decades.

7. Many different categories of work, especially those involving repetitive and precise mechanical work, have already been automated. Many others will follow, as computing power continues to grow exponentially. Earlier than anticipated, the work of the different professions of lawyers, financial analysts, doctors, journalists, accountants, insurers or librarians may be partially or completely automated. So far, the evidence is as follows: The Fourth Industrial Revolution seems to create fewer jobs in new industries than previous revolutions. According to an estimate from the Oxford Martin Program on Technology and Employment, only 0.5% of the U.S. workforce is employed in industries that did not exist at the turn of the century, a significantly lower percentage than about 8% of new industries in 1980 and 4.5% of new jobs created in the 1990s. This is corroborated by the recent US Economic Census, which highlights the interesting relationship between technology and unemployment. It shows that innovations in information and other disruptive technologies tend to increase productivity by replacing existing workers, instead of creating new products that require more manpower to produce them. Two Oxford Martin School researchers, economist Carl Benedikt Frey and machine learning expert Michael Osborne, quantified the potential effect of technological innovation on unemployment, ranking 702 different professions, depending on the probability of being automated, from the most less susceptible to risk ("0" which does not correspond at all to risk) to those who are most sensitive to risk ("1" which corresponds to a certain risk of replacing a job with a computer of



any kind). Employment will increase in high-income cognitive and creative jobs and low-income manual occupations, but will decrease considerably for routine and repeated middle-income jobs.

1.2. But also we can observe that there are a lot of clear **benefits of Industry 4.0** in the World of Work:

Industry 4.0 technologies could potentially transform the manufacturing chain completely. The benefits of digitization are significant from the efficiency of production, to the deployment of innovative products and services.

Revenue gains

According to a report by PwC (<https://i4-0-self-assessment.pwc.nl/i40/study.pdf>) digitalised services and products create €110 billion additional profit per year in Europe. Revolutionary companies with digitalised services and products have noticed a significant growth in the last few years. Almost 50% of businesses who are converting to Industry 4.0 are expected to double their revenue in the next 5 years of implementation. Also, one in five businesses expect a 20% sales rise.

With the help of big data analytics, companies can also gain a deeper understanding of customer needs. The new information provided, can be applied to product development and used to build up customer interactions.

Increased efficiency and productivity

An article published in OECD.org by McKinsey & Company

(<http://www.oecd.org/dev/Digital-in-industry-From-buzzword-to-value-creation.pdf>)

estimate that converting to automation and digitalisation can boost productivity in technical professions by 45% - 55%. IoT (Internet of Things) has already been applied in large companies such as Siemens, Airbus, Cisco and many other companies in the Industry, which can now create more advanced IoT ecosystems of devices developed by sellers. The initial products enable seamless, fast and secure cross-platform connectivity and data exchanges between different IoT (Industrial Internet of Things) systems.



Human-robot teams are appearing in the factories now. The new generation robots are able to help manufacturers automate parts of the production process in order to get the products to the market faster. The MIT technology review (<https://www.technologyreview.com/s/530696/how-human-robot-teamwork-will-upend-manufacturing/>) estimates that the collaboration with the robot teams will reduce the workers time by 85%.

Improved supply/demand matching

Cloud-based inventory management solutions enable better interactions with suppliers. Instead of operating in “individual silo”, you can create seamless exchanges and ensure that companies that have applied Industry 4.0 technologies to their system have:

- High service-parts fill rates;
- High levels of product uptime with minimal risk;
- Higher customer service levels.

By pairing their inventory management system with a big data analytics solution, they will improve their demand by at least 85%. They can also perform real-time supply chain optimization and gain more visibility into the possible tailbacks, and expanding their growth.

1.3. The implications of industry 4.0 in education

Digitization has begun, and the application of IT technology is unstoppable. And of course this affect the acceleration of other processes in society; we are already seeing great changes in education

Over the last 50 years, machines have been replacing our jobs and a large number of people are losing work, because certain software programs do it faster and in a shorter amount of time than 3 human workers. What will we do about all these people? Where is their place in society? They become inactive citizens and do not have a job. What do we do about all these unemployed people? Where is the division in the world? Which place in the society belongs to machines, and which one to people? The fact is - this is happening. Work created man. If a man has nothing to do, what is happening in the society?



Does this affect the rise of violence we are witnessing? Over the past 50 years, there have been major changes with the application of IT technology and digitization, but it seems as if these changes were not followed by the changes that are taking place in society. We have a cause, but the consequences that led to the dynamic changes in the society have not been addressed (unemployment, unrest and protests in Europe and other parts of the world, depression, increase in violence, number of divorces rising, loneliness as phenomena, an increase in suicide rates, human alienation, poverty, migrations etc.). The question is, which professions will be handled by humans, which ones by machines, and which professions are adults going to be digitally educated for, in the future?

University of Durham provided a research based of teaching methods stating that they should not be substituted with digital technologies. The best result is attained when students are using technologies during certain periods of time. As the research states, if students use too much time using technologies it has a negative effect on their processing abilities. It provokes students to browse different websites to find the answer in an easy way instead of trying to conduct a thorough research thus it boosts poor studying habits.

The new technologies does not only affect the students, but it carries an impact on teachers as well. Not all teachers are trained and qualified to be able to use technologies successfully, it takes time to transform set of teaching methods. Frequently, technological error such as internet connectivity issue might arise leading to learning and teaching difficulty.

However, it is valuable to keep in mind that technologies should be used as a tool and not be regarded as an alternative for teaching provided by an acknowledged individual (professor) in a classroom. It is essential to use these tools sensibly and avoid over consumption. The same perspective goes towards technology used in industry as well. If the labour force is equipped with the skills needed to use the technology, it will grant us major transformation in our society.



Tasks:

1. View this short [video](#) presenting some aspects of digital transformation in Sweden. What are the thoughts that go through your mind when you see him? Name 3 areas in which digital technology is already present.

Video: https://dl-mail.ymail.com/ws/download/mailboxes/@.id==VjN-yg8Wn-tmEHPwMwDVids6ETwRld_7tmO5f6d8tdJVLiuw8d1DfQwatJjYTaZNo-VHBmBxuc2UTjmHlmQVjcwMQ/messages/@.id==AlkibN94PsahXq57YArqFW2UjQ/content/parts/@.id==2/raw?appid=YMailNodin&ymreqid=9b29e981-164d-7380-1c55-020000019800&token=zitEzqOML3j84e6ealFTT5U7-km5qEQF52lp7AcCuBac0ZENuxotU1td8JhDzjr31-3oFZzDwpUNsBbpYEwEHVpN9cVZpwKi1m5WgdmxEnEaXYsR4RvwvgV3QYEmzl84





2. Education

2.1. EU involvement

EU started a new development program in 2014 with a goal to integrate technologies in learning process.⁵ This should assist students at the higher education institutions to not only gain experience of learning set of facts, but it also focuses on their logical thinking. Currently, technology provide teachers with an opportunity to deliver lectures online enabling the professor to be in charge of monitoring the efficiency of learning online, time frame for how much the student spends time on certain exercise. It facilitates to reduce paperwork. Exercises, notes are being provided on software programs making it more accessible for students and teachers. Instead of printing out copies, with some simple steps they can upload a shared file that can be accessed by students online. This has positively impacted the EU and the world since reduced paperwork led to reduced supplies of paper. Analysing from another perspective, this leads to a safer and a stable environment.

In order to talk about efficient digitalization, the school must have the necessary equipment, trained and open teachers to less conventional, creative methods, specialists and pedagogues, to the same extent. The system also needs adequate national platforms, access to virtual libraries and open educational resources, ensuring a fair path for all pupils and students, beyond individual possibilities, residential environments, possible economic inequalities. These are essential European principles, as well as the conditions of a modern, inclusive and democratic society.

Modern education means books and computers, libraries and software, academic lectures, dialogues, seminars and webinars, face-to-face courses and lessons, distance learning, listening and interaction, IT applications, various ways to capitalize on Internet resources, information from a dynamic world , fluids that await human intelligence for creative development and reconfiguration.

⁵ Cisco (2016): Digitizing Higher Education. Available at: <https://www.cisco.com/c/dam/assets/docs/education/digitize-your-institution.pdf>



Let us return, for pedagogical reflection, to the metaphorical suggestions of Alvin Toffler who warns that literacy in the 21st century means the possibility for young people to learn, to unwind and to relearn.

The major lesson that the current pandemic has conveyed is that sometimes learning, studying, our professional lives go beyond known patterns, and adaptation, alternatives must be immediately accessible to overcome the unknown and unpredictable existential. That is why digitalization, e-learning methods and the development of digital skills are becoming mandatory educational pathways that we must assume as an emergency educational policy.

2.2. Digitalisation in higher education: mapping institutional approaches for teaching and learning⁶

One of the contradictions seriously impeding the modernization of education is the discrepancy between the speed of digitalization of educational resources and the speed at which the digitalization of the educational process itself, which is still very low. The reform of education is presented in the article by the example of various forms of curricular and extracurricular activities aimed at the active use of digital educational resources.

Discussing the phenomenon of digitalization it should be noted that various analysts and forecast experts (mostly British, including Tim Berners-Lee - one of the inventors of the World Wide Web (Stuart, 2014)) consider transition of education process into digital stage as the turning point in the history of education.

The stated approach was adopted by the European Union. EU 2020 education development strategy, adopted in 2014, focuses on digital technologies. This document has as its core objective the integration of state-of-the-art IT-solutions in education institutions' activities across EU. "DigEduPol". The main aim is to integrate digital technologies in education process, so that they were going hand in hand both with teaching of certain subjects and with school education process in general.

⁶ <https://www.tandfonline.com/doi/full/10.1080/13538322.2019.1603611>



2.3. Trends in education

Distance education, based on new digital technologies opportunities, is a separate issue in terms of education digitalization trend.

Digital technologies help teachers to reduce paperwork: exercise books and reports are replaced by laptops or tablets, with all the required academic information available. Home tasks of students, except when special teacher's references are required, can be automatically controlled by software tools.

According to scientists, very shortly digital format will eliminate the need for handwriting lectures, when each student will get all the materials and will be able to process them on a real-time basis and work interactively. All the texts will be available online and stored in a digital 'cloud' (Apple iCloud alternative), which will practically eliminate any negative consequences related to absence from school.

Intensive digital technologies penetration in education raises a number of practical issues. Same like with the other innovations, the world of online technologies is associated with certain contradictions and unforeseen circumstances. For instance parents, who want their child to spend less time at the computer, should change their mind, since education process modernization presupposes the opposite.

Another issue in this context is comprehensive digitalization of human life, predicted by numerous scientists. Nowadays the ability to adapt to new technologies is a success prerequisite.

Another major tendency in education development in terms of globalization is institutional reorganization. Currently we face the stage when the tendencies of digital and online education require institutionalization in new-type educational establishments, with a simplified form of participation and presence at classes (personal presence, distant online or extra-mural offline).



Classroom activities of the future will not represent a typical picture of a teacher in front of its students, sitting at desks arranged in perfect rows. Introduction of innovation digital technologies will change not only teaching form and tools, but its environment as such.

We might state that modern educational system faces creative crisis. Classwork and lessons do not contribute to students' personal initiatives to learn something new, establish objective connection between their knowledge and the real world, use their imagination to look for nonstandard answers to standard questions instead of using stereotypic models. Therefore the classroom of the future should not be a place of knowledge transfer, but a place of investing in the mind of students, focusing on creativity and innovation and not on repeating ready-made opinions or mechanical response to test questions. The stated approach to education will force us to reconsider curricula and integration of conceptual and actual innovations. New curricula should stipulate not only obligatory transfer of facts, but focus on students' reaching certain objectives, namely creativity, imagination and teamwork irrespective of team members' location. Finally, it should be noted that today's global education has faced major transformations, caused by further integration of new digital technologies in academic activity and is actively searching for efficient implementation models, which will compromise with traditions and innovations.

2.4. Digitization and education⁷

Digitization and use of tools make learning and presentation easier, speeding up the process of solving tasks that can be solved by a greater number of students simultaneously. It also facilitates the process of examining the tasks, and it's possible to show a video of many phenomena and processes.

1. PRESCHOOL EDUCATION AND DIGITIZATION

The use of digitization and digital tools enable easier visualization and realistic view of objects and professions that are explained to children aged 1 to 7 years. The tools

⁷ <https://epale.ec.europa.eu/en/blog/digitization-and-education> - by Ivana Jevtic



can provide a diverse combination of letters and numbers, more interesting and different learning of letters and mathematics, as well as show and explain phenomena in vivid way otherwise not explicable to children of that age. The job of educators working with a large number of children becomes much easier. Children aged 1 to 7 can absorb a large amount of knowledge and information. They have the ability to master up to 3 foreign languages, much easier through play and entertainment than older kids have. This results in development of more advanced, mature and intelligent children. Digitization brings accelerated development, advanced communication and progress. This does not imply spending up 6 to 8 hours with computers or on tablets in a pre-school institution.

2. PRIMARY AND SECONDARY EDUCATION AND DIGITIZATION

Compulsory digitization brings changes at all levels of education - to align 50% of the theoretical knowledge with 50% of the practice applicable in the environment we live in. This is closely related to the problem young people still face at primary school and that is the lack of ideas about a possible future profession. Their perceptions of occupations are not grounded in reality, information about them are not available nor presented through practice. They later make choices guided by their parents' counsel and opinions, which often produces bad results (they leave studies or switch to another studies). This unnecessarily confuses the individual and subsequently leads to unnecessary chaos in society. It is therefore necessary to bring practice closer to children at primary schools, to organize research and classification of the types of occupations that will be needed in society of the future after educational period is finished. The next step would be the selection of children's skills and their abilities that would enable the right choice of the profession for which they would be prepared. It is noted that this type of approach is probably more accessible in developed countries than in underdeveloped countries.

3. HIGHER EDUCATION AND DIGITALIZATION

The need for research is in line with professions that will disappear in the near future. Students will not be educated for professions that in future will not be needed in society, as per the development of IT technology. Professors will not be left without their jobs because they will reorient to new subjects that they will teach or improve certain profiles in line with the development of IT technology. Again, we have the



application of digital adult education. So those who have to re-qualify will go through the digital education process, but they will later apply it in their lectures, too. Digitization and use of tools make learning and presentation easier, speeding up the process of solving tasks that can be solved by a greater number of students simultaneously. It also facilitates the process of examining the tasks, and it's possible to show a video of many phenomena and processes. Note that projects and practice must be an integral part of the 4, 5 or 6 years of education in cooperation with companies or institutions depending on which vocation the students are studying for. After finishing their education, they will have passed the training, acquired the necessary skills and are ready for the labour market.

2.5. How Technology is Shaping the Future of Education⁸ -

The combination of evolving educational needs for children and a more uncertain future of work means that updating what children learn, and how they learn it, has become a crucial issue for schools and colleges—but what should be prioritized?

Classrooms 2.0

In a survey of 1,400 educators, the majority of them say they believe that classrooms of the future will be centered around self-paced and personalized learning.

This student-centric approach would allow children to choose their own pace and learning objectives based on individual interests—all of which could be guided by artificial intelligence, chatbots, and video-based learning. Sali de clase 2.0

Artificial Intelligence

Artificial intelligence in education typically focuses on identifying what a student does or doesn't know, and then subsequently developing a personalized curricula for each student.

⁸ <https://www.visualcapitalist.com/how-technology-is-shaping-the-future-of-education> - by Katie Jones



The AI-powered language learning platform Duolingo is one of the most downloaded education apps globally, with more than 50 million installs in 2018. The platform single-handedly challenges the notion of traditional learning, with a study showing that spending just 34 hours on the app equates to an entire university semester of language education. AI-driven applications in education are still in their infancy, but success's e-learning platform demonstrates the growth potential in the sector. Inteligență artificială

Chatbots

Chatbots are also quickly becoming a fundamental tool in next generation education. Designed to simplify the interaction between student and computer, chatbots provide a wide range of benefits, including:

- **Spaced interval learning:** Uses algorithms and repetition to optimize memorization
- **Immediate feedback:** Papers can be graded with **92%** accuracy and in a faster time than teachers
- **Self-paced learning:** Tracks a student's performance and guides them based on their individual needs

This innovative technology is arming educators with new strategies for more engaged learning, whilst simultaneously reducing their workload. Chatbots

Video Learning

Although video-based learning may not necessarily be considered as innovative as artificial intelligence or chatbots, **98%** of educators view it as a vital component in personalized learning experiences. Most institutions report incorporating video into their curriculums in some way, but even higher demand for video-based learning may come from students in the near future.

This is due to the fact that video learning increases student satisfaction by **91%**, and student achievements by **82%**, which could be why educators are increasingly using video for tasks like:

- Providing material for student assignments
- Giving feedback on assignments



- Flipped instruction (blended learning) exercises

A flipped classroom overturns conventional learning by focusing on practical content that is delivered online and often outside the classroom. Învățare video

The Battle Between Traditional and Tech

Flipping classrooms is a trend that has gained momentum in recent years—and may be considered to be a radical change in how students absorb information. The relatively new model also eliminates homework, by empowering students to work collaboratively on their tasks during class time.

Although new models of learning are disrupting the status quo of traditional learning, could the increasing amount of time children spend in front of screens be detrimental?

Research has shown that children are more likely to absorb information from books rather than screens. There has also been an evident increase in low-tech or tech-free schools that believe that human interaction is paramount when it comes to keeping children engaged and excited to learn.

Creating First-Class Humans

Although we may not be in the era of iTeachers just yet, the benefits of technology as teaching aids are undeniable. However, what is more important is that these aids are used in tandem with developmental and educational psychology—ultimately keeping students rather than technology at the core of education.

The future will be about pairing the artificial intelligence of computers with the cognitive, social and emotional capabilities of humans, so that we educate first-class humans, not second-class robots”

—OECD, Trends Shaping Education report



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After all, how children develop these skills is perhaps less important than their ability to navigate change, as that is the only thing that will remain constant.





Tasks

2. Answer to the following questions.

Single choice.

Nr	Question	Yes	No
1	Should digitization be part of the future education of preschoolers?	x	
2	Digitization must be part of primary and secondary education	x	
3	Digitization will not be part of VET education		x
4	Digitization must be part of university education	x	

3. Talking about education, which of the following statements are correct?

Multiple choices (the good one is marked in green).

- a) in the future, the education will be student-centered and personalized for each student
- b) technologies such as virtual reality (VR), video recordings or online lectures, electronic portfolios and other forms of interactive study will replace the professor in the future.
- c) The education of the future aims to prepare students ready to take the place of robots
- d) the classroom of the future will not be a place of knowledge transfer, but a place of investments in the student's mind.



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