DOI: 10.35218/rae-2025-0041 Review of Artistic Education no. 30 2025 298 - 307
https://doi.org/10.35218/rae-2025-0041

PART IV EDUCATION

1. EDUCATION 4.0: THE DIGITALISATION OF EDUCATION AND ITS ETHICAL IMPLICATIONS (INCLUDING ARTS)

Bogdan Gabriel Georgescu,[251]
Petrișor Laurențiu Țucă,[252]
Ciprian Mihai Dobre,[253]
Oana Mariana Ciuchi[254]

Abstract: *Education 4.0 represents a transformative shift in the educational landscape, driven by the technological advancements of the fourth industrial revolution. This new paradigm promotes connected and personalised learning tailored to meet the challenges and opportunities of the digital era. This article explores the ethical implications of integrating digital tools into higher education. Online platforms and virtual classrooms make educational resources more accessible, fostering flexible, student-centred learning. These strategies enhance digital literacy and prepare students for the interconnected, technology-driven world. However, the shift to Education 4.0 brings ethical concerns, such as data privacy, cybersecurity, and equitable access to education. It is crucial for educators and administrators to be aware of these challenges and to develop strategies that mitigate potential risks.*
Key words: *Digital Education, Education 4.0, Ethical Implications, Personalized Learning, Data Privacy*

1. Introduction

The learning landscape is changing through the incorporation and adoption of digital technologies. This shift in the educational paradigm, referred to as Education 4.0, entails fundamentally re-evaluating the structure, delivery, and experience of education in a society pushed forward by Industry 4.0 and related technologies. Education 4.0 encapsulates a transformative framework where technology-based pedagogies converge to reimagine learning, empowering learners with unprecedented opportunities for engagement and exploration (Qureshi et al., 2021). This is usually called Connected Learning, where students are encouraged to explore and discover the world's values while developing critical-thinking skills by pedagogical means centred around exploration rather than memorization-based activities.

However, this revolutionary shift towards Education 4.0 and Connected Learning does not come without its ethical conundrum. With the exponential rise in digital connectivity, where information surrounds us to the point where it becomes hard to distinguish structure, and data-driven, where everything is based on some form of data that needs to be explained to devise its truth, educational practices

[251] Candidate Doctoral, National University of Science and Technology Politehnica, București, România, email: bgeorgescu@upb.ro, ID ORCID https://orcid.org/0009-0000-2863-5380
[252] Candidate Doctoral, National University of Science and Technology Politehnica, București, România, email: petrisor.tuca@upb.ro
[253] Professor PhD., National University of Science and Technology Politehnica, București, România, email: ciprian.dobre@upb.ro, ID ORCID https://orcid.org/0000-0003-4638-7725
[254] Associate Professor PhD., National University of Science and Technology Politehnica, București, România, email: oana_mariana.ciuchi@upb.ro, ID ORCID https://orcid.org/0009-0000-3551-9142

create multifaceted ethical dilemmas (Swartz, 2021). Amid this intersection of technological innovation and ethical imperatives, this paper explores the intricacies of Education 4.0 and Connected Learning. Through examining fundamental principles and moral considerations, this research aims to elucidate the transformative potential of these paradigms while advocating for a conscientious approach that balances technological advancements with ethical responsibilities. By synthesising insights from seminal works and contemporary research, we seek to delineate the critical facets of Education 4.0 and Connected Learning, shedding light on their implications for responsible educational practices in the digital era.

2. Method

Our research methodology was designed to explore three fundamental research questions designed to assess the current progress in the application concepts related to Education 4.0: (1) How do emerging technologies impact the learning process in the context of Education 4.0? (2) What ethical considerations arise in the context of Education 4.0, and how could they be effectively addressed? We reviewed the existing literature for our research methodologies, aiming to execute an in-depth analysis of existing academic literature on Education 4.0, as detailed in Sections 3 and 4. Our primary focus was to explore research on integrating emerging technologies in education, developing strategies for personalising online learning experiences, and examining ethical considerations in using digital technologies in education processes.

The review focuses mainly on peer-reviewed journals, conference proceedings, and significant policy documents - particularly recently published- and broadly addresses *higher education*, *technology integration*, and *educational ethics*. Furthermore, the review entailed a comprehensive thematic analysis to discern prevailing trends, challenges, and best practices in shifting towards Education 4.0 across diverse educational settings. Our empirical study is designed to understand better the views and perceptions of the digitalisation coordinators within seven member universities within the European University Alliance. Respondents to the survey were heads of digitalisation departments, project team coordinators or members of the teams that developed the university's digitalisation strategy, deans of computer science faculties, or vice-rectors responsible for digitalisation. Data was collected through Microsoft Forms, and Python code was created for data analysis. The conclusions of this survey are presented in Section 4.

3. From Education 1.0 to Education 4.0

The transition from Education 1.0 to Education 4.0 marks a significant transformation in how education is perceived and delivered, mirroring societal shifts, technological advancements, and the evolving concept of knowledge. The origins of **Education 1.0** can be traced back to the late 18th century. The early model prioritised rote memorisation, positioning teachers as central figures in disseminating knowledge. It aimed to instil basic skills such as literacy and numeracy, prioritising strict discipline and information memorisation. In this configuration, classrooms were highly structured environments with a clear hierarchy and minimal opportunities for students to engage in their learning journey actively (Miranda et al., 2021).

As society moved into the 20th century, **Education 2.0** began to form. This phase shifted towards a more inquiry-based approach, where the teacher transitioned from a sole disseminator of knowledge to a guide or facilitator (Tirziu&Vrabie, 2015). Some authors link this to ancient philosophical means of study (Donskikh, 2019). Collaborative learning started to gain importance, emphasising critical thinking and problem-solving skills. The onset of classroom technology, such as radio, films, and television, began influencing educational methods (Miranda et al., 2021). With the advent of the Internet and digital technology, **Education 3.0** was later formed. This stage is characterised by emphasising student-centred learning and using technology to facilitate personalised learning experiences (Allison & Kendrick, 2015). The role of the teacher evolved further into that of a mentor or coach, supporting students as they navigated an increasingly diverse and rich landscape of information. Collaborative and experiential learning became more pronounced, leveraging the connectedness provided by the Internet (Watson et al., 2015).

The recent and ongoing shift towards **Education 4.0** describes the frontier of educational evolution in close alignment with the needs and dynamics of the 21st century. It is heavily influenced by the ever-more rapid technological advancements, such as Artificial Intelligence and later Generative AI, the Internet of Things (IoT), or Virtual / Augmented Reality. In this educational model, education is and will continue to evolve as highly personalised and adaptive, emphasising lifelong learning. The learner's progress can be monitored and tracked thanks to advanced data processing algorithms, and the education methodology can be personalised accordingly (Ciolacu et al., 2017). The focus is now on developing competencies such as creativity, critical thinking, problem-solving, future literacy, digital literacy, and collaboration (Sharma, 2019). The learning environment is more flexible, transcending traditional classroom boundaries and extending into virtual and augmented realities (Miranda et al., 2021).

With the wide adoption of Education 4.0 methods in teaching, one concern is increasingly mentioned by more and more practitioners: the ethical considerations associated with using advanced technologies (especially AI, but not only) in education, particularly issues related to privacy, data security, and algorithmic bias. To summarise, the evolution of educational systems has been marked by the shift from traditional teaching methods, known as Education 1.0, to innovative and technologically advanced approaches, referred to as Education 4.0.

This transition reflects profound changes in how knowledge is transmitted, assimilated, and applied in an increasingly digitalised world. This progression from Education 1.0 to 4.0 reflects a broader societal shift from industrial to knowledge and digital economies. The role of the educator has transitioned from a source of knowledge to a facilitator of learning experiences, where students are encouraged to be active, self-directed learners. Technology integration has been pivotal as a tool for teaching and learning and as a means of preparing students for the demands of a rapidly changing, technologically advanced world.

3.1. Connected learning

Before the COVID-19 pandemic, various voices were advertising the need for a change in Academia, primarily due to factors like decreasing natality and political

support for vocational education. In the context of educational transformations precipitated by the COVID-19 pandemic and technological developments, the concept of "Connected Learning" become increasingly relevant (Kumpulainen & Sefton-Green, 2014). The pandemic accelerated a societal shift towards in-home activities, increasing the reliance on alternative information sources like YouTube, Ted Talks, podcasts, or MOOCs. With their significant potential and disruptive capabilities, the infancy of Machine Learning, and later Artificial Intelligence and Generative AI, poses opportunities and threats to traditional job markets.

Among the threats we acknowledge are the explosion of information surrounding us, sometimes in contradiction depending on their data sources, the depreciation of a clear structure for the knowledge being transmitted, or the lack of clear evidence to support the ideas one receives. The structured lectures transmitted by a professional lecturer in the classroom keep students engaged and are still at the foundation of our education system. However, technology is advancing, and we cannot know what the future virtual classroom will probably bring, if not the problems already faced by online technologies.

Despite technological strides, the significance of inspirational lectures and individual wisdom in education remains irreplaceable. However, this stance does not signify an endorsement of pre-pandemic educational norms. Automation and Data Science are reshaping professional landscapes, compelling a thorough reconsideration of academic approaches. Universities should set themselves apart from tech giants by concentrating on human literacies that confer a competitive edge over machines while judiciously incorporating technology to complement human intellect (Parker, 2021).

3.2. Innovating Higher Education through Education 4.0

The rapid evolution of technology and the widespread impact of globalisation are exerting profound pressures on institutions of higher education, necessitating the provision of education that is both accessible and inclusive throughout an individual's life. Since March 2020, the unforeseen upheaval in higher education has presented opportunities for fostering creativity and promoting essential transformations. Projections indicate that by 2025, 60% of the working-age population in the United States will require some form of post-secondary qualification for employment, a significant increase from the 52% at the beginning of 2021 (Gazi & Baker, 2021).

The closure of campuses due to the pandemic highlighted the need for systematic online instructional delivery, exposing the unpreparedness of academic institutions to provide meaningful, large-scale online learning (Lederman, 2020). Despite substantial investments in educational technology, higher education was unprepared to make significant progress in developing the capacity for widespread online education. Digital learning allows universities to reach extensive learner populations beyond traditional classrooms, yet the effectiveness of such large-scale education remains a subject of debate (Joksimović et al., 2018). This scepticism is particularly evident in the context of Massive Open Online Courses (MOOCs), which were the first learning formats that truly embraced online technologies.

However, this scepticism has gradually given way to innovative approaches, leading to developing early, affordable models for comprehensive online programs.

The technologies and devices that initially popularised MOOCs now form the essential infrastructure enabling many universities to offer remote learning to their students (Pelletier, 2019). To examine the application of critical thinking, it is pertinent to consider two specific instances where its implementation proves notably challenging within an online context.

First, consider the domain of mathematics. Traditionally, we envision a teacher employing the classic chalk-on-the-board method to impart mathematical knowledge. However, mathematical proficiency is inherently tied to critical thinking, necessitating students to independently formulate solutions in their minds, actively engaging with the intermediary steps of problem-solving. Brainika! is an educational platform for children that fosters an intuitive understanding of math. The platform employs ingenious methods, incorporating spaced repetition, recall, deliberate practice, feedback, and positive reinforcement. Such strategies are among the most effective ways to cultivate mathematical intuition through the procedural system (Oakley, 2021).

In computer programming, James Bowen, a Java, DevOps, online teacher and author, has taken the fundamental concepts of procedural and declarative learning and applied them specifically to improving one's coding ability. He introduced the idea to developers, which he further applied to teaching Kotlin. Today, James is trying to help coders unpack the ability to recognise an opportunity consciously but execute the skill automatically. (Bowen, 2021) Given the significant pandemic-induced transformations in the educational landscape, taking an analytical perspective on teaching paradigms is imperative.

The current landscape is undergoing rapid transformation, driven by automation and the advent of the digital age. This transformative shift, indicative of the commencement of the fourth industrial revolution, demands an appreciation and cultivation of skills pertinent to the changing dynamics of work, technology, and intricate processes. Amidst this transformation, a crucial aspect involves revisiting foundational skills essential for success in current and future work environments. As recognised by McKinsey, a diverse set of skills is imperative for the future workplace, emphasising active learning as a critical factor in their development. Consequently, there is a need to recalibrate traditional education systems to better prepare individuals for forthcoming challenges (Dondi et al., 2021).

The 21st century requires diverse skills, with education playing a pivotal role in providing them. Critical thinking, effective planning, communication, and mental flexibility are highlighted in the cognitive domain. These competencies are increasingly crucial as they facilitate adaptation to the rapidly evolving global landscape by improving critical communication and decision-making skills. Interpersonal skills encompass relationship building and teamwork effectiveness and are indispensable in any future work context. Effective interaction within and between teams is vital to achieving collective goals. Self-leadership skills, including self-awareness, self-management, entrepreneurship, and goal achievement, are critical to future success. Cultivating leadership and self-awareness enables individuals to build stronger relationships and increase the effectiveness of projects they will be involved in.

Digital skills, which include digital fluency, ethical digital citizenship,

software use, and understanding of digital systems, are central to the ethos of technology talent training programs. In the evolving digital landscape, having strong digital skills is imperative for success in future work environments. For cognitive skills, much responsibility is placed on the students to think critically, communicate effectively, and self-manage. With the self-paced and remote nature of online programs, students have the flexibility to complete projects and learn without sacrificing other essential commitments in their lives.

They can develop ways of learning that work for them individually. The projects should be engaging to them and should require out-of-the-box thinking. This helps students in the long run for future employment and careers. Students should be asked to explain their thinking and reasoning to an external source, allowing them to understand better how they solved the problem. Through coding collaboration and live coding sessions, students should be allowed to translate their knowledge, ask questions, and work on public speaking communication techniques. Structured problem-solving should be involved with each quest a learner completes.

The skills described above are only learned through hands-on practice. Knowledge transmission needs to come closer to being enough for students to know what is required. Learning skills such as mental flexibility will demand being put in positions where flexibility is pushed, and learners are outside their comfort zone. These do not happen in a lecture where they are not engaged in the emotional or mental part of learning these skills. People prefer to be in their comfort zone and will think they have learned more via lectures, but the science of skill development holds that experiential learning is far more effective whether learners like it or not. It is hard to accept change and establish new ways, but the sooner a student can, the sooner she can learn new skills and be prepared for the future of work.

4. Discussions on Education 4.0

Education 4.0 is a conceptual framework that represents the evolution of education in response to the challenges and opportunities presented by the fourth industrial revolution. It encapsulates principles and practices that aim to reshape the educational landscape to better prepare individuals for the demands of the digital age. To understand where we are today with Education 4.0, we analysed the status of digitalisation in South-East European universities. University digitalisation is a crucial component of the broader Education 4.0 paradigm, which embraces integrating advanced technologies to transform the landscape of higher education.

As expected, Universities are increasingly adopting online learning platforms[255] to deliver courses and programs. These platforms offer flexibility in accessing educational content, supporting the personalised and learner-centric approach advocated by Education 4.0. Digitalisation enables the implementation of blended learning models, combining traditional classroom instruction with online components. This approach caters to diverse learning styles, fostering a more interactive and engaging educational experience.

Virtual classrooms and collaborative tools, on the other side, have the potential to facilitate real-time interactions among students and educators, transcending

[255] According to our findings, Moodle (https://moodle.org/) seems to be the preferred learning platform put in place by most universities today. Other technologies, such as Open edX, are also quite commonly found with universities.

physical boundaries. This promotes cooperative learning, a key emphasis in Education 4.0, and prepares students for the interconnected nature of the fourth industrial revolution. Universities are leveraging digital tools for assessments and feedback. This includes online exams, automated grading systems, and digital feedback mechanisms, contributing to the continuous evaluation and feedback loop promoted by Education 4.0. Thus, digitalisation allows universities to collect and analyse student performance and engagement data. Data analytics can personalise learning experiences, identify at-risk students, and tailor interventions, aligning with the data-driven decision-making aspect of Education 4.0.

University digitalisation is a crucial enabler of Education 4.0, promoting flexible, technology-driven, and learner-centric educational experiences. It enhances accessibility, supports continuous learning, and prepares students for the demands of the digital age and the fourth industrial revolution. Education 4.0 emphasises the ability to evaluate and navigate a vast amount of online information critically. In a digitalised classroom, students are exposed to various online resources, requiring them to develop information literacy skills and discern the credibility and relevance of information. Asynchronous discussions, a common feature of digitalised classrooms, have the potential to provide students with the opportunity for thoughtful reflection and in-depth analysis. This asynchronous format encourages critical thinking as students take the time to formulate well-reasoned responses and engage in meaningful discourse.

In a digitalised classroom, students can interact with peers and educators from diverse cultural backgrounds. Exposure to global perspectives encourages critical thinking by challenging assumptions, broadening perspectives, and fostering a more nuanced understanding of complex issues. The distributed nature of online learning allows for the implementation of continuous feedback loops. Immediate feedback on assignments, discussions, or assessments will enable students to reflect on their thinking processes, identify areas for improvement, and refine their critical thinking skills. Virtual classrooms are considered the solution for an online learning experience and often include project-based assessments that require students to apply critical thinking skills to solve authentic problems.

These assessments go beyond traditional exams, emphasising the application of knowledge in real-world contexts. The flexibility of virtual classrooms contributes to creating more inclusive learning environments. Students from various backgrounds and learning styles can actively participate, fostering a diversity of thought and perspectives that enrich critical discussions. The virtual classroom in Education 4.0 is conducive to developing critical thinking skills through virtual collaboration, access to online resources, problem-based learning, and integration of adaptive and interactive technologies. It prepares students for the complex challenges of the fourth industrial revolution by nurturing their ability to analyse, evaluate, and synthesise information in diverse and dynamic learning environments.

Ethical Implications of Education 4.0

As previously discussed, Education 4.0 represents a profound transformation in learning methodologies (Ito et al., 2013). While this shift comes with significant advancements in education, it also brings forth critical ethical concerns that demand thoughtful attention and resolution (Swartz, 2021). One central ethical challenge

concerns collecting and handling student data (Swartz, 2021). The extensive information generated through online learning platforms, student interactions, and assessments poses substantial privacy risks (Ito et al., 2013; Qureshi et al., 2021). To diminish the risks, educators must establish robust data protection protocols within the institutions they represent, ensuring ethical collection, usage, and protection of student data (Swartz, 2021).

Another ethical issue of concern is the potential for biases and discrimination embedded in algorithms utilised in Education 4.0 (Ito et al., 2013; Qureshi et al., 2021). Machine learning algorithms might perpetuate societal biases, leading to unfair outcomes for specific student groups (Swartz, 2021). For instance, automated grading systems or personalised learning tools might disadvantage student demographics. To resolve this, educators and institutions must closely examine the fairness embedded within the AI models (Ito et al., 2013; Qureshi et al., 2021; Swartz, 2021). Following the analysis of the data collected from the digitalisation experts who responded to our survey, there is a varied awareness of ethics in using AI. Not all universities recognise the importance of ethics in the use of AI, and not all have an adequate level of awareness or training to implement ethical practices efficiently.

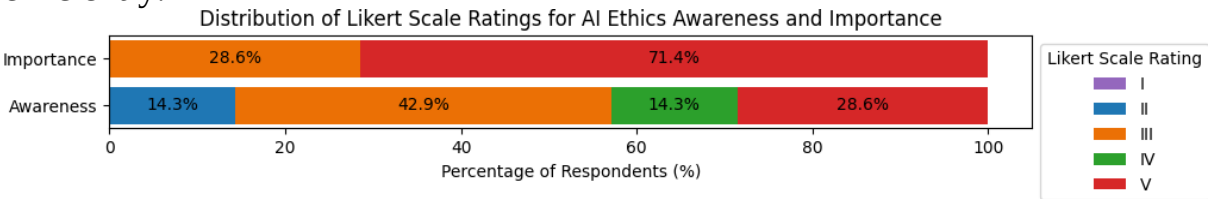

Figure 1 Respondents' perception of the importance and awareness of the ethical use of AI (Source image: Authors` contribution)

After analysing the survey data, we found that 43% of universities have implemented training programs for the ethical use of AI for both students and faculty members. Such training sessions are held annually for the university's employees and students. Despite widespread recognition of the importance of ethics in the use of AI, evidenced by the significant weights assigned by respondents in the Likert ratings of awareness and importance, there appears to be a gap between belief and action. Universities must work to convince people that such classes are not without importance and that students and faculty members do have to apply AI ethics concepts in their work.

Even more, the remaining 57% of universities still need to implement training initiatives dedicated to ethics in AI, indicating a possible lack of resources, awareness, or strategic prioritisation in this area. This absence of coherent policies and structured training programs on AI ethics suggests an urgent need for action and the development of a comprehensive framework to address these gaps. Equitable access to digital devices, reliable internet, and necessary technological skills between students could further impact the implementation of Education 4.0. A 2021 report by ANOSR[256], which surveyed 2765 students from Romanian universities, found that 25.8% of respondents had difficulties in accessing digital resources due to lack of technological competencies, 32.1% due to unreliable internet, and 28.7% due to not having access to a computer that met the performance requirements of the e-learning platforms used (ANOSR, 2020). To address this division, educators

[256] https://anosr.ro/en/documente-oficiale/publicatii/

and institutions must provide equitable technology access, support digital literacy, and cultivate inclusive learning environments that meet diverse students' needs.

5. Conclusions

While technology plays a vital role in Education 4.0, educators should prioritise the human element in this process (Swartz, 2021). The improvement of education through technology is clear within Education 4.0, but more is needed to replace the vital role of human guidance and interaction throughout the teaching and learning process. Overreliance on technology could devalue critical thinking and creativity (Ito et al., 2013; Qureshi et al., 2021; Swartz, 2021), eroding students' ability to develop innovative solutions for real-world problems. Educators need to ensure technology supplements rather than replaces these essential skills.

Such conclusions were the basis of our research questions on the ethical implications of digital technologies for learning as we witness the proliferation of digital tools with Education 4.0. To answer this, we analysed previous work, highlighting the implications of digital technology in educational processes. We then analysed the current landscape in several universities in Europe, asking teachers and students alike how they perceive the implications of digital technology. The conclusions show some fear about the ethical implications and the lack of clear structure in the information we are surrounding nowadays.

To summarise the findings, educators are responsible for navigating the ethical dimensions of Education 4.0 (Swartz, 2021). Proper training programs addressing technology integration ethics, data privacy, bias mitigation, and equitable education should be provided. Moreover, integrating ethical education into the curriculum empowers students to be responsible digital citizens. The migration towards Education 4.0 requires an attentive examination of its ethical implications. It is of the utmost importance for all parties to maintain a responsible approach, maintain human connections, and nurture critical thinking within the student body. By aligning with ethical principles, educators can harness the potential of Education 4.0 while safeguarding the welfare of learners.

"This research was funded by a grant from the National Program for Research of the National Association of Technical Universities – GNAC ARUT 2023"

References

1. Allison, M., & Kendrick, L. M., (2015), Toward education 3.0: Pedagogical affordances and implications of social software and the semantic web. New directions for Teaching and Learning, 144 (2015), 109-119
2. ANOSR, (2020), Învățământul online prin ochii studenților. Bucharest
3. Bowen, J., (2021), *Learn Code Retain*. Retrieved January 4, 2024, from https://www.learncoderetain.com/2021/06/28/how-developers-remember-things/
4. Ciolacu, M., Tehrani, A. F., Beer, R., & Popp, H., (2017, October). Education 4.0—Fostering student's performance with machine learning methods. In 2017 IEEE 23rd International Symposium for Design and Technology in Electronic Packaging (SIITME) (pp. 438-443). IEEE

5. Donskikh, O. A., (2019), Significance of Aristotle's teaching practice for modern education. In Teacher Education in the 21st Century. IntechOpen
6. Dondi, M., Killer, J., Panier, F., & Schubert, J., (2021), *McKinsey & Company*. Retrieved January 4, 2024, from https://www.mckinsey.com/industries/public-sector/our-insights/defining-the-skills-citizens-will-need-in-the-future-world-of-work
7. Gazi, Y., & Baker, N., (2021), Moving Horizontally: The New Dimensions of At Scale Learning in the Time of COVID-19. Atlanta
8. Ito, M., Gutiérrez, K., Livingstone, S., Penuel, B., Rhodes, J., & Salen, K., (2013), *Connected learning: an agenda for research and design.* LSE Research Online
9. Joksimović, S., Poquet, O., Kovanović, V., Dowell, N., Mills, C., & Gašević, D., (2018), How Do We Model Learning at Scale? A Systematic Review of Research on MOOCs. *Review of Educational Research*, *88*(1), 43-86
10. Kumpulainen, K., & Sefton-Green, J., (2014), What is connected learning and how to research. *International journal of learning and media*, 4 (2), 7-18
11. Lederman, D., (2020), *Inside Higher Education*. Retrieved December 29, 2023, fromhttps://www.insidehighered.com/news/2020/03/25/survey-gauges-state-online-education-landscape-pre-coronavirus
12. Miranda, J., Navarrete, C., Noguez, J., Molina-Espinosa, J.-M., & Ramirez-Montoya, M.-S., (2021), The core components of education 4.0 in higher education: Three case studies in engineering education. *Computers and Electrical Engineering* (93)
13. Oakley, B., (2021), *Barbara Oakley*. Retrieved January 4, 2024, from https://barbaraoakley.com/what-will-remain-in-teaching-post-pandemic/
14. Parker, S., (2021), *Campus Morgning Mail*. Retrieved October 18, 2023, from https://campusmorningmail.com.au/news/re-imagining-the-post-pandemic-university/
15. Pelletier, S., (2019), *Unbond: Reinventing Higher Education*. Retrieved December 29, 2023, from https://unbound.upcea.edu/leadership-strategy/credentialing/success-at-scale-the-growth-of-large-scale-online-programs/
16. Quresh, M. I., Khan, N., Raza, H., Imran, A., & Ismail, F., (2021), Digital Technologies in Education 4.0. Does it Enhance the Effectiveness of Learning? - A Systematic Literature Review. *International Journal of Interactive Mobile Technologies*, 15 (04), 31-47
17. Sharma, P., (2019), Digital revolution of education 4.0. International Journal of Engineering and Advanced Technology, 9 (2), 3558-3564
18. Swartz, B., (2021), Ethics in engineering education 4.0: The educator's perspective. *SAIEE Africa Research Journal*, 112 (4), 181-188
19. Tîrziu, A. M., & Vrabie, C., (2015), Education 2.0: E-learning methods. Procedia-Social and Behavioral Sciences, 186, 376-380
20. Watson, W. R., Watson, S. L., & Reigeluth, C. M., (2015), Education 3.0: Breaking the mold with technology. Interactive Learning Environments, 23 (3), 332-343