EDITORIAL

Re-thinking Education in the Age of AI

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Why to re-think education?

Previous industrial revolutions have transformed the socio-economic structures of society, dissociating human productive processes from animal power, creating the pre-conditions for mass production, and bringing digital devices into the houses of billions of people. The technological innovation associated with the industrial revolutions led to profound sociological, economic and educational changes, having an extensive intergenerational impact.

As observed in the past, the Fourth Industrial Revolution will gradually change the role of humans in the economy and society. The mainstreaming of artificial intelligence (AI) and the progress in the field of robotics will create new technologies fusing physical, digital and biological worlds. In discontinuity with the previous industrial revolutions, the impact would not be confined to a specific productive sector, but conversely, it will also affect the service industry. This transformation will challenge the relevance of the contemporary normative theories related to society and the economy. The Fourth Industrial Revolution will encompass the life and employability of future generations, creating new opportunities and novel dividing lines. In 2015, a report jointly issued by Citi and Oxford University, estimated that 57% of jobs are at risk of automation, while a study from PwC (2018) predicted that by 2035, almost 50% of the low-skilled workers would be replaced by machines and software. As the economists Erik Brynjolfsson and Andrew McAfee (2014) pointed out, technological advancement in AI and robotics could yield greater inequality, generating an extensive reorganization of the labor market. The reshuffling of the labor market will primarily affect the employability of individuals from disadvantaged socio-economic backgrounds. As

explained by Martin Ford (2015), the jobs most at risk are those in which the tasks allocated are related to routinary, repetitive and predictable actions. In this scenario, even in low-income countries, workers would not be in a position to compete with the robots and software.

In the wake of the Fourth Industrial Revolution, policymakers and educators need to re-think education vis-a-vis the mutation occurring in society and the labor market. Educators, psychologists – and experts in social sciences – should play a pivotal role in assisting policymakers in transforming socio-ecomomic challenges into opportunities. Therefore, reshaping education through the use of learning technologies in all possible developments (e.g., innovative pedagogies, webtools, open educational resources, platforms, AI, robotics) is the need of the hour. A multilingual approach to education (Council of Europe, 2022) should also be considered within this framework, taking into account the strategic significance associated with linguistic and digital competencies by the European Commission (2018) and the importance of a pluriliteracies approach to education (Coyle and Meyer, 2021; Cinganotto and Cuccurullo, 2019).

The contribution of the special issue to the scientific discussion

The special issue *Re-thinking Education in the Age of AI* aims to provide an interdisciplinary and holistic contribution to the discussion over the readaptation of education to the ongoing technological advancements. The publication has been supported by the Erasmus+ EDUREFORM project, co-financed by the European Union. The articles address different pedagogical and scientific aspects related to education, technology and socio-economic mutation.

The special issue opens with an article from *David Marsh*, which brings to light the juxtaposition between education and technological advancement. Adopting a realistic approach, the author illustrates the challenges that policymakers and practitioners will face to embed artificial intelligence in the existing curricula. The following contribution from *Nick Saville* provides a pragmatic reflection on the use of AI in language education. While acknowledging the inefficacy of banning AI from the classroom, the article ponders the strategies practitioners could use to enhance students' performances. Through case analysis and participant observation methodologies, the article presented by *Stefano Greco* researches the ability of public programs and international cooperation initiatives to transform the education sector. With this goal, the socio-economic challenges of the Fourth Industrial Revolution have been applied to the critical analysis of the Erasmus+ programme in India. Based on the training mobility organized in the framework of the EDUREFORM

project, the study conducted by *Letizia Cinganotto* aims to assess the reactions of Indian pre-service teachers to innovative teaching practices. The study conducted in Italy reports the results of the experimental teaching activities, identifying possible paths toward the promotion of multilingual and intercultural pedagogies in India. Focusing on linguistic comprehension and deep learning, the interdisciplinary research conducted by *Gunta Rozina*, *Indra Karapetjana* and *Marina Losevica* relates the transformations arising from the Fourth Industrial Revolution with the learners' cognitive abilities. The contribution is based on the critical contextualization of case studies where linguistic obstacles impair the students' learning processes.

The following article, co-authored by *Madhavi Shamkuwar*, *Priya Jindal*, *Rahul More*, *Pandurang Patil* and *Pravin Mahamuni*, broadens the discussion, presenting a systematic literature review on the expansion of AI in the research domain. The aim is to comprehend the contributions of the scientific literature in defining how AI can be integrated into higher education curricula to enhance learners' performance. A connected study presented by *Kalyani Pande*, *Vaibhav Jadhav* and *Mahesh Mali* investigates the attitude of Indian secondary students toward AI. The research explores how the students perceive the inclusion of new technologies in the learning sessions with a specific focus on the role of the teachers in the classrooms. A similar study has been conducted by *Chaitali Sarangi*, *Tanushri Mohanta*, *Moumita Pradhan* and *Nibedita Guru* to assess the impact of COVID-19 on the learning methodologies deployed by teachers. Based on the qualitative and quantitative interviews engaging Indian teachers and students from different schools, the research investigates how technological developments have penetrated the learning practices following the coronavirus pandemic. Providing a supplementary insight on education and technology, the work of *Shama P. Ansari* and *Ashutosh Biswal* scrutinizes the attitude of future Indian in-service teachers towards online learning. The experiential investigation is based on the exposure of the target group to MOOCs, collecting integrated qualitative feedback regarding the attitude of future Indian teachers towards online learning. Continuing the examination of digital technologies and pedagogical practices, the article by *Debanjali Roy* and *Tanmoy Putatunda* analyzes the integration of AI tools in English literature classrooms. By referring to classroom experiences, the study demonstrates how AI can be instrumental in developing collaborative learning practices.

The special issue also provides space for pedagogical strategies training critical, analytical and creative skills among the learners. The study proposed by *Nidhi Waldia*, *Vaibhav Jadhav* and *Mahesh Mali* examines microlearning strategies as a pedagogical solution to the Education 4.0 challenges. Following this objective, the research assesses Indian teachers' preparedness to

utilize microlearning in the classroom. The following article from *Meenal Arora* proposes video-making as a further pedagogical tool to revise education practices vis-à-vis the challenge of the Fourth Industrial Revolution. The study engaged Indian pre-service teachers to comprehend the relationship between the creation of videos and the student's learning process. Chasing a similar path, *Pooja Singh* and *Jyotika Guleria* investigate the attitude of Indian undergraduate students towards sketchnoting pedagogy. The study aims to assess if sketchnoting could be a valuable tool for teachers to enhance learners' skills. Conducting a survey based on the observation of Indian pre-service teachers, *A.V. Jayalakshmi* and *Ashutosh Biswal* examine the impact of the open book environment in higher education. More specifically, the research assesses how a learning environment characterized by open book assessment influences the learners' critical, creative and analytical skills. Continuing to examine innovative teaching practices, *Manisha* and *Shubham Gargrish* comprehensively review augmented reality (AR) use in education. The final aim of the study is to inform educators interested in incorporating AR technology in educational settings.

The special issue pays specific attention to studies providing an interdisciplinary perspective on the impact of the new technologies on the learning environment. The digital divide is at the center of the contribution offered by *Vidyanand S. Khandagale*. Through the collection of quantitative and qualitative data, the paper identifies the strategies deployed in the Indian scenario to mitigate the detrimental socio-economic impact of the digital divide. The last article of the special issue developed by *Roopali Kansal* and *Payal Bassi* provides a holistic perspective on the modernization of the education sector. The paper illustrates the role that architecture can play in reshaping learning spaces to the needs of education 4.0, emphasizing the importance of enlarging the focus of the discussion towards different subject areas.

Education and Fourth Industrial Revolution: The way forward

Adapting the education system to the mutation of the labor market and society remains a rebus. Policymakers and practitioners are not yet fully aware of the challenges ahead. The proclamations from the tycoons of Silicon Valley in favor of public schemes for guaranteed income reveal their concern regarding the impact of AI and robotics on human employability. As occurred during the previous industrial revolution, the upcoming technological developments will substantially restructure the agricultural, manufacturing and service sectors. Policymakers should deeply re-think education to mitigate the detrimental socio-economic effects of the Fourth Industrial Revolution. In the first place,

practitioners and scholars should be aware of the nature and the magnitude of the challenges ahead. Awareness campaigns would be instrumental in enlarging the pool of experts interested in transforming education, bringing forward experimental teaching practices to train learners' analytical, creative, and critical skills. New digital devices would hardly excel in those skills, representing an essential asset for workers willing to escape the technological unemployment trap. For this reason, curricula should avoid aiming at mere memorization, and educators should be aware of the importance of developing out-of-the-box skills among their students. Until today, these skills are often considered an inborn peculiarity of the learners. Contrary to the vernacular beliefs, out-of-box skills can be trained. The advent of the Fourth Industrial Revolution brought into the agenda of the policymakers the dilemma of how the education system could effectively train analytical, creative and critical skills among the learners. The way forward entangles a paradigm shift, moving away from the empty motto 'think out of the box!'. With the support of scholars and educators, policymakers need to define how the schooling system can support deep learning among students. As mentioned earlier, society must be aware of the challenges ahead to achieve this goal. Without this step, there is the concrete risk of underestimating the socio-economic consequences of the Fourth Industrial Revolution, leaving society unprepared for the labour market's transformation (and its socio-economic consequences).

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