Commentary: Transforming Education 4.0 to Education 5.0: sustainable education

Background

Educational requirements can be treated as learners' needs. With changing global scenarios, these needs increased beyond the typical expectations like having healthy classrooms, competent teachers and good study curriculum and material. During COVID-19, the requirement of having a good online teaching app gets added to these needs, which remained there even after the pandemic. On the other side, the government's initiative to reach education at the grass-root level, even in remote places, accelerated online education to address the learning gap for providing education to all. A combined effect of these facts created a critical need for taking assistance from advanced technologies. The fourth industrial revolution or Industry 4.0 already augmented the digital transformation, automation and data exchange practices specifically in the manufacturing industries. The education sector is not much different than the manufacturing sector. Education 4.0 is all about learning techniques related to Industry 4.0 that includes the technology like Big Data Analysis, Internet of Things (IoT), Robotic Process Automation (RPA), Block Chain Technology, Artificial Intelligence (AI) and Machine Learning (ML). After the success of Education 4.0, the crucial needs and requirements shifted to the education that can make the teaching more humanized. Education 5.0 addresses these changing needs. This paper explains about transforming Education 4.0 to Education 5.0 to make education sustainable and learner-centric.

Introduction

The purpose of an education is not restricted to just reduce the unemployability but to unravel social issues like dropout, poverty, racism, violence, drugs, bullying, obesity and suicide attempts.

Information and communication technology specifically proven its capability to cover the maximum possible area by reaching remote locations to provide education through online mode effectively; during the recent pandemic, this was evident.

The fourth Industrial Revolution (Industry 4.0) offered many capabilities with various technologies including virtual reality (VR) and augmented reality (AR) with simulation techniques contributed significantly to the training area. IoT and robotics provide remote operations capabilities, whereas the technologies such as Block Chain and Big Data Analysis provide infrastructure for data analytics. In general, Industry 4.0 technologies made a positive impact on the educational sector.

After significant contributions from the technologies of Industry 4.0 in an education, the requirement is transformed from obtaining the intelligence quotient (IQ) to achieving the emotional quotient (EQ). Though Education 4.0 is backed by all the advanced technologies

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from Industry 4.0, the social and emotional aspects were missing; hence, Education 5.0 is all about the people and not about technology. Because it is assumed that the education sector is already exploring the capabilities of technologies involved in Industry 4.0 and moving towards Society 5.0 to make it more learner-centric.

Literature review

How engineering education specifically constantly evolved in Education 5.0 (Lantada, 2020) is being explained in which the development of technology and its applications in Industry 4.0 goes with ethics and humanism together is well elaborated. The author (Lantada, 2020) identified the risk of uncontrolled technological growth that can cause unpredictable effects on human lives. In this paper, the author (Lantada, 2020) expressed the need for protecting human rights by adopting Education 5.0, which can support sustainable education.

The deficiencies in current education systems in Mexico were identified (Alvarez-Cedillo *et al.*, 2019) with the issues due to rapid technological developments and applications. According to the authors (Alvarez-Cedillo *et al.*, 2019), the freedom and originality of learners get lost, and unemployment increases due to wide applications of technology. This paper suggests the steps to be taken to apply the Industry 4.0 technologies to create the Society 5.0, which should be human-centric. The specific stages suggested in this paper were found useful for effectively transforming Education 4.0 to Education 5.0.

Manna Team network has developed for horizontal collaboration with universities and vertical collaboration with the schools (Flor *et al.*, 2020) to reduce the gender gap in the technological sector using Education 5.0. The authors (Flor *et al.*, 2020) explain five perspectives, namely hard skills with innovation, soft skills with freedom, collaborative support and competency-based learning. These perspectives (though they may not be key drivers) contribute significantly to transforming Education 4.0 to Education 5.0.

An assessment for determining the educator level was carried out in Zimbabwe (Muzira and Muzira, 2020) for Education 5.0. In this assessment, a questionnaire-based survey was conducted to collect the required data to baseline the status. Accordingly, six stages of innovation were defined, and responses against these stages were collected and analyzed to assess the preparedness for Education 5.0. The gaps identified during the survey became the foundation for transformation.

In the chapter (Chinchorkar, 2023) of the proposed book on Agile Leadership for Industry 4.0, the author explained about the industrial revolutions and how the process of change (i.e., agility) is adopted and managed. The roadmap for radical change from "transactional efficiency" using technology to "transformational leadership," which includes cognitive skills, can be referred to as the basis for transforming Education 4.0 to Education 5.0.

The role of Education 5.0 in Sustainable Development Goals (SDGs) to overcome the critical shortage of basic resources in Harare (Togo and Gandidzanwa, 2021) was explained in the qualitative research paper. Specifically, how Education 5.0 contributes to promoting sustainable industrialization (SDG#9) and economic growth with full productive employment (SDG#8) through innovation hubs and policymaking was explained.

A comparative study of implementation of Education 5.0 in developed and developing countries (Alharbi, 2023) was available in which evolution process of the web and education was correlated. The development (migration) from source of knowledge to facilitation, orchestration, innovation and navigation was explained diagrammatically. This illustration specifies how the education field is evolving with the technological evolution. Using the PRISM data flow technique the literature synthesis details were presented in which aspects such as "education system transformation," "industrial and social evolvement," "modifications at higher education sector," "educational and administrative development" and "financial and promotional development" were elaborated. These aspects supported to

map the educational levels of revolution with the common parameters like restructuring, academic progress, operations and digitization. This mapping gives a fair overview of migration from Education 4.0 to Education 5.0.

A questionnaire-based SWOT (strengths (S), weaknesses (W), opportunities (O) and threats (T)) analysis integrated with the analytic hierarchy process (AHP) was done (Mian *et al.*, 2020), which analyzes the impact of Industry 4.0 on sustainable education. The paper suggests strategies like aggressive, conservative, defensive and competitive according to the SWOT matrix.

The best combination of Education 5.0 and Industry 4.0 and its impact on the teaching-learning process (Nadiah *et al.*, 2020) were well defined. The learning pattern in the digital age as game-based component is suggested as learning simulation. They stated that cutting-edge technology is needed in education with the importance of face-to-face learning, which can be taken as a basis of Education 5.0.

The revolution in education from memorization to ethics-based education is depicted in Figure 1 (https://www.mdpi.com/2071-1050/14/18/11199). This reflects the incremental migration in the focus in education.

Focus of the article

As the name of the article suggests, the focus of the article is on transforming Education 4.0 to Education 5.0. This includes the following points.

(1) The boom and need for digital transformation in major sectors.

(2) The increased number of applications using technologies like AI, ML, IoT, Big Data and Block Chain.

(3) Online classes and distance education become need of education, specifically during the pandemic.

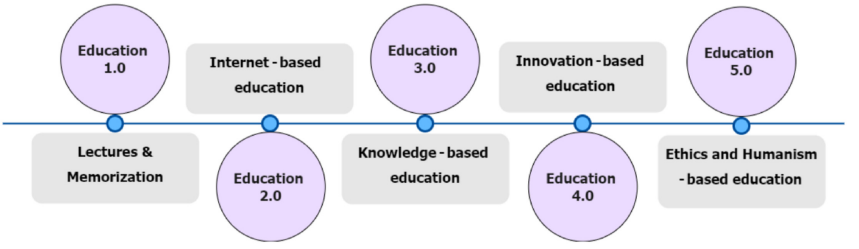
(4) Challenge to shift digital transformation to social transformation.

(5) Linking digital technology to human, social and emotional skills.

Solutions and recommendations

The following table (Table 1) depicts the correlation between industry, society and education with focus on revolution in each one.

To create a Society 5.0 (i.e. smart society), humanization aspects need to be added with Industry 4.0 technologies in Education 4.0 to transform it to Education 5.0. Following are the specific recommendations for this transformation.



Source(s): Figure courtesy of Ahmad *et al* (2022) https://www.mdpi.com/2071-1050/14/18/11199

Figure 1.
Revolution in education

(1) Planning, designing and promoting the curriculum for Education 5.0

- Project-based or application-based learning: this gives more focus on practical and applications; the curriculum should incorporate these concepts.
- Inclusion of concepts like cognitive thinking and exploring the things while planning and designing the courses.

(2) Enhance intellectual framework

- Collaborative learning: This includes practices like cognitive thinking, exploring things and data interpretation skills.
- While enhancing the framework, educational partnership and entrepreneurship development should be considered.

(3) Include technical infrastructure integrating with other non-technical infrastructure.

- Selecting better standards: Traditional education standards may not support the practices involved in Education 5.0 such as the flipped classroom model and Bring Your Own Devices (BYOD) practices etc.
- Application of Big Data for data analysis (with real data) and techniques like VR and AR should be considered.

(4) Encourage innovative approaches.

- Concepts like gamification in education should be promoted.
- Personalized learning that customizes what, when and how each student is taught should be considered with innovative assessment approaches.

These are a few suggestions toward bringing the education close to reality by adding more experimental and experiential components in the traditional education to focus more on learners. This can add privacy, ethics, security and technical mindfulness among the learners.

Future research directions

The Turing Test by Alan Turing in 1950 identified the inability of technology to think like human beings. As Education 5.0 is based on the set of technologies from Industry 4.0, the limitations in terms of thinking and acting like human beings toward achieving the objectives of Education 5.0 as "humanization" are ever-challenging.

Enhancement in Education 5.0 by incorporating ever-changing social and emotional values can be a future research direction.

Society		Industry		Education	
Type	Focus	Type	Focus	Type	Focus
Society 1.0	Hunting	Industry 1.0	Mechanization	Education 1.0	Teaching
Society 2.0	Agricultural	Industry 2.0	Mass production	Education 2.0	Research
Society 3.0	Industrial	Industry 3.0	Automation	Education 3.0	Community
Society 4.0	Information	Industry 4.0	*Digitization*	Education 4.0	Innovation
Society 5.0	*Smart*	*Industry 5.0*	Personalization	*Education 5.0*	*Humanization*

Source(s): Table by authors

Table 1. Correlation between the society, industry and education revolutions with focus

Conclusion

The boom of digital transformation and thereby applications of technologies from Industry 4.0 has given s significant boost to the education sector. During the pandemic, this fact was evident while taking online classes and observing increased preferences to distance learning with the help of technology. The focus of Education 4.0 was more on innovation and on the spread, and this objective is obtained using the set of technologies from Industry 4.0. However, while focusing on reach and inventions in education, the human touch got lost. Education 5.0 seeks to focus on the people and not on the technology (because most of the technologies are already in effect); in fact, it is an effective combination of both. The social and emotional levels in the society can be obtained by introducing the humanization element in education. Taking step-by-step conscious decisions, the transformation of Education 4.0 to Education 5.0 is possible for sustainable education to make it more learner-centric essential for the development of Society 5.0.

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Additional readings

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Further reading

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