

## Essence of Education 4.0

Matthew N. O. Sadiku, Adedamola Omotoso, Sarhan M. Musa

Roy G. Perry College of Engineering, Prairie View A&M University, Prairie View, Texas

### ABSTRACT

Education is rapidly evolving in response to the changes in the society. Today literacy is significantly fueled by media, Internet, and social media technologies. Education 4.0 seeks to align with Industry 4.0 and prepare students for the next industrial revolution.

Universities should be at forefront of innovation and knowledge creation to be relevant in the new age of Education 4.0. This paper provides a brief introduction to Education 4.0.

**KEYWORDS:** education 4.0, industry 4.0, competency based education

**How to cite this paper:** Matthew N. O. Sadiku | Adedamola Omotoso | Sarhan M. Musa "Essence of Education 4.0" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-4 | Issue-4, June 2020, pp.1110-1112, URL: [www.ijtsrd.com/papers/ijtsrd31342.pdf](http://www.ijtsrd.com/papers/ijtsrd31342.pdf)



IJTSRD31342

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### INTRODUCTION

The basic mission of universities include three main factors [1]: (1) the training of professionals who can face technological, social, political, and economic challenges,

(2) the creation of knowledge through scientific research, and (3) sharing the knowledge and experience with the society to improve the quality of life. To carry out this mission, educational activities are increasingly moving online and course contents are becoming available in digital format. Taking advantage of this situation requires a change in mindset [2].

Education 4.0 requires new way of thinking for both the teacher and students. Being a good teacher requires acquiring a large set different kind of interdisciplinary skills. The student today is a digital native who is comfortable with the mobile and computing devices. New skills, new curricula, new teaching, new learning, and new training as well as the flexibility in education are necessary. Due to rapid economic and technological changes, students need to be prepared for jobs that have not yet been created. Education 4.0 needs also a strong partnership between industry and academia in the development of human resources for Industry 4.0 [3].

### TRADITIONAL EDUCATION IS LACKING

Traditional education is well established but it is no longer fit-for-purpose. Traditional formal education was designed for mass distribution. It is obsessed with tests. It has not integrated with the industry needs. The new educational model is called Education 4.0 (or E4.0). Education 4.0 is a response to the needs of Industry 4.0 or the fourth industrial

revolution. Education is now regarded as a life-long process rather than a classroom-oriented experience.

### EMERGENCE OF INDUSTRY 4.0

The innovations in fields such as artificial intelligence, Internet of things, cloud computing, big data, mobile supercomputing, intelligent robots, self-driving vehicles, biotechnology, nanotechnology, 3-D Printing, and quantum computing have made the fourth industrial revolution evolve at rapid pace and disrupt almost every industry. These innovations have created an opportunity to build a learning ecosystem that allows personalized learning which is independent of time and location.

In the last 250 years, society has experienced four Industrial Revolutions, which have entirely changed the face of industry as we know it. These revolutions are shown in Figure 1 [4] and explained below.

**Industry 1.0:** (1784) : Based on mechanical production equipment driven by water and steam power. The invention of the Steam Engine by James Watts in 1780 changed the workforce forever.

**Industry 2.0:** (1870): Based on mass production enabled by the division of labor and the use of electricity.

**Industry 3.0** (1969): Based on the use of electronics and IT to further automate production. Just 70 years later, the computer brought a third industrial revolution.

**Industry 4.0 (today):** Based on the use of cyber-physical systems, Internet of things, and smart technologies. In 2000, the ubiquitous nature of the Internet ushered in the fourth industrial revolution.

Industry 4.0 is the current gradual industrial transformation with automation, cloud computing, cyber-physical systems, robots, and industrial IoT to realize smart industry and manufacturing [5]. The 4th industrial revolution will require a shift in approaches and models. It utilizes cyber-physical systems, in which machines communicate efficiently with each other. Industry 4.0 has brought disruptive change, which takes place in the manufacturing industry through the pervasive application of ICT. To perform the Industry 4.0, there are basically six different design principles [4]: interoperability, transparency of information, technical support, real-time data acquisition and processing, modularity and distributed decision. Using of industry 4.0 in education is very important in terms of training qualified personnel.

#### EMERGENCE OF EDUCATION 4.0

The global education technology market is growing rapidly with the growing need for skills and changing workforce in the 21st century. Emerging technologies such as the Internet of things, social media, mobile, and cloud computing are impacting all areas of education. These new resources can empower individuals to develop a fuller array of competencies, skills, and knowledge. The emergence of Industry 4.0 requires that Education 4.0 also leaps from the current Education 2.0 framework to Education 3.0/4.0.

**Education 1.0:** Limited to few privileged people and governed by informal methods of teaching.

**Education 2.0:** With the invention of the printing press, knowledge dissemination could be done to the masses through printed books.

**Education 3.0:** The Internet has provided a platform that has greatly expanded access to education and changed the ways of learning.

**Education 4.0:** Empowering education to produce innovation through personalization of the learning experience.

Most of the world's education is at the 1.0 level and only a fraction of world education is moving toward Education 2.0 [6]. While education delivery has evolved over the years, through Education 1.0 to Education 3.0, the main process of teaching has not changed and the main learning methods have remained unchanged. E-Learning may be regarded as the third education revolution and the subject of E-Learning has been Massive Open Online Courses (MOOC). Artificial Intelligence will play a major role in the fourth revolution in education. Education 4.0 responds to the need of Industry 4.0, where man and machine work together to enable new possibilities. Education 4.0 puts the learner at the center of the ecosystem and enables him to go through experiential learning. Innovations and digital technology are driving the

“personalization” of learning. The requirement for life-long learning has become a given.

#### CHALLENGES

Individuals are falling behind and not keeping pace with the rapidly evolving technology. The leaders of today are not digital natives. It is important to work toward capability development of the teachers, educators, and leaders for the Education 4.0 ecosystem. Teachers are the key element to change when teaching with technology. Changing curriculum and teaching practices is a challenging and time-consuming process. Investment in infrastructure is an on-going process.

#### CONCLUSION

Education 4.0 is tipped as the future of education and poised to change consumption of information. It is deemed as a disruptive system which focuses on what is taught as well as the way in which it is taught. Human skills need constant upgrading to handle the key enabling technologies including machines as cyber-physical systems, augmented reality, human-robot collaboration, and smart devices. The skill-set that would be necessary for the “jobs-of-the-future” would change drastically. Students across disciplines will, therefore, need to gain digital skills and data literacy during their studies. When looking jobs, engineering students should be prepared to meet the demands of society 4.0 and industry 4.0 – resulting from a fourth industrial revolution. More information about Industry 4.0 can be found in [7].

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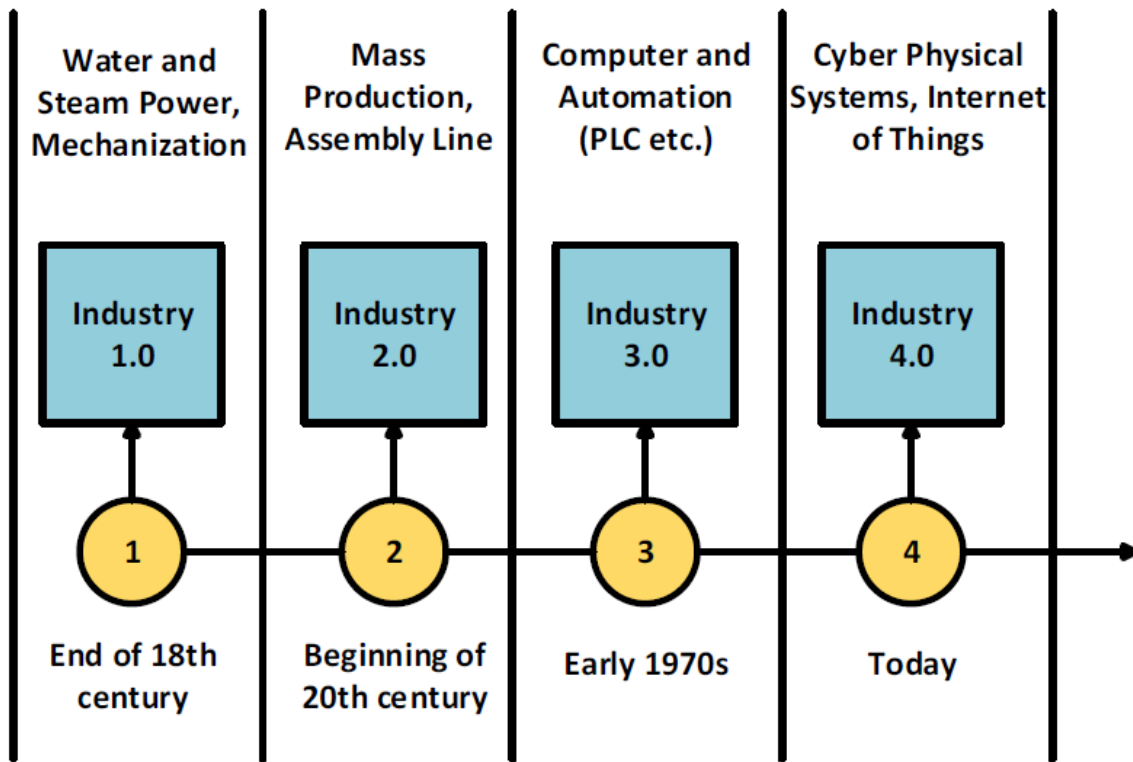


Figure 1 The industrial revolutions [4].

