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Faculty Member 4.0 Changing Roles In Technology Enhanced Learnıng: Industry 4.0 and Globalization

Öğretim Üyesi 4.0 Teknoloji İle Geliştirilmiş Öğrenmede Değişen Roller: Endüstri 4.0 ve Küreselleşme

ABSTRACT

Technological developments known as "Fourth Industrial Revolution", "Industry 4.0" has significant changes in human's life. New systems, approach methods , management systems are emerging in every area of life.The transformation of society shows itself not only in manufacturing processes but also in inevitable sectors such as education, health, environmental areas and services sector. The evolution of societies from the agricultural society to the industrial society, from the information society to the information society, manifests itself not only in manufacturing systems, but also in areas where education is inevitable, such as education, health and the environment. In literature, it is possible that you can observe the concepts of Health 4.0, Environment 4.0, Water 4.0, Logistics 4.0 and Education 4.0. In this study, Education 4.0 will be examined and the possible changes in education systems will be underlined. With Education 4.0, already known education systems merges with the technological developments and it transforms into innovation dominated structure. For this reason, in this study the components of Education 4.0 will be explained and in this context, information on how to perform the systemic transformation will be realized.

Keywords: Educational Technologies, Education 4.0, Industry 4.0

ÖZ

Dördüncü Endüstriyel devrim olarak adlandırılan ve kısaca "Endüstri 4.0" olarak bilinen teknolojik gelişimler insan hayatı üzerinde önemli değişimlere yol açmaktadır. Yaşamın her alanında yeni sistemler, yaklaşım tarzları, yönetim sistemleri ortaya çıkmaktadır. Toplumların, önceleri tarım toplumundan endüstri toplumuna oradan enformasyon toplumuna oradan da bilgi toplumuna evrilmesi sadece imalat sistemlerinde değil aynı zamanda eğitim, sağlık, çevre gibi hizmet üretiminin kaçınılmaz olduğu alanlarda da kendisini göstermektedir. Literatürde sağlık 4.0, çevre 4.0, su 4.0, lojistik 4.0, eğitim 4.0 gibi kavramlara rastlamak mümkündür. Bu çalışmada özellikle eğitim 4.0 kavramı irdelenecek ve bilinen eğitim sistemlerinde olası değişimlere dikkat çekilecektir. Eğitim 4.0 ile bilinen eğitim sistemleri teknolojik gelişmeler ile bütünleşmekte ve inovasyon ağırlıklı bir yapıya bürünmektedir. Bu sebeple çalışmada, eğitim 4.0 sisteminin bileşenleri açıklanarak bu kapsamda sistemsel dönüşümün nasıl gerçekleştirilebileceğine yönelik bilgiler de verilecektir.

Anahtar Kelimeler: Eğitim Teknolojileri, Eğitim 4.0, Endüstri 4.0

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1.Introduction

With the concept of Industry, a rapid digital transformation is triggerred in societies. In this context, if possible developments are analysed, it is apparent that on the one hand, digital dominancy has more effects on in every moment of industrial life, on the other hand, it leads major developments on society. Researchers draw the attention to the developments that Industry 4.0 applications will cause in the society. As an example, Oztemel (2017), Davies (2017) and the others can be examined. In the historical process,Industrial movement(First Revolution) started with the invention of steam engines and it continued with Mass Production (Second Revolution) with the invention of electricity.

The development of Information Technologies and automation (Third Revolution) created transformation which is beyond the expectations. The impact of this change has survived to the present day and a rapid journey has been taken to a world dominated by digital and autonomous systems (the fourth revolution). Intensive researches are conducted on this subject. Liao and the others (2017) provided an assessment of case studies. As digital manufacturing (automation, data exchange, production technologies), integrated communication network (internet of things), cyber physical systems, smart factories (flexibility, speed, efficiency) manifests, the qualities of the products produced and the services offered change(Kıymaz vd, 2016: 108).

Dimensions are getting smaller but ingenuity is growing. With products that can make decisions on their own, produce support by communicating with their users, and draw attention to good and bad developments in their own structure, on the one hand, life has become more connected with more machines. While new opportunities are offered to people, it is mentioned about the obstacles that robots will leave people unemployed and create against people.
It is clear that it will not be possible to prevent these developments. There are more positive contributions and benefits than possible negative effects. One of the most effective ways of minimizing negative effects by highlighting benefits is the effective implementation of education systems. This naturally triggers a digital transformation in education systems as well. This digital transformation is called Education 4.0. (Puncreobutr, 2016).

2.Process Of Industry 4.0

Information systems and related technological possibilities, which are one of the main pillars of the information society, can make machines comment, solve problems, establish and decide relationships, learn, understand that computers can solve solutions to complex problems that they cannot solve under normal conditions, understand the words, climb stairs, play ball, answer questions. it clearly shows that they can communicate, perceive and prioritize events. However, even if some issues have not yet been reached to the desired level, computers and machines can talk to each other, go for the same purpose (goal / sensor modeling), socialize, help each other, support each other (emotional intelligence), teach each other events, and even do Research and Development studies. On the above issues, important developments are witnessed(Aslangilay, 2016: 35). The basic components of these developments, defined as the Fourth Industrial revolution, can be listed as follows(Bloom ,1964: 75; Croiser, 2013: 45; Davies, 2017: 1290):
• Autonomous robots: Robots that can move on their own, make decisions, and solve problems in manufacturing environment.

• Intelligent IT network: An IT network that enables machines to communicate with each other, people and software, and can manage and control data traffic.

• System integration: It is the operation of manufacturing systems that are integrated with each other and that can make independent decisions but have to work dependently.

• Cyber physical systems: Cyber systems that enable all communication and systems integration.

• Cyber security systems: High-preventive systems that will prevent all kinds of cyber attacks.

• Internet of Things: The internet that enables data communication protocols that will enable the communication of objects communicating with each other in every segment of the society, especially the systems in the manufacturing environment, and their communication.

• Big data analysis: New data is produced twice a year. It is the provision of necessary information to decision makers automatically with intelligent analysis on big data. To ensure that the right information is in the right place at the right time.

• Cloud computing: Instead of giving big money and purchasing software as before, both cloud storage and storage systems and the possibilities of using software can be met with very small costs. It will be possible to “pay as much as you use”.

• Simulation and Augmented reality: Simulation environment and real environment can be used in an integrated way. Faulty systems can be repaired on the real system, as shown on the virtual models of glasses.

Additive manufacturing and 3D printers: It is the production of physical products in desired qualities and sizes with 3D printers only by entering the model information into the computer.

• Preventive maintenance: In the new industrial transformation, the machines will have to work continuously. This will naturally require the maintenance of the machines to be more rigorous and precautions to be taken by foreseeing the negativities that may occur. Industrial transformation is only about the intellectualization of the manufacturing environment and the flexibility of the IT network, the speed of production, etc. does not bring innovations. At the same time, the quality of being "intelligent products" in the products produced increases. Personalized products have already started to show themselves in the market. While each product gains personal identity on the one hand, it can also act as an observer. The size of the robots used in the manufacturing environment is getting smaller, but the number and qualities of the work they do increase. Robots can now work interactively with humans. Robots can read information about the weight, size and holding points from the product memory with the help of the antenna in their hands(Fisk, 2017: 67). They work by taking commands from the parts produced under CPPS (Cyber Physical Production Systems).

3. The Communıcatıon Process Of The Educatıon 4.0 Approach

Education 4.0 means to achieve digital transformation in the education world as in other fields. In parallel with the understanding of Industry 4.0, it would not be wrong to say that the education world has experienced 4 main transformations. Researchers such as Wallner and Wagner (2016), Puncreobutr (2016), Rosik (2017), Fisk (2017) draw attention to this issue. In general terms, it is seen that the change and transformation in the education world follows a process like the one below(Liao et all, 2017: 78; Rosik, 2017: 87; Oztemel, 2017: 97):

Education 1.0: It is defined as the realization of trainings that will meet the needs of the agricultural society naturally. In agricultural societies, knowledge was transferred from teacher to student with the help of concepts. Extensive studies were needed to learn about events and related

information. Students mostly had to follow their teachers and apply the methods they used. Developing new methods was one of the main purposes.

Education 2.0: There has been a significant transformation in the content of education systems in industrial societies, and the development of technologies and technological tools that will meet the basic needs of industrial institutions has started to be essential. The development of technologies to be used in business life has become an important training component. Developments that will trigger mass production have become an important educational motivation. According to Pooworawan (2015), educational institutions started to be seen as a factory and students as products produced in these factories. Educational contents indicated the basic qualifications of the students to be trained.

Exams started to be seen as the quality control of the education system and diplomas as a guarantee document. At this stage, it is seen that the learning process defined by Bloom is a force that guides the education systems (Bloom et al., 1964:65).

Education 3.0: When the information-oriented structuring of the society started, naturally, education systems started to be structured in a way to meet the needs of the “technology society”. At the basis of this period, the phenomenon of "self-learning" emerged. With the use of digital media, the period when social media, especially internet, made itself felt in education systems started. Computer aided and mutually interactive education systems have emerged. Another important transformation that occurred during this period is that students are trained as “producers of knowledge” rather than those who consume information. At this stage, ensuring quality assurance of education systems is essential. Multinational joint education programs and systems, which started with the Bologna process (Crosier D. and Parveva, 2013:54), have been put into practice.

Education 4.0: It is not wrong to say that innovation has become the dominant position in education systems with the Industry 4.0 transformation. More precisely, it will be possible for educational institutions performing innovation-based education to be successful in the coming years. Educational institutions, as Aslangilay (2016) pointed out, will not only see innovation as a key component of the education system, but to go beyond it, to increase the competitiveness of the world with the effect of globalization. In addition, the use of tools and materials in the field of education and training visually will be of great importance in the Education 4.0 process. The use of new technologies that can adapt to new social changes will become an important need. Lifelong learning will become extremely important in the Education 4.0 process. This element will be among the most important missions of all educational institutions. In addition to knowledge, cooperation, leadership, digitalization of literacy, effectiveness of communication channels, emotional intelligence, ability to solve problems, global citizenship, etc. will be brought to the agenda. Also, securing these capabilities will be essential for basic learning. Education 4.0 is not just a new education system. It will become important to focus on issues such as critical analytical thinking, productivity, multicultural knowledge sharing and career development(Sucu, 2021: 20; Şener vd, 2017: 25).

At every stage required by the Industry 4.0 process, it is very important that the manpower that will make, develop and put into practice the technological planning goes through an effective training process. In this process, far-sighted and high-level thinking individuals are required. Just knowing about a subject is not enough. Thinking will become a necessity. It is extremely

important for individuals to think far-sighted and analytically. In all stages of education, the process will need to be thought, designed, planned and implemented in an integrated manner.

In the Education 4.0 approach, it is stated that constructivist education systems will be applied in general, and it is defined that a learning process based on the 3 fields explained below will be applied by going beyond Bloom's taxonomy (Bloom et all, 1964: 20). • The 3Rs that regulate understanding (Recalling-Remembering, Relating-Associating, Refining- Refining) • The 3Is that trigger the research (Inquiring- Questioning, Interacting- Interaction, Interpreting- Interpreting) • The result-producing 3Ps (Participating-Participating, Processing- Processing), it is pointed out that it will be necessary to use approaches such as visual learning, personalized education systems, game and scenario-based learning, project-based problem solving, and augmented reality in order to provide students with these abilities (Nedeva and Dineva, 2012).

In order to achieve the targeted achievements in education systems, especially in the higher education academic community, there will be an imperative to focus on educational research, such as improving the quality of education in universities, integrating prospective teachers with technology, developing innovative products with them, and developing digital literacy. In order to meet such educational needs of the future, significant changes will also occur in the education systems. As explained above, an innovation-weighted approach will come to the fore rather than learning in general terms. Learning is not an important activity for children and it is rapidly moving towards the days when lifelong learning will be important(Oztemel, 2017: 55).

The main points of change and transformation that will occur within the scope of education 4.0 as a result of the examination of the related literature are summarized as below (Pooworawan, 2015: 76; Puncreobutr, 2016: 85; Wallner et all, 2016: 65; Gakh, 2022: 2):

1. Education and training activities can take place in different places, at different times and using different tools. Education / learning or understanding will prevail anywhere and anytime. Individuals can receive distance education in line with their learning and understanding. Theoretical information can be obtained outside the classroom. Practical information will be the cornerstone of face-to-face education.

2. Students will be able to receive personalized education through training systems which are adaptable to their abilities and talents. The contents of the education can be enriched according to the learning speed and status of the students. If the students have difficulty in understanding a topic, they will be able to receive training repeatedly until they overcome that topic. They will be constantly encouraged in direct proportion to their individual earning skills. Thus, students will be provided with self-confidence. In addition, teachers will have tools to see which students have more support in which subjects. In other words, instead of adapting students to the education system, it will be possible to shape the system according to the students' abilities and talents.

3. Although the aim of the lessons is to take the student to a certain point, the path that each student will follow to reach the targeted point may be different. The learning process should be planned with the tools suitable fort he students. Students will be able to perform flexible learning with their own education and tools that are shaped freely in line with their own preferences, that is, they can overcome their deficiencies. Learning with new approaches such as blended learning, classless learning, learning with their own devices will be important.

4. Students will have to carry out project-based learning and work, as they will have to prepare themselves for independent work in future free economic settings. In other words, they will have

to learn how to apply their talents and abilities in a short time. Institutional and organizational time management will be one of the basic requirements students need to learn to prepare for the future.

5. In the light of technological developments, a learning environment based on face-to-face interaction can be created that requires especially human knowledge and expertise. The main theme of the lessons will focus on field knowledge and experience. Trainings will be given to students to gain skills to solve more real world problems. This shows that training / learning activities will be enriched with more internship, mentor Projects, and team work, cooperation-oriented approaches.

6. Today, one of the three most important indicators that eliminate ignorance is mathematics. It is clear that manual math operations will no longer be seen from elements that prevent ignorance. Computers will be able to make all kinds of statistical analysis, analyze data and make future predictions. What people need to do is to be able to interpret this data. The most important indicator of eliminating ignorance and being literate will now be the ability to apply theoretical knowledge to numerical data (perform data analysis) and reveal future trends from these data. Students will need to be trained extensively on big data and improved analysis skills.

7. Exam types will change completely. Now the Question and Answer application will be abandoned. Students will get rid of memorizing topics until the very end and forgetting the day after the exam. Throughout the learning process, their knowledge will be measured and tested with their ability to apply the information in the field and the performance of the projects they work with. In short, the concept of situation assesment instead of the exam will be on the agenda.

8. Students will be more and more involved in creating their course content. Up-to-date, modern and realistic content can be reached with the content prepared by students and teachers. The most important input of the learning programs will be the criticism of the students regarding the content.

9. Using a mentor will be more important every day. The learning processes of the students will be more independent, so using a mentor will make an important contribution to the student's success. Since education will be carried out remotely, teachers and educational institutions will be more important for academic performance. Virtual mentors will be actively used in the world of Education 4.0.

10. Access to all courses and lectures on the Internet will be possible. Web interfaces and access systems will be implemented for students to learn in the most appropriate way.

11. New technologies are developing that will affect the technologies of all time. These technologies will also be a part of the education systems. Education 4.0 will use these technologies both in the creation of education systems and tools and will make it a part of the education program for students to learn. It is anticipated that 14 technologies will be actively on the agenda with the General Lines. Some of these have already been raised:

1.Big data analysis

2. Implanted technologies

3. Cloud Computing

4. Mobile internet

5. Internet of Things

6. Information automation

7. Advanced robot technologies

8. Autonomous devices

9. New generation genes (Gene science)

10. Energy storage and renewable energy

11. 3D printing

12. Advanced and intelligent materials

13. Unmanned vehicles

14. Bitcoin and Blockchain technologies (Smart contract creation, information security, privacy technology)

Based on these statements, there will be changes in the education strategies of universities. Among them it is possible to count the following:

• Transformation into educational environments where Digital Culture is becoming widespread

• Launching innovation-led education programs

• Implementation of new business models and multidisciplinary education programs (realization of faculty structuring accordingly)

• Education programs based on innovation cycle, to keep up with the change in accreditation processes, to give up fixed training programs

• Use of new educational technologies and approaches, such as virtual simulation systems (integration of augmented reality with the real world) and training programs.

• Application of distance education technologies and new computer-based learning processes

• Commissioning of personalized educational environments

4. Conclusion

It is not only possible for social transformations to walk healthy through industrial and technological transformations. In parallel, it is essential to carry out change and transformation systematically in areas such as education and health that will guide the basic dynamism of the society. It is inevitable that the subjects form the cornerstones of the education system. Countries that fail to do this will not be able to obtain new opportunities. On the contrary, it would be inevitable to monitor the countries that have it and to be exposed to their guidance. It will be necessary to follow the countries that have these opportunities and act under their guidance. While focusing on new technologies to be applied in education systems, internet technology that enables machines to communicate, unmanned factories, 3D printers, additive manufacturing, on the other hand, long-term and analytical thinking, human capital management, focusing ability, and the best alternatives of opportunities are taken into consideration. evaluation will be of great importance. Considering the following characteristics of the future world, it will be clear that the concept of Education 4.0 explained above is also a very strategic issue for countries:

• Use of individual digital armies and technology police

• Software, autonomous police and armies on duty

• Technical infrastructure & energy - wars targeting food are inevitable

• Firms' direction in global politics

• Effective use of autonomous quality control and filtering systems for air, water and plants

• Autonomous health, surgical and artificial organs are among the indispensable components of life.

• Improving the quality of life with cyber-assisted intelligence and memory, additional limbs

• The return of augmented reality to routine life as a result of virtual and reality mixing

• As simulation holidays and less speech become a part of human life, this list can actually be increased.

Societies need to determine a road map in which they can experience the inevitable digital transformation in the most convenient way for them and reorganize their education systems accordingly. This is very important in order to eliminate anxiety such as unemployment and technological slavery caused by the arrival of robots. Because the fear of people becoming unemployed when machines came out with the understanding of education 4.0, it will be seen that there is no place for unemployment and other fears in industry 4.0 society. Innovative brains will always be needed to develop new systems. It will also be possible to develop systems that will prevent all kinds of bad thoughts. However, in societies that cannot achieve a healthy educational transformation, these fears will leave permanent marks and their compensation will not be as easy as before.

As a result, instead of waiting for the renewal and adaptation process of the current education system,a faster-moving alternative needs to be created. Made in projections, people related to Industry 4.0 have an in-depth expertise in a single subject. is not seen. Instead, it is a group that adapts more easily to emerging technologies and generations that can use it immediately are desired. Such going in-depth to the current educational system his area of expertise will also be intact.

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Destek ve teşekkür

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