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Research Article

The Role of Educators and Learners at the Colleges and Universities in the of Era of Industry 4.0

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ABSTRACT

This paper analyzes the roles of educators and learners in the context of Industry 4.0, especially in college and university education, when advanced technologies such as Artificial Intelligence (AI), Big Data and Internet of Things (IoT) are deeply impacting teaching and learning methods. The paper aims to clarify the transformation of educators from the role of imparting knowledge to the role of guides, supporting learners to develop self-learning skills, creative thinking and digital competence. At the same time, the paper also examines how learners are increasingly at the center of the learning process, actively using digital tools, collaborating in virtual environments, and developing skills needed for the modern labor market. The paper uses a qualitative approach, including a literature review, an analysis of modern educational models, and an assessment of the practical application of technology in teaching. In addition, the paper also reviews research on digital education, online learning, and AI-based teaching to provide a comprehensive view of the impact of Industry 4.0 on higher education. The results show that educators need to enhance digital competencies, integrate AI-based data analysis, and apply personalized teaching methods to optimize learner engagement. Meanwhile, learners need to cultivate adaptability, develop solid digital skills and maintain lifelong learning to meet the demands of the ever-changing digital environment. While Industry 4.0 offers many opportunities, such as expanding access to global knowledge, personalizing learning pathways and applying data-driven teaching methods, it also poses many challenges, including digital divide, cybersecurity risks and the decline of human interaction in traditional education. Addressing these issues requires a balanced approach that leverages technology while maintaining human-centered educational values.

Keywords: Industry 4.0, roles of educators and learners, digital competence, personalized learning, AI in education

1. INTRODUCTION

Industry 4.0, also known as the Fourth Industrial Revolution, marks the convergence of advanced technologies such as Artificial Intelligence (AI), Big Data, and the Internet of Things (IoT). These technological advancements are profoundly transforming how we live, work, and learn. In education, Industry 4.0 presents new opportunities for innovative teaching and learning methods while also introducing challenges related to adaptation and innovation, particularly in colleges and universities.

Education plays a pivotal role in training high-quality human resources to meet the demands of modern society. In the context of Industry 4.0, the relationship between educators and learners is shifting from a traditional model to one that emphasizes collaboration and interaction. Educators are no longer just transmitters of knowledge; they now act as facilitators who guide learners in developing independent learning skills and creative thinking. Meanwhile, learners are becoming more proactive, engaging actively in the learning process, and acquiring essential skills for the future.

This paper aims to analyze the evolving roles of educators and learners in colleges and universities amid the technological transformation of Industry 4.0. Additionally, it discusses the challenges and opportunities that the digital age brings to modern education.

2. MATERIALS AND METHODS

This paper adopts a qualitative research methodology to explore the evolving roles of educators and learners in the context of Industry 4.0. The primary method employed is a comprehensive literature review, focusing on recent academic publications,

policy reports, and global case studies related to digital education, artificial intelligence in teaching, and competency-based learning models. Key theoretical frameworks were drawn from the works of Friedman (2016), Schwab (2017), Harasim (2017), and others, providing a foundation for analyzing the transformation of educational roles in the digital age.

In addition to the literature review, the paper includes content analysis of current educational practices in higher education institutions in Vietnam, particularly at Ho Chi Minh City Industry and Trade College. This analysis involved reviewing institutional reports, curriculum updates, and teacher training programs to assess how emerging technologies are being integrated into pedagogy. Furthermore, the paper synthesizes insights from global educational platforms and digital tools, such as learning management systems (e.g., Moodle, Canvas), online resources (e.g., Coursera, Khan Academy), and AI-supported learning environments, to provide a holistic understanding of the challenges and opportunities faced by educators and learners.

3. RESULTS AND DISCUSSIONS

1. The role of educators

(1) Evolving from knowledge providers to learning facilitators

In the context of Industry 4.0, educators are no longer the sole source of knowledge transmission; instead, they act as facilitators who support learners in discovering knowledge independently (Friedman, 2016). This shift requires a fundamental change in mindset and teaching methodologies. Lecturers must leverage digital tools such as teaching software and online learning platforms to create interactive, engaging, and personalized learning experiences.

For example, instead of traditional linear lectures, educators can use tools like Kahoot! or Nearpod to create interactive learning environments where students actively participate in real-time activities. This approach not only enhances learning engagement but also fosters critical thinking and problem-solving skills. Personalized teaching is becoming increasingly essential, allowing educators to tailor content based on individual students' proficiency levels and learning paces to optimize educational outcomes.

Integrating modern technologies in teaching

According to Schwab (2017), modern technology has significant potential to enhance educational quality. The integration of AI, Big Data, and IoT enriches teaching methods while also optimizing classroom management and student performance assessment.

For instance, AI-powered intelligent learning systems can serve as virtual tutors, providing personalized study recommendations based on students' needs and abilities. Big Data analytics allows educators to analyze student learning patterns, identify strengths and weaknesses, and adjust instructional strategies accordingly. Additionally, Virtual Reality (VR) and Augmented Reality (AR) create immersive learning experiences, enabling students to conduct virtual experiments or explore historical sites in an interactive manner. These technologies not only deepen understanding but also stimulate imagination and creativity.

Developing digital competencies

In the digital age, educators must not only possess subject-matter expertise but also master digital competencies. Harasim (2017) emphasizes the increasing prevalence of teacher training programs focusing on learning management systems (e.g., Moodle, Canvas), data analytics, and digital content creation.

Developing digital competencies enhances teaching effectiveness and contributes to the digital transformation of education. Educators serve as a bridge for students to access and apply technology, equipping them with essential skills for the future. For example, lecturers proficient in programming or data analysis can guide students in developing logical thinking and information-processing capabilities.

Inspiring and motivating learners

The role of educators extends beyond knowledge dissemination to inspiring and motivating learners to achieve holistic development. Lifelong learning has become a central focus, especially in an era where technological advancements continuously demand new skills (Schwab, 2017).

Educators must encourage creativity and problem-solving skills by designing real-world projects where students apply knowledge to tackle social or environmental issues (Harasim, 2017). For instance, group assignments involving data analysis for social research or sustainability initiatives enable students to grasp not only theoretical concepts but also their real-world implications.

By fostering an environment of inspiration and guidance, educators play a crucial role in preparing learners to embrace the challenges and opportunities of modern society.

2. The role of learners

Being active in learning

In the Industry 4.0 era, learners must transition from passive knowledge recipients to active participants who personalize their learning journeys. Online platforms like Coursera, Udemy, and Khan Academy provide learners with access to vast knowledge resources from global experts (Harasim, 2017).

Active learning involves setting learning objectives, evaluating progress, and adjusting learning strategies to enhance independence, creativity, and time management skills -key competencies for success in the digital economy.

Developing digital skills

Learners must acquire digital competencies, including proficiency in educational software, data analysis, and technology-based problem-solving. For example, programming skills enhance learners' understanding of technology, while learning management systems like Moodle or Blackboard facilitate effective academic project management (Friedman, 2016).

Moreover, Big Data literacy enables learners to analyze and leverage information for informed decision-making, enhancing their competitiveness in the global job market.

Fostering creative and innovative thinking

Technology empowers learners to become content creators and innovators, contributing new ideas and solutions. Engaging in real-world projects, such as developing technological products or addressing societal challenges, fosters practical application of knowledge (Schwab, 2017).

Additionally, practicing problem-solving skills in technology-driven contexts cultivates critical thinking and creativity, laying the foundation for adaptability and growth in an ever-changing environment.

Cultivating a lifelong learning mindset

In a rapidly evolving technological landscape, lifelong learning is essential for continuous skill development. Learners must cultivate self-learning capabilities to keep up with emerging trends and career demands.

Harasim (2017) highlights online courses, workshops, and short-term training programs in technology and soft skills as effective ways for learners to stay relevant in the digital age. Lifelong learning is not only a personal responsibility but also a driving force for sustainable societal development.

3. Challenges for educators and learners in the era of industry 4.0

Digital divide among educators and learners

Anderson and Dron (2011) highlight that transitioning to technology-based learning requires educators and learners to adapt quickly to new tools and methodologies.

One of the greatest challenges of Industry 4.0 is the disparity in access to and proficiency with technology among educators and learners. According to Schwab (2017), older educators or those without formal training in digital skills often struggle to integrate technology into teaching. Meanwhile, students, particularly those from rural areas or low-income backgrounds, may lack access to essential devices such as computers, smartphones, or stable internet connections.

Over-reliance on technology and loss of direct interaction

The increasing use of technology in education sometimes leads to excessive dependence, disrupting the balance between online learning and face-to-face interaction. Harasim (2017) argues that the overuse of online learning platforms may reduce social engagement in classrooms, weakening communication skills and teamwork abilities. Additionally, without proper guidance, students may become distracted by social media or online games, negatively impacting their academic performance.

4. Opportunities from industry 4.0

Expanding access to global knowledge

Industry 4.0 offers unprecedented opportunities for global knowledge access. With open learning platforms such as edX, Khan Academy, and Coursera, students worldwide can access high-quality courses from prestigious universities like Harvard, MIT, and Stanford (Friedman, 2016). This technological advancement not only eliminates geographical barriers but also provides equal learning opportunities for disadvantaged groups, such as people with disabilities or students from remote areas.

Picciano (2017) argues that online technology has erased geographical boundaries in education, allowing individuals to learn from anywhere in the world.

Enhancing teaching and learning effectiveness

The integration of AI and Big Data enables personalized learning experiences, allowing educators to identify students' individual needs and tailor instruction accordingly (Schwab, 2017). For example, AI can develop customized learning paths, providing relevant resources and study recommendations based on students' progress. Moreover, Virtual Reality (VR) and Augmented Reality (AR) create immersive environments where learners can explore complex concepts such as atomic structures, chemical reactions, or historical events.

Additionally, UNESCO (2020) highlights that AI not only enhances personalized learning but also supports educators in making data-driven pedagogical decisions.

5. Solutions for enhancing the roles of educators and learners in the era of 4.0

5.1. For educators

Strengthening digital skills training

To meet the demands of Industry 4.0, educators must receive training in essential digital skills. These training programs should not only focus on using AI and Big Data but also on integrating these technologies into teaching practices.

For example, in Vietnam, the Ministry of Education and Training has introduced courses on using software such as Microsoft Teams, Google Classroom, and digital content creation tools like Canva and Powtoon. UNESCO (2020) emphasizes that enhancing digital competencies among educators is a key factor in promoting digital transformation in education. This effort not only improves teaching quality but also facilitates better knowledge access for students.

Collaborating with technology and education organizations

Collaboration between educational institutions and technology companies helps educators access advanced tools and rich learning resources. For instance, the Microsoft Educator Center has supported millions of teachers worldwide in developing digital skills. In Vietnam, FPT Education has partnered with many schools to implement smart classrooms and digitalized learning materials. Selwyn (2016) highlights that partnerships with technology organizations not only enhance teaching capabilities but also increase the practicality of education in the globalized era.

5.2. For learners

Encouraging learning through digital platforms

Students should be encouraged to utilize online learning platforms such as Coursera, edX, and Khan Academy to access global knowledge and develop independent learning skills. For instance, in the United States, Khan Academy has helped students prepare for major standardized tests such as the SAT. In Vietnam, e-learning platforms like OLM (Online Learning Management) and Violet have become essential tools for students during online learning periods caused by the COVID-19 pandemic.

Friedman (2016) asserts that digital learning fosters flexibility and personalized education, catering to individual student needs more effectively.

Developing soft skills alongside digital skills

While digital skills are essential, soft skills such as communication, teamwork, and creativity are equally important for holistic development. In Singapore, students are encouraged to participate in social projects where they use technology to address real-world issues, such as developing apps to assist individuals with disabilities.

Schwab (2017) emphasizes that soft skills help students adapt more effectively to the evolving work environment and society.

5.3. Additional solutions for both educators and learners

Developing blended learning communities

Blended learning environments, where educators and students engage in both online and in-person sessions, offer an effective solution. For instance, teachers can guide students in using AI-powered tools like ChatGPT for academic support while fostering discussions through online forums.

Selwyn (2016) suggests that blended learning communities not only enhance teaching effectiveness but also strengthen connections between educators and students in a dynamic, interactive learning environment.

Utilizing learning analytics

Learning analytics enables educators to use Big Data to personalize student learning paths. For example, in South Korea, AI-powered systems track student progress and provide tailored study recommendations.

Anderson and Dron (2011) argue that learning analytics not only optimizes learning outcomes but also assists educators in refining their teaching methodologies

4. CONCLUSION

In the era of Industry 4.0, the roles of educators and learners in colleges and universities have undergone a fundamental transformation. Educators are no longer mere knowledge transmitters but rather facilitators who guide, support, and empower learners to develop self-learning skills, creative thinking, and digital literacy. Conversely, learners have transitioned from passive recipients to active participants who take charge of their learning journey and acquire essential digital and soft skills.

Adapting to this new era requires a fundamental shift in educational approaches, particularly in higher education. This transformation not only enhances teaching and learning quality but also ensures that education continues to play a crucial role in developing a skilled workforce that meets the demands of modern society. Strengthening digital skills training for educators, promoting digital learning for students, and fostering essential soft skills are key strategies for navigating this transformation effectively.

As we move forward into an increasingly digitalized world, education must continue to innovate and evolve to drive sustainable development. The synergy between human potential and technology, coupled with creative educational solutions, will remain the cornerstone of building a comprehensive, advanced, and future-ready education system..

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