INTEGRATING ACTIVE LEARNING STRATEGIES WITH TECHNOLOGY TO ENHANCE TEACHING AND LEARNING IN THE AGE OF INDUSTRY 4.0

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Abstract: The advent of Industry 4.0 has brought about significant changes in education. Traditional teaching methods are becoming obsolete as they fail to keep pace with the evolving needs of society. Student-centered active learning, a pedagogical approach that prioritizes learner engagement, has emerged as a promising solution. This article explores how the integration of student-centered active learning and technology can revolutionize teaching and learning practices in the age of Industry 4.0, ultimately benefiting both teachers and students.

Key words: *Teaching method, Active learning, Student-centered, Technology integration, Industry 4.0 era*

1. Problem statement

In the renovation period, the Communist Party of Vietnam has consistently affirmed that education and training are top national policies; investment in education is an investment in development, and education must be prioritized and precede other fields. To meet the urgent demands of the practical situation, the Party's 8th Central Committee issued Resolution No. 29-NQ/TW, dated November 4, 2013, on fundamentally and comprehensively reforming education and training to meet the requirements of industrialization, and modernization in the context of a socialist-oriented market economy, and international integration. Based on this, the reform of higher education in Vietnam has been carried out with the goal of creating a fundamental and strong transformation in the quality and effectiveness of education and training to better serve the cause of building and defending the country and the learning needs of all people. The resolution also sets a target of achieving advanced regional standards in higher education by 2030.

The need to reform higher education in Vietnam is determined by the country's development situation and the general trends of the world. The requirements for the development of a socialist-oriented market economy and the need to restructure the economy towards quality, efficiency, and high competitiveness require higher education to meet the learning needs of society and rapidly contribute to the training of high-quality human resources.

Vietnam has been an active and proactive participant in international integration, recognizing the objective nature of this process in global development. After overcoming the socio-economic crisis in 1996, Vietnam gradually shifted from economic integration to comprehensive and deep international integration in all fields. To cultivate global citizens capable of competing in the global labor market, it is imperative to reform higher education while preserving the unique characteristics of domestic higher education and aligning with international standards. Thus, Vietnam's intrinsic development needs demand a significant transformation of higher education.

Furthermore, the need to reform higher education, particularly teaching methods, is driven by the Fourth Industrial Revolution. Under the impact of this revolution, specialized knowledge becomes obsolete rapidly, new knowledge and scientific information are generated exponentially, and can be stored in very compact media. In a digital environment, higher education will undergo significant changes, from educational philosophy and objectives to the role of teachers, from teaching methods to the central position of learners... (Assoc. Prof. Dr. Tran Thi Minh Tuyet, 2022) Therefore, the reform of higher education in general and teaching methods in particular is a global trend, and Vietnam cannot be an exception. This is a fierce competition for the quality of human resources, which is a decisive factor for development opportunities.

2. The necessity of integrating active learning strategies with technology in instruction

The goal of education in this new phase is to innovate the curriculum in terms of content and teaching methods, aiming to transform learning and empower students to become active and creative learners. A priority is to reform the current passive teaching methods. Professor Tran Hong Quan once asserted, "*To educate individuals to become independent, dynamic, and creative, educational methods must focus on stimulating, cultivating, and developing the ability to think and act independently, dynamically, and creatively, right in their studies and work at school*" (Communist Party of Vietnam, 2013). Methods that serve these functions in education belong to the system of active learning methods centered on the learner. This is a system of methods that can directly address the basic requirements of the goals in the renovation period. The viewpoint of "*teaching to activate learners' learning activities, with the learner at the center of the learning process*" or simply "*active learning centered on the learner*" is a progressive idea with some experimental models that have appeared for decades in the history of education. Some Western European and Southeast Asian countries have truly embraced this idea in all teaching activities.

An effective teaching method is one that establishes a close connection between students and lecturers, not limited to lecturers transmitting knowledge but also includes stimulating students' curiosity and exploration through the study and research of scientific and practical sources of knowledge. The teaching method requires the teacher to have the ability to organize teaching suitable for the environment and create interest for students. Thus, the teaching method is not simply the passive transmission of information, but a process of learning and interaction, developing learners' skills and creative thinking.

The learner-centered approach, also known as active learning, is an educational approach where learners take an active role in their learning process. Instead of passively listening to lectures and taking notes, learners engage in discussions, research, practice, and apply knowledge to real-world situations. This helps them develop self-learning skills, teamwork abilities, and critical thinking. Applying the learner-centered approach has significant implications for modern education. First, it helps learners feel more interested and passionate about learning. When they are actively involved in the learning process, they are more likely to absorb knowledge and retain it for longer. Moreover, this approach also helps learners develop soft skills necessary for life and work, such as communication, leadership, and time management. Finally, a learner-centered approach contributes to improving the quality of education and meeting the demands of an increasingly demanding labor market.

With traditional education, students primarily receive knowledge from textbooks, curricula, and lectures, but today, a diverse range of knowledge is available online through internet connections. We can find millions of search results with just a click. Technology provides instant access to knowledge, from general knowledge to academic knowledge, which can be easily searched for and applied in teaching processes through library search systems, search engines like Google Search, Google Scholars, Google Books, academic databases like Scopus, and academic social networks like Academia, ResearchGate, etc. In modern education, teachers are the ones who transmit basic, core knowledge and act as guides for learners to explore abundant and multidimensional information from the Internet. This plays a significant role in educational reform, helping to personalize learning, cultivate a proactive learning spirit, and combine learning with practice to maximize creativity.

Thus, learner-centered active learning is based on the principle of "*teachers helping learners to discover on the basis of self-motivation and being allowed to think, debate, and propose solutions independently*". Lecturers become guides, students become explorers, implementers, and even "*researchers*". Through this teaching method, even while still sitting in university classrooms, learners are equipped with the necessary knowledge to

solve problems they will encounter in social life using their own abilities. Through learning experiences, students not only acquire knowledge but also cultivate and develop their personality, becoming independent, proactive, creative, and capable of problem-solving and self-learning individuals, meeting the educational goals of the renovation period.

With the application of new technologies in education today, learners can connect with diverse sources of information in various formats and languages, all beyond the school campus. Therefore, the requirement for lecturers is to continuously update, learn, and apply new technologies that are changing daily to meet the needs of learners. On the technology platform, teachers play the role of guiding, transmitting, and connecting learners with data and learning materials; Lecturers are digital teachers who must master technology to be ready to support learners in accessing, accepting, and using technology, inspiring learners to be able to use technology, and exploit this invaluable resource to the fullest. Today, the use of learning support apps as "virtual teachers", the use of artificial intelligence (AI), big data, Internet of Things (IoT), machine learning, deep learning, and teaching robots is becoming increasingly popular. With the support of these "virtual experts", learners seem to become more interested in learning and research, ready to try and register to use these intelligent support apps (M.A. Nguyen Thi Bich Nguyet, 2021).

Technology promotes an open education, helping people access multidimensional information, shorten distances, narrow all spaces, and optimize time (M.A. Nguyen Thi Bich Nguyet, 2021). From there, people develop faster in terms of knowledge, awareness, and thinking. Open education programs help people exchange and search for knowledge effectively. Modern learning and teaching require approaching an issue from many different sources of information, from many different perspectives, thereby giving learners a comprehensive view, an opportunity to deepen their knowledge, and find the essence, the root cause of the problem, contributing to improving knowledge, changing thinking, and indirectly helping to improve learning and research effectiveness. Along with open education are open educational resources, helping learners and teachers connect with knowledge effectively wherever and whenever they are. Open educational resources are an essential development trend of modern education.

3. Benefits and obstacles of integrating active learning strategies with technology in instruction during the Fourth Industrial Revolution

3.1. Benefits

At a workshop on digital transformation in education and training held in early December 2020, Minister of Education and Training Phung Xuan Nha affirmed: "*Digital*

transformation has been identified by the sector as a breakthrough and an important task that needs to be focused on in the coming years of the education and training sector" (Ministry of Education and Training, 2020).

In the 4.0 era, technology has become an indispensable part of education. The use of technological tools such as computers, tablets, smartphones, and online learning software helps learners easily access knowledge anytime, anywhere. In addition, online learning platforms also allow learners to participate in distance learning courses, creating conditions for them to self-study and research at their own pace. Many technology applications can be used to support the "*learner-centered*" approach. For example, software like Kahoot or Quizizz allows learners to participate in gamified learning, fostering excitement and competition in the classroom. Tools like Google Classroom or Microsoft Teams enable teachers to effortlessly organize online classes, share materials, and interact with learners effectively. Technology not only enhances teaching quality but also creates an interactive learning environment.

With the dedicated efforts of digital learners and educators, digital learning materials are rapidly developing as we dive deeper into the digital realm. Educational resources, content, knowledge, and skills are being digitized comprehensively, from design, production, publication, to storage, generating massive amounts of diverse, rich open educational resources. The digitalization and storage of these resources enable learners to easily access, search for information, share, and contribute ideas. Digital learning materials are gradually becoming a valuable goal and tool in the educational process.

Learners' interactions with artificial intelligence (AI) products, educational robots, facial recognition, biometrics, and emotion recognition technologies create new, diverse, and more effective opportunities for personalized learning. In specialized subjects, applications of virtual reality (VR), augmented reality (AR), mixed reality (MR), and computer-generated reality (CR) provide opportunities for interactions in physical/virtual, multidimensional spaces, enhancing access to and processing of information; expanding learning spaces and environments; and developing creative thinking and problem-solving skills for both learners and educators, thereby continuously improving the quality of teaching and learning.

With the convenience of learning anytime, anywhere, technology empowers learners to choose subjects that align with their interests, talents, and preferences, thereby fostering individual strengths. This directly contributes to the development of talents. The availability of abundant open educational resources facilitates easy access to knowledge, indirectly

encouraging individuals to proactively acquire new knowledge, fill knowledge gaps, and stimulate exploration, discovery, and creativity.

The current trend in education and training is a shift towards a more practical and career-oriented approach, with a growing emphasis on combining theory with practice and aligning education with industry needs. This trend is evident in universities worldwide, including Vietnam (Ministry of Education and Training, 2023). By providing students with access to technology applications from the early stages of their university education, institutions are equipping them with the practical skills and knowledge required to thrive in today's technology-driven workforce. In fact, beyond technical skills, students are also developing soft skills, critical thinking, independent research abilities, and the ability to collaborate effectively using technology, enabling them to meet the pressing demands of professional practice. Consequently, the integration of technology into education directly contributes to the development of a high-quality workforce for businesses, fostering opportunities for labor collaboration. This collaboration between educational institutions, businesses, and learners creates a mutually beneficial ecosystem.

3.2. Obstacles

There are numerous shortcomings in the educational system at all levels. Notable weaknesses include an excessive emphasis on academic achievements, unrealistic evaluation of results; a curriculum that is heavy on theory and light on practice; a rigid educational system that lacks connectivity and fails to meet the demands of national development and international integration; a disconnect between training, utilization, and the needs of the labor market; a teaching force with many shortcomings in terms of quantity and quality; many financial policies and mechanisms that are still average and spread out; and inadequate, outdated, and substandard physical facilities.

Firstly, in terms of administrative management, the faculty team is responsible for managing, organizing classes for students, as well as carrying out most of the communication, monitoring, management and support activities for students outside the classroom. Meanwhile, teaching and learning activities, as well as assessment, do not require much use of information technology for both lecturers and students. Some evidence includes: the curricula currently used in the Faculty, including practical curricula, do not have any online support software; or assessment activities are almost exclusively conducted in a traditional manner in the classroom... Moreover, a significant proportion of lecturers are not really aware of using technology to support students' expertise outside the classroom.

Therefore, lecturers hardly use the ability to apply technology in managing and organizing classes, as well as the ability to apply technology in assessing students' learning outcomes.

Secondly, the rapid development of educational technology in the 4.0 era also leads to the risk of lagging behind in the application of technology in teaching among lecturers. Currently, technology contributes to creating a diversity of teaching methods and assessment methods. This is the emergence and development of many training methods using technology such as: E-learning, U-learning, Mobile learning, CD-Rom courses (all of which can be applied to teaching), the prevalence of synchronous or asynchronous online teaching methods (Mai Van Hung, 2020). In particular, the trend of combining learner-centered teaching methods with the application of technology (blended learning) with teaching models such as Rotation model (including Station Rotation, Lab Rotation, Flipped Classroom, and Individual Rotation); Flex model; A La Carte model; and Enriched Virtual model. In addition, technology has also been widely applied in testing, with the emergence of online multiple-choice testing software, software for creating subjective questions from a question bank, software for mixing test papers, etc. (Mai Van Hung, 2020).

Thirdly, the development of lecturers' technological capabilities must go hand in hand with the development of the Faculty's technological infrastructure, as a modern and synchronized technological infrastructure is a solid foundation for all activities and applications related to technology. However, it can be seen that the current technological infrastructure has not been given priority in investment and development to be able to widely deploy the application of technology in management, teaching and learning, and assessment in a synchronized manner.

Fourthly, in recent years, only a few staff and lecturers have participated in training courses on the application of technology in management and teaching. For various reasons, these courses have not been organized on a large scale and regularly. Moreover, considering the specific field of expertise, the staff and lecturers have hardly been trained or developed the ability to use technology in foreign language teaching.

4. Solutions to address difficulties in combining active learning and technology in instruction

Based on the above situation, to enhance the capacity to apply technology in teaching, based on the perspective that human capacity is largely due to work and practice, the author has the following recommendations:

Firstly, it is necessary to establish regulations and policies to encourage lecturers to use technology in teaching. Besides building a roadmap for the transition from traditional

teaching methods to blended learning methods, and developing policies oriented towards promoting lecturers' ability to exploit and apply technology to improve the quality of classroom lectures, the institution should also have policies to encourage lecturers to use technology applications to manage and support students' expertise outside the classroom.

Secondly, invest in building a modern and synchronized technological infrastructure to serve university management and teaching. Focus on building a technology-friendly learning environment: Classrooms with network connections, additional labs, using curricula with online support software, implementing online assessment software, and investing in additional technological equipment to support teaching and learning. Train students in self-learning skills, applying technology creatively and innovatively in the learning process.

Thirdly, regularly organize training courses on the application of technology in teaching for both lecturers and students. To ensure the practical and effective nature of these training courses, it is necessary to first conduct a survey of lecturers' knowledge and skills in using technology, focusing on the ability to apply technology in teaching. Based on the survey results, develop a training plan for different groups of participants. In addition to basic knowledge and skills in applying technology, lecturers are in great need of up-to-date information on new trends in applying technology in university teaching, as well as being trained in using these skills.

Fourthly, the institution should apply basic technology skills standards to all lecturer positions. Only recruit new lecturers who have met the prescribed information technology skills standards.

5. Conclusion

The learner-centered approach is one of the most effective teaching methods in the 4.0 technology era. Applying this approach not only helps learners maximize their potential but also creates a positive and creative learning environment. However, to successfully apply this method, many challenges must be overcome, from changing teaching mindset to assessing learning outcomes. Only when teachers and learners work together can the learner-centered approach unleash its full potential in improving education quality.

The 4.0 industrial revolution has had a significant impact on teaching and learning in general and higher education in particular, contributing to diversifying and improving the effectiveness of transferring knowledge and foreign language skills through the application of technological achievements. The ability of teachers to apply technology plays an increasingly important role in improving training quality.

Although there have been many pioneering lecturers leading the way in innovating not only teaching methods but also assessment methods, the reality is that the results are still limited due to inadequate facilities. And especially, there is a lack of synchronization in certain criteria to apply to all lecturers in innovating and combining methods in the reform period. In such a context, with the current situation, lecturers need to be focused on developing the ability to apply technology in teaching, as well as needing favorable conditions and environments to promote these abilities.

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