Journal of Namibian Studies, 34(2023): 4972–4986 ISSN: 2197-5523 (online)

Management of input factors for engineering and technology students to meet the output standards approaching CDIO at universities in the Mekong Delta, Vietnam: current situation and solutions

Nguyen Minh Sang[1]

Abstract

The management of the learning activities of engineering and technology students to meet the CDIO-approaching output standards is the key to improving the training quality of universities, especially the quality of education highly qualified for Vietnamese engineers, ready to meet the needs of domestic and international enterprises. The article analyzes and evaluates the current situation of managing input factors of student learning activities in engineering and technology to meet the output standards approaching CDIO on that basis, proposing solutions to improve efficiency management results of the learning activities of students majoring in engineering and technology to meet the output standards approaching CDIO to meet the requirements of society in the digital era.

KEYWORDS: Output standards approaching CDIO, students, Mekong Delta, Vietnam.

1. INTRODUCTION

The 4.0 revolution is creating profound and great impacts on many fields of economy, politics, environment, society, and culture, and education is no exception. The world today is going through unprecedented changes. The fourth industrial revolution, also known as the 4.0 industry, creates development at an exponential rate, from factors such as knowledge, scientific and technical progress, and labor productivity to the amount of wealth created and the change in the structure of the administrative and institutional system. Through that, life has had and will continue to have a strong impact on all aspects of human life and humanity in the 21st century. It can be said that when the scientific and technological revolution began, Marx predicted genius about "reaching a certain level of development" and then "common social knowledge," or science, as we usually say, turned into

[1] Vinh Long University of Technology Education, Viet Nam, sangnm@vlute.edu.vn

a "direct productive force" [1]. C. Marx's argument is increasingly proven by history to be methodologically valid.

Resolution No. 29 of the Eighth Conference of the Central Executive Committee of the Communist Party of Vietnam, term XI, on "comprehensive reform of education and training, highlighting the task of perfecting the national education system in the direction of a higher education system "Open education, lifelong learning, and building a learning society [2] has great significance and has blown a new wind in the socio-political life of Vietnam today. It poses a series of urgent tasks that need to be reformed in education and training that society is interested in. In such tasks as focusing on training highly qualified human resources and fostering talents as a resource for national development. Sharing the same view, the socio-economic development strategy for the period 2021–2030 identifies the need to maximize the human factor and consider people as the center, the subject, the most important resource, and the goal of national development. Conclusion No. 51-KL/TW of the Central Committee: "fundamentally and comprehensively renovating education and training to meet the requirements of industrialization and modernization in the context of a socially oriented market economy, internationalism, and integration". Inheriting the spirit of the previous congresses, the 13th Congress, the Communist Party of Vietnam emphasized: "Education and training, together with science and technology, are the leading national policy and the key driving force for developing the country. Creating breakthroughs in fundamental and comprehensive innovation in education and training, science, and technology; developing high-quality human resources; attracting and appreciating talents; vigorously applying the achievements of the revolution in the fourth industry [4].

Higher education is located in the national education system and has its own special position and specificity. The mission of higher education is to train and provide high-quality human resources for society. In the era of globalization and industrial revolution 4.0, it is necessary to train capable, independent, creative, flexible, and sensitive people. Facing the vortex of the industrial revolution 4.0, there are only two options: either do nothing or boldly change, courageously innovate to integrate with the world's progress, and define the world training mission young system so as not to be eliminated in the industrial revolution 4.0.

After nearly 40 years of renovation, Vietnam has been integrating more and more deeply with the world and revitalizing the education system in the country, which is facing extremely urgent tasks. During his lifetime, President Ho Chi Minh always wanted our country to be rich and strong, our people to be wise, and our society to be a highly cultural society. To do so, the main thing is that society must train

many talented people with strong political will to participate in national construction. The education sector also needs to change to catch up with the development of society in the digital era, especially higher education, which is facing the requirements of a revolution to overcome the recession, make breakthroughs, and carry out the education revival, considering it the key to national rejuvenation. In countless situations, even with the syndromes and paradoxes of higher education in Vietnam over the years, it is impossible not to talk about the uncertainties in teaching and learning in higher education in Vietnam today.

The whole Mekong Delta region has 17 universities (with 6 non-public schools) mainly providing multi-disciplinary training in engineering, business, administration, agriculture, tourism, environment, etc., and human resources with knowledge, skills, and capacity to meet the requirements of the increasingly large labor market in the context of the rapidly changing, unpredictable, and highly demanding socio-economic situation today. Higher education in the Mekong Delta is now trying to gradually move from assessing learners' knowledge to assessing their quality and working capacity. It can be seen that, before the impact of the 4.0 revolution, the revolution with the foundation of digitization and the system of real and virtual connections—smart schools with robots, things connected to the internet, interactive virtual reality, super-cloud computing data, learning applications, exchange forums, program structure, and textbooks—had not been timely updated with new problems arising in social practice. With such a training picture, we can see that there is still a gap in the training of high-quality human resources in the region. In order to meet the needs of learners, society, and domestic and foreign labor markets, higher education institutions must improve training quality, ensure the development of quality and self-study capacity, and help students develop self-study skills. Learning to enrich themselves with knowledge, creativity, professional ethics, and scientific research capacity, learners not only learn knowledge but, more importantly, practice skills and actions related to that knowledge here and there, leading to brand assessment, reputation, and quality of higher education institutions. Therefore, the management of the input factors of the learning activities of engineering and technology students meets the output standards according to the English name approach Conceive, Design, Implement, and Operate (CDIO) of universities. Studying in the Mekong Delta, Vietnam, is an urgent matter that cannot be delayed.

2. METHODS

The article uses methods of document collection, analysis, synthesis, and comparison of theoretical documents, undertakings, and policies of the Party, State, ministries, branches, and central and local levels; domestic and foreign research projects with content related to the management of input factors of learning activities for engineering and technology students to meet the output standards approaching CDIO of universities in the Dong Nai region by the Mekong River, Vietnam.

In addition, the article also uses some other methods: Survey method; Interview method; Observation method; Method of summarizing practice; Experimental method of pedagogy; Product research methods; Professional solution. In particular, using mathematical statistical methods to process survey results, analyze research results, and evaluate the reliability of survey data using Stata, SPSS 25, and MS software Excel, processing one-way Anova test statistics.

3. DISCUSSIONS AND RESULTS

3.1. Current student quality assurance management

First, about planning to ensure the quality of learners, In the process of accelerating industrialization, modernization, and applying science to production in all fields and professions, it is necessary to apply advanced scientific and technical knowledge and technologies, especially in the digital age. Therefore, it is also necessary to develop a strategy to ensure the quality of learners, not only from the school but also from the students themselves, as well as with the employers, considering it an indispensable and key factor in improving the quality of higher education. According to the survey results and the author's Oneway Anova test statistical processing at universities in the Mekong Delta, when asked about the importance of planning to ensure student quality, the results show that all subjects answered that the planning to ensure the quality of learners was at a "good" level. Managers rated it as good at a high threshold of 2.76; the lecturer rated it as quite good at 2.55, while the students rated it at an average level of 2.47, which is close to the good level in the scale. Although the survey subjects have different views on the assessment of "The reality of planning for quality assurance of learners," $p = 0.000$ ($p < 5\%$). But the results show that the planning to ensure the quality of students is of special interest to the subjects. It can be seen that, under the influence of the market economy, modern industrialization, international integration and globalization, and digital transformation, most universities attach importance to quality assurance planning. This further confirms that, in order to improve the quality of higher education to meet the needs of society, it is necessary to plan to ensure the quality of learners as a long-term strategy.

Table 1. Plan to ensure the quality of learners

No	Contents	Head (120)	Lecturers (500)	Students (1190)	overall average	Rank
1	Enrollment planning	2.70	2.54	2.48	2.51	1
a	Bases for planning according to regulations of the Ministry of Education and Training	2.10	2.55	2.42	2.44	
b	Ensure scientific and feasible	2.88	2.51	2.76	2.70	
c	The recruitment method is suitable for the candidates	2.91	2.53	2.40	2.47	
d	The enrollment criteria are suitable for the school's development scale	2.83	2.54	2.03	2.23	
e	Determine the time and resources to implement the plan	2.78	2.56	2.78	2.72	
2	Make a plan to foster learning capacity for students	2.83	2.55	2.45	2.50	2
a	Define training goals and content	2.83	2.60	2.58	2.60	
b	Determine the time, and place of the refresher	2.88	2.55	2.60	2.60	
c	Determine training methods	2.76	2.51	2.59	2.58	
d	Identify resources to implement the training plan	2.84	2.54	2.03	2.23	
	Average	2.76	2.55	2.47	2.51	
Standard deviation		0.74	0.33	0.42	The standard deviation of the sum variable is 0.44	
Prob F-Satistic, (Sig, p value)		0.00				

Second, on the organization of the implementation of the quality assurance plan, the statistical processing results of the one-way ANOVA test show that there is a statistically significant difference between the survey subject average scores and that they have

different views on the assessment of "The actual situation of organization and planning to ensure the quality of life ensure the quality of learners," p = 0.0016 (p < 5%), performed by the schools at an average level but at a high threshold, close to the good level in the scale.

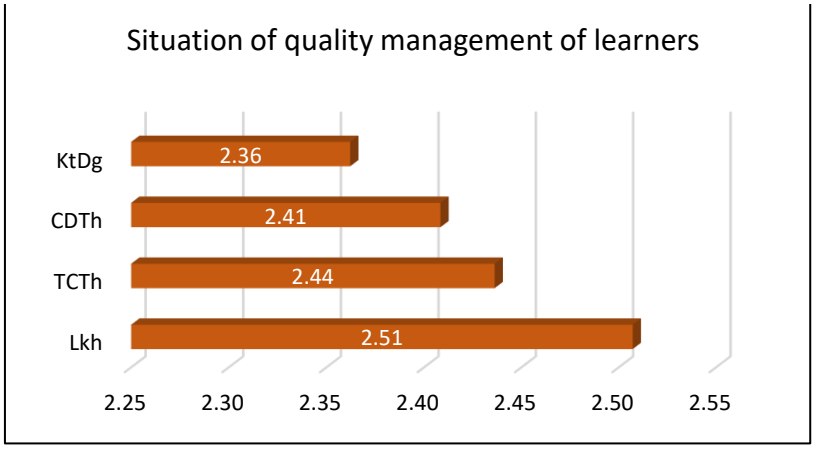
Regarding the organization and implementation of the enrollment plan, according to the survey results, the management staff rated the level as quite good at 2.72; the lecturer rated the good level at 2.54; and the students rated the average level at 2.38. This shows that the universities have well implemented their enrollment plans and have achieved their annual enrollment targets. Regarding the organization of training for students' learning capacity, it is rated lower than "enrollment activities". All survey subjects were rated at the average level on the scale. It shows that universities in the Mekong Delta have not focused on fostering learning capacity for students. Thus, the organization that well implements the plan to ensure the quality of learners needs to perform both tasks: organizing enrollment activities and organizing training for new students' learning capacity, contributing to improving the quality of students at the school. At the same time, the school's leaders pay special attention to the implementation of the student quality assurance plan.

Third, on directing the implementation of the student quality assurance plan The survey results show that the survey subjects have a statistically significant difference between the mean scores and have different views on the assessment of "The current situation of directing the implementation of the plan to ensure the quality of human resources." p = 0.00 (p < 5%). For managers, the assessment is quite good at 2.52; the lecturer assessed that the average level was close to the good threshold of 2.44; and the average student rating is 2.22. This shows that the direction of the implementation of the student quality assurance plan is deeply concerned by the leaders of the schools, closely monitored, and promptly resolved when the units and individuals implement the plan.

Fourth, on inspection and assessment of quality assurance According to the survey results, lecturers and students rated the "average" level, administrators rated it as quite 2.5, there was a difference, and there was statistical significance between the average score and having Different views on assessment ("The reality of testing and evaluating the implementation of the quality assurance plan for learners), p = 0.0037 (p < 5%). Assessment activities have not been valued by universities, which leads to the quality not being as expected.

Every year, universities in the Mekong Delta widely propagate their enrollment plans in the mass media. Conduct capacity-building for learners. Check reviews transparently and publicly.

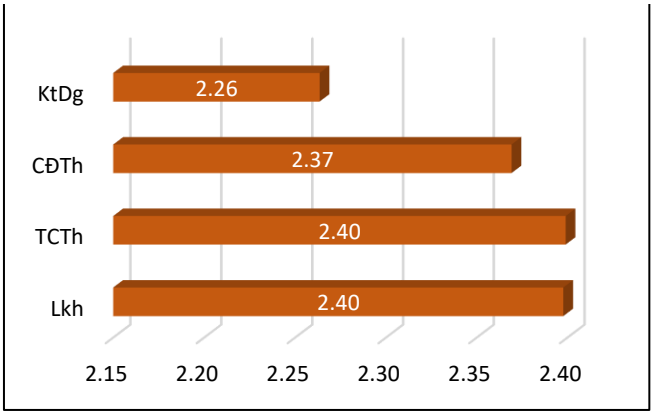
Figure 1. Management to ensure the quality of learners



3.2. Ensuring the quality of the team in charge of managing student learning activities.

Regarding quality assurance management, the team managing student learning activities is being evaluated as stable at the "average" level. These content management functions need to be paid more attention to ensure management quality, such as: the management planning must ensure the scientific, good forecasting of the needs, conditions and resources to To achieve the goals set out in the plan, the organization and implementation of the management plan should ensure the scientific nature of having a responsible department and assigning specific assignments to each member before implementation; The direction needs to ensure enough requirements on influencing factors in order to create motivation and trust to motivate people to work with high efficiency, and at the same time, inspection and evaluation activities need to be carried out regularly, promoting management process leads to high efficiency in practice.

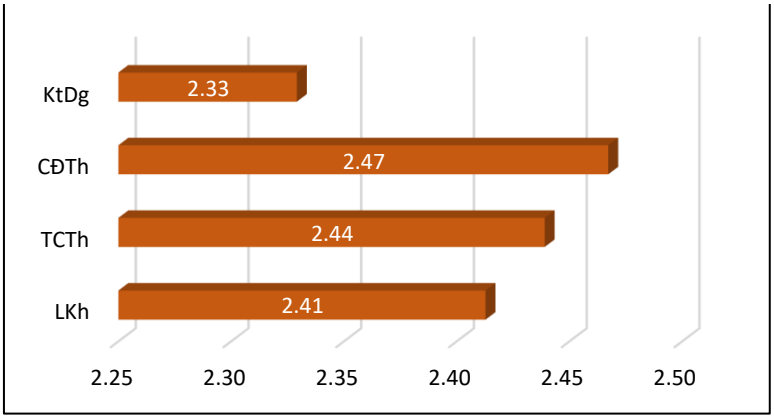
Figure 2. Quality assurance management of the learning management team.



3.3. Quality assurance management of training programs

Regarding the quality assurance management of training programs, the management of learning activities by engineering and technology students at universities in the Mekong Delta is being evaluated as average or approaching average quite on the scale. That shows that the training program actually learns, does real work, and focuses on knowledge training in parallel with skills training. The training program allows students to participate in more hands-on activities. The inclusion of students in the organization into the reality of productive work gives them the opportunity to apply the knowledge they have learned to solving specific tasks as well as giving them the opportunity to experience comprehensive development with hard skills and soft skills to quickly adapt to the ever-changing and evolving working environment. At the same time, it helps the school adjust additional training programs to suit the needs of students development of society in order to constantly ensure the quality of training programs For that purpose, managers and lecturers of universities are currently paying great attention to the management and quality assurance of student training programs and consider this to be a matter of the survival of the university. And it all makes a difference between schools. However, the transformation is still mechanical; there has not been a profound change in training program development. Every year, the training program is still reviewed, supplemented, and updated by universities to meet the needs of society, but the additions and modifications are still local, small, and have not been evaluated comprehensively the strengths and weaknesses of each program so as to develop more and more advanced training programs to better meet the needs of the labor market and society.

Figure 3. Quality assurance management training program

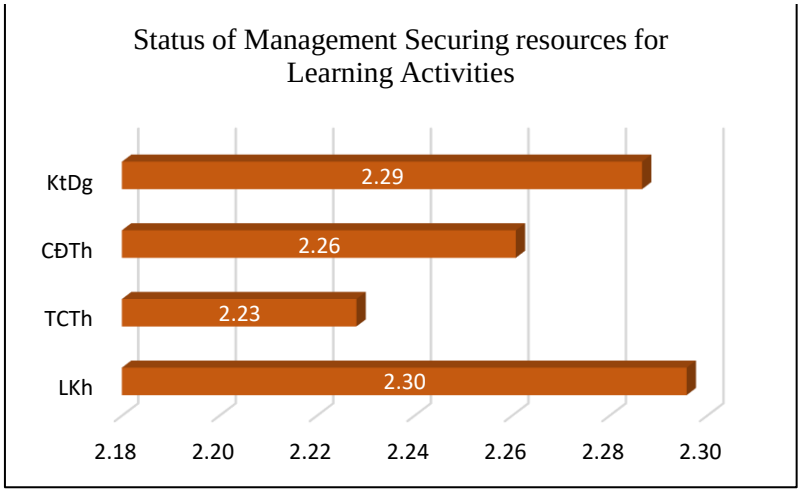


3.4. Manage and ensure resources for learning activities.

Regarding the management of ensuring resources for learning activities, the management of learning activities for engineering and

technology students is being evaluated as "average" (2.27/4 points). The performance of these content management functions has not been effectively evaluated in a highly positive direction in practice. Some limitations that need to be improved to make this activity more satisfactory are: performing the management planning function in a scientific manner; being more specific about objectives, content, implementation, and conditions. implementation of a clear and feasible plan; perform the task of organizing the establishment of a management apparatus and assigning responsibilities to the participants in this apparatus closely, in the direction of linking authority with responsibility to easily supervise and inspect the implementation of the effective plan.

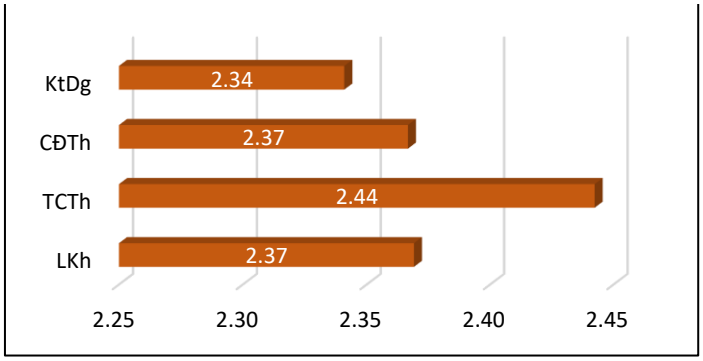
Figure 4. Manage and ensure resources for learning activities.



3.5. Manage training coordination activities between universities and enterprises.

Regarding the management of training coordination activities between universities and enterprises, the management of the learning activities of engineering and technology students at universities in the Mekong Delta is being evaluated price is "average" (2.38/4 points). Training cooperation between universities and businesses is currently being consolidated and developed in both the scope of cooperation and the depth of cooperation content in order to bring the training quality of the university to the business. Career, associated with society, is the right educational view today. However, the results of cooperation are not really effective according to the training requirements associated with labor market needs. The reason is that universities have not fully and effectively implemented these operational management functions in practice, such as planning, organizing, directing, and evaluating the implementation scientifically and methodically planned by management science.

Figure 5. Manage training coordination activities between universities and enterprises.



In addition to the achieved results, it is also necessary to frankly admit that the quality of higher education in the Mekong Delta is currently lower than that of other regions in Vietnam, affecting the quality of human resources in the region. The Mekong Delta region is not high compared to other regions. The actual situation of the learning activities of students majoring in engineering and technology still has certain limitations. The study skills of students have not been formed stably and have not fully promoted their self-study skills to bring high efficiency to the quality of higher education. Students have not clearly demonstrated their learning abilities, such as planning, organizing the implementation, and checking and evaluating the implementation of their self-study plan. The current situation of managing learning activities that meet the output standards according to the CDIO approach of engineering and technology students at universities in the Mekong Delta has not yet reached the high quality required for activity management tasks study. Specifically, the content of learning activity management, which is the performance of functions (planning, organizing the implementation, directing the implementation, and checking and evaluating the implementation of the plan), for each content of learning activities according to "input" factors (including: learners, teachers, programs, facilities, cooperation with enterprises); the "process" factor (the elements of learning activities, such as: routines, objectives, content, methods, forms, and means); and the "output" factor (testing and assessing learning outcomes).

The ability to study, especially the ability to self-study and self-study of students, is very inadequate with the requirements of studying tasks at universities in the direction of developing quality and capacity to meet the needs of society and the market. The labor market is constantly developing in terms of quality. Specifically, the learning capacity of students is still limited in terms of organizing learning activities (in class and self-study outside of class). Students do not have the habit of researching the output standards of the training program

or the output standards of the specific subject they are studying. Students do not have the skills to plan study, organize learning activities, self-check and evaluate learning results effectively. Students have not been active in choosing learning materials or determining methods and forms of learning organization suitable for themselves. Students do not have the skills to coordinate with lecturers and students of the same subject to organize effective learning activities (in terms of learning and scientific research). Students who do not have the skills to develop effective learning environments, such as libraries, reading rooms, practice rooms, research rooms, the internet, exhibition halls of scientific and technological achievements, etc., organize seminars and conferences to discuss topics, write scientific papers, etc., to serve the learning activities of the subject.

4. Some measures to improve the efficiency of managing "input" factors of learning activities of engineering and technology students to meet the output standards approaching CDIO.

Firstly, managing the "learner" factor ensures that the learning requirements meet the most important CDIO-accessible output standards in learning activities in order to contribute to the highest results. Students, who are the subject of learning activities, need to have all the requirements in terms of health, physical strength, stature, intelligence, talent, and skills to meet learning activities. The capacity for "self-study and self-training is extremely important; it is necessary to aim for self-study and lifelong learning" [5], which determines the quality of learning. Having the ability to self-study allows one to research and explore to acquire knowledge and advance towards the need for lifelong learning in today's modern and digital society. Self-study is an indispensable form of learning for students studying at universities." [6]. A role of self-study and self-study skills training of individuals proposes an organization for learners to learn in activities and by active and creative self-discipline" [7]. Learners will be active in self-study, and their ability to acquire and apply knowledge increases when they are actively learning to meet subject requirements through tests. Thereby, students actively and actively explore knowledge under the guidance of both lecturers, not passively absorbing it through lectures. Students will promote their own capacity and forte, not only learning specialized knowledge but also forging personal skills to help them become more stable, more mature, and more confident in activities. "Planning the management of self-study activities; promoting activities to raise awareness, build motivation, and foster self-study skills; organizing the renewal of

student-centered teaching methods". On the other hand, learners here also talk about the number of students in the theoretical class, the number of students in the practical class, and the number of students to ensure the quality of learning in each type of theory and practice lesson or integration. To ensure learning tools and equipment; to ensure high interaction between students and lecturers; and between learners and learners.

In addition to allowing students to participate in more internships through the choice of study form in the 3rd and 4th years, learners choose one of three orientations: internship, vocational training, or academic. Bringing students to participate in the reality of production labor in enterprises not only in the country but also abroad gives learners the opportunity to apply the knowledge they have learned at university to solve problems in practical work, thereby giving them the opportunity to develop comprehensive hard skills and soft skills to quickly adapt to employers in the digital era.

Secondly, managing the faculty element ensures that the learning requirements meet the CDIO-accessible output standards and that students will learn individual skills along with specialized knowledge. The program will therefore have to be built in the direction of integrating specialized knowledge with skill training, allowing lecturers and students to use dual time to both teach knowledge and teach specialized applied skills—factors that link students' work ability with the requirements of employers, thereby bridging the gap between the school's training and the requirements of human resource users. In line with the educational philosophy of "no boundary between school and reality", students trained by the University have promoted knowledge, skills, attitudes, and creative thinking in production practice.

Third, manage the training program elements to ensure that the learning requirements meet the output standards according to the CDIO approach. In other words, the training program is based on output standards to design inputs: "standard training programs; formulating, appraising, and promulgating training programs at higher education levels." [9]. A goal of the training program is to comprehensively develop hard and soft skills for learners. The program is built on the basis of surveys of employers, managers, professional scientists, lecturers, and socio-professional organizations, especially learners. To have a quality training program, meet the labor market, meet the requirements, and meet society. Requires specific design for each separate training program, specific to each detailed course outline. The output standards of the training program are built specifically and in detail for each knowledge module with the main and outstanding content of the module, avoiding spreading academically and borrowing from the training program of other universities, in line

with the output standards of each profession and the actual conditions of each school. "Manage university training according to output standards, including: building output standards to meet social requirements; developing training programs according to output standards; strengthening the examination and assessment of students based on their ability." [10]. Training programs at universities need to be approached in the direction of application and practice, combining specialized knowledge training with skills training designed in an open direction and on the basis of first-class standards. It is the school's commitment to society to improve the quality of human resources. In other words, the training program is the concretization in terms of knowledge, skills, and abilities in accordance with the school's commitment to society, which is recognized by society.

Fourth, managing financial factors, facilities, and equipment to ensure learning requirements meet output standards according to the CDIO approach is a condition to ensure the learning activities of engineering students are supported by technology to get the desired output quality. The way the technical and technological training industry needs financial resources to invest in facilities, equipment, workshops, practice rooms, experiments, practice materials, practice, etc. is important for effective, quality learning. According to the production labor market, with new technologies, it is necessary to continuously update and equip students after training so that they are not outdated in modern machinery and technology. Business is very important for this resource at school.

Fifth, managing the factor of coordination between schools and businesses in ensuring that learning requirements meet the output standards according to the CDIO approach is very necessary and is expected by society to implement the teaching principle. "School associated with society" means that the social demand for the labor market must match the school's output standards, which are the most desired by enterprises. Selective and committed when signing a cooperation agreement between the two parties. Support students' entrepreneurial spirit and entrepreneurial activities. Having a long-term plan for working in professional exchange, guiding students, and needing a functional department to participate in the cooperation process to improve the quality of cooperation It is very important to facilitate the effective implementation of the terms of cooperation to meet the aspirations of training labor resources for society.

5. CONCLUSIONS

In the context of land renewal and education revival, the country is facing extremely urgent tasks. The fourth industrial revolution with its impacts has brought many opportunities and challenges, including the

need to cultivate high-quality human resources capable of adapting and meeting the requirements of the innovation career, which requires the management of the learning activities of engineering and technology students to meet the output standards according to the CDIO approach of universities in the Mekong Delta, Vietnam. This is one of the key tasks, mainly making an important contribution to improving the quality of human resource training not only in the Mekong Delta but also in the whole country of Vietnam today. Being aware of that, in the coming time, universities in the Mekong Delta must constantly innovate the content and form of organizing the management of input factors in student learning activities. Technology meets output standards according to the CDIO approach, contributing significantly to the implementation of the mission of training high-quality human resources for the socio-economic development of the Mekong Delta and of Vietnam in the spirit of Resolution XIII of the Communist Party of Vietnam for a prosperous and happy Vietnam.

Bibliography

1. C. Marx and Ph. Engels (1995), Publishing House, National Politics, Hanoi.
2. Resolution No. 29-NQ/TW, dated November 4, 2013, adopted at the 8th Plenum of the Party Central Committee, term XI, on the fundamental and comprehensive renovation of education and training, highlighting the task of perfecting the system national education system in the direction of an open education system, lifelong learning and building a learning society.
3. Central Committee (2019), Conclusion No. 51-KL/TW (May 30, 2019), on continuing to implement the resolution of the 8th plenum on fundamental and comprehensive reform of education and training to meet the requirements of industrialization and modernization in the context of a socialist-oriented market economy and international integration.
4. Communist Party of Vietnam (2021), Documents of the 13th National Congress of Deputies, Volume 1-2, National Political Publishing House Truth.
5. Pham Viet Ha (2013), Self-study – a basic learning method of students. Retrieved from http://huc.edu.vn.
6. Diep Thi Thanh and Doan Thanh Ha (2009), Self-study method - a bridge between learning and scientific research. Journal of Development and Integration, p.1.
7. Vu Xuan Hung (2011), Training of teaching capacity for students at University of Technical Education in pedagogical practice according to performance approach, Doctoral thesis in education, Vietnam Academy of Sciences.

8. Do Khac Thanh (2014). Improving management measures of students' self-study activities of Hung Vuong University. Doctoral Thesis in Educational Administration. University of Agriculture and Forestry - Thai Nguyen University and University of Southern Luzon, Philippines.
9. Ministry of Education and Training (2017). Circular No. 17/2021/TT-BGDĐT, dated June 22, 2021, of the Ministry of Education and Training, "Regulations on standards of training programs; formulating, appraising and promulgating training programs at higher education levels".
10. Ngo Van Khanh, Bui Hong Van, Nguyen Thi Thuy Ngoc (2016), a training management solutions according to output standards. Education Magazine, special issue (December 2016), pp.34.