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ASSESSMENT OF ENGINEERING SPECIALITY TEACHING IN THE PERIOD OF INTEGRATION

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ABSTRACT

The industrial sectors, especially manufacturing industries, are considered as key economic sectors of Vietnam in the ages of national industrialization and modernization, especially when Vietnam prepares to take part in the global value chain, and want to upgrade its position in that value chain. But in the current situation of Vietnamese human resources, there is a remarkable lack of skilled scientists, engineers, and workers in these technical fields. The golden generation of Vietnam now mainly prefers to choose the other fields, such as business, trade, finance, support services, rather than the fields that create basic value for the economy because of specific job characteristics (task variety, challenge, and remuneration). A part of students could not identify their own future careers because the program of mass education in high school, vocational education, and career orientation has not brought an effective result. Besides that, the tendency to diplomas and titles preference in businesses and the whole society is still popular. They prefer to be enrolled in the university rather than a vocational school. As a result, universities must accept low-quality student input but still have to ensure the quality of teaching, researching, training and educating. Organizing and managing technical major, especially evaluating the education process, still has to face those issues.

KEYWORDS

vocational education, engineer, technical major.

1. INTRODUCTION

The Vietnam integration process, such as joining WTO International Trade Organization, FTA free trade agreements and recently the Trans-Pacific Partnership Economic Partnership Agreement, has not only opened countless great opportunities for the development of our country but also bring many great challenges [1,2]. One of the fundamental challenges that Vietnam must overcome is the pressure on qualifications, knowledge and skills, especially the labor force in the key economic sectors of the industrialization and modernization process [3].

Vietnam's industry development strategy to 2020, vision to 2030, has approved by the Vietnamese government, is to mobilize effectively all social resources to restructure the industry towards modernization, focusing on educating skilled, disciplined and creative human resources [4]. Our Party has repeatedly affirmed: youth is a core part of society, is the pillar of the national sustainability, is the shock force of the revolution and the future owner of the country, and is the golden labor force which takes charge of the revolution of industrialization and modernization, and brings the country to socialism [5].

However, in recent years, the number of admissions in the engineering majors of universities from top to bottom is very precarious in both quantity and quality. The tendency to choose easy and high-paying jobs leads to engineering industries is no longer attractive to young people. These majors become temporary places to get a university or college degree, and help find a job [6].

Engineering education in universities is also facing many challenges. The strong development of new technologies and high technologies shortens the time of commercialization, requiring new innovations and new products [7-9]. Research and creation have become an important issue. Affected by the development of technology, the majors are gradually merging, the narrowed education sector is no longer appropriate [10]. The most fundamental but still unsolved problem is the lack of practice in technical education [11].

Using approaches such as CDIO (Conceiving - Designing - Implementing - Operating) in teaching technical subjects currently applied in some universities which leads to a new experience in teaching and learning in the ages of integration. But evaluating the process of teaching and learning to enhance standards of education is still a big issue [12].

2. COMMON ISSUES IN ENGINEERING MAJOR TRAINING PROCESS

Looking back on the problems of the Vietnamese young generation, a market research organization in Denmark with representative offices in Asia - Epinion Global has surveyed and introduced some interesting characteristics about the generation Z, Vietnam's golden labor generation as [13]:

They prefer to communicate via an online laptop, regardless of time and place rather than to spend time outside. Mobile phones became one of the most important devices in their daily lives. The border between real life and virtual network is very fragile; their existence must be recognized by social networks; they will do nothing without holding the phone; they would like to search for information, products, and brands on mobile devices, They have a lot of experience when accessing online information, and they know which sources are reliable and which organizations are reputable [14];

They are quite fast in grasping the trend, social information; they are confident and knowledgeable. The younger generation always wants them to look fashion. They like to be involved and have the influence on social issues; their voices have a greater influence on important decisions in life. They are smart people and always knowledgeable; they will easily become experts with the extensive knowledge if they try to learn and improve their mindset [15].

However, many of them cannot be independent because they live too safely; with the support of their families, they lack personal characters and independence. According to the survey, the report of the Vietnam Youth

Union also showed that a part of young people also showed signs of deteriorating political, moral and lifestyle ideology; reduced confidence in the Communist party, paid little attention to the situation of the country, lacked the sense of law observance, and lacked awareness of the national cultural tradition. But the current generation of students is still new, young, desirable, curious, interested in exploring, discovering, and being sensitive to technology. Therefore, they will succeed if they are educated in the right way. Looking back at the training process of universities, colleges, and professional high schools, most of them are facing with common issues such as entrance admissions, the number of students dropping out of school, the quality of graduate students [16].

Universities recently have faced that engineering candidates mostly take the types A, A1, or D of the university entrance exam. Many students who took type A1 and D are not really good at science subjects. They choose a major in engineering because of high admission rates, low entrance scores, and learning only to get a college degree.

At the beginning of the course, there are many students receiving warning letters because of bad learning outcomes and low cumulative points. The reason is often because the fundamental knowledge of these students is about social science. In addition, the teaching and learning methods are not based on the situation and the actual issues. Therefore, it leads to depression and tiredness caused by overwork, leading to knowledge gaps and difficulty following promptly, etc. Some new students have forced to drop out due to poor accumulation points just a few months after entering the university. Others who go through the fundamental semesters find it difficult to keep motivated and enthusiastic in the specialized semesters with many intensive assignments. They experienced a hard time reaching the graduation requirement such as foreign languages standard and minimum GPA. Therefore, they do not have enough time to pay attention to soft skills, job search skills, which may limit their opportunity to get a good job and a high salary [17].

In fact, the evaluation of the learning process through the traditional scale has eliminated many students who are interested in technical major and intend to pursue careers. Most students felt distraught and crestfallen in the first years of university because of the new working environment and the difficulty level of fundamental subjects and intensive exams. Freshmen tend to be lazy and want to relax after passing an intensive exam (the university entrance exam). Therefore, they devote their time to relaxing rather than learning, which leads to a very poor result in the very first semesters. It may also lead to worsening results such as academic warning letters or expulsion. The learning process also has nothing change in the core semesters. There are much more complicated assignments, mid-term exams, and final exams with the old evaluation process. The viciousness of the evaluation process does not support students to adapt to new requirements, social integration, and post-graduation work environment [14].

3. CURRENT TRAINING TREND OF ENGINEERING MAJOR

It can be seen clearly that engineering majors is a promising major. There are many job opportunities related to this major. Engineering learners can work in many positions, from the operator positions to management positions, such as production team leaders, senior engineers, Head of department, director of factory, general director, etc. They can work in many different industries like manufacturing, electronics, health, agriculture, entertainment, transportation, communication, research, development, testing, designation, analysis, manufacturing, operation, maintenance, technical support, customer support, sales, consulting, management, and etc [4,18].

During four years of the course, the university has a duty to train students to meet the output standards, skills and attitudes, as well as the requirements of engineering education during the integration period. In order to achieve that, engineering major in universities experienced a significant change over years, such as developing the training programs to meet the needs of labor market and learners, changing teaching - learning methods, taking learners as a center, changing from providing knowledge to forming students' competence, applying technology in teaching and evaluation, holding training and academic exchange meeting with domestic and foreign universities, joining the network of universities in the region, as well as in the world, using advance measures to analysis the quality of training programs such as national standards, AUN standards, ABET standards, and etc [1,19]. Currently, some schools are also using CDIO methodology in teaching: this method includes four stage: C - Conceive; D - Design; I – Implement; O - Operate, along with evaluation in all aspects from critical thinking, problems solving, planning skill, information analysis, managing skill and individual development plan, seminar in the lecture room, extracurricular and volunteering activities [4]. Implementing these training process may ensure that our graduated students meet the country's integration needs [20].

4. TEACHING EVALUATION DURING THE AGE OF INTEGRATION

Teaching process evaluation is to evaluate learners' progress, the accuracy of the teaching-learning method, the quality of the training program, thereby monitoring the educational process, organization and operation process of the university administrators [5,8].

With input quality of the university as above and the integration requirement of the graduate student, teaching evaluation takes charge of very important missions: to figure out the penchant of each student, create excitement learning, research, creativity, and community responsibility in each student.

Based on the three fundamental missions of education included awareness, skills, and attitudes, teaching evaluation should also be divided into different levels from the simple to the complex based on the learning outcomes. This ensures a true alignment between the program's mission, curriculum, and competencies and preventing the possibility of mission drift [10].

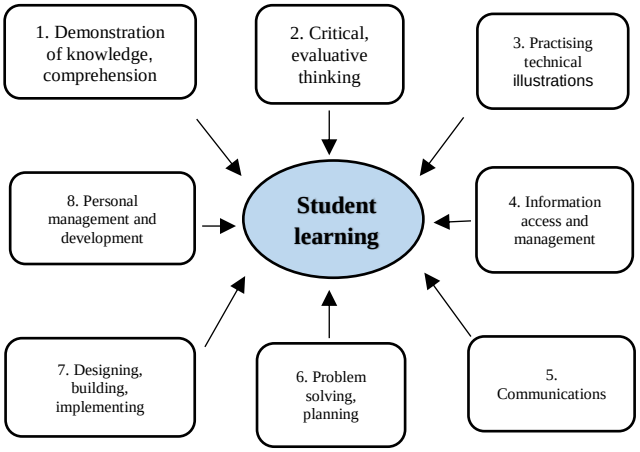

Figure 1: Learning outcomes [4]

Using a combination of assessment types: Initial assessment, diagnosis, based on criteria on the lecture room, individual, assessment process, and etc. All data of the teaching and learning process of instructors and students should be recorded, such as class assignments, homework, discussed topics, research projects, exams, group assignment, and the ways student handle their assignments [7]. Online Teaching and learning activities through many types of online media are included.

Use evaluation criteria tables (rubrics) to facilitate quantification of assessments. Set the weight for the grades that students get during the learning process higher than the final exam grade. Rubrics have to be carefully considered, and choised in order to help future engineers compete and deliver in an age of smart manufacturing It should be noted that the 21st century is a period of the skill-based economy; 85% - 15% of soft skills (emotional intelligence) and hard skills (logical intelligence) are the results of a survey about successful people in current time [21]. The needed soft skill competencies of each future engineer will be the ability to solve problems by virtual teamwork and to be able to work in hybrid teams consisting of human and robots, working indispensable together. The 4 skills are highlighted such as: systems thinking, data savviness, collaboration and communication, and adaptability. Learners in engineering educational institutions will need to seek new knowledge and skills as part of lifelong learning and as preparation for career advancement [11].

The assessment process should be implemented during the very first years. Through exams, assignments and inputs classification based on the background of natural sciences, social sciences, and foreign languages, students might be divided into groups according to their ability in the first semester when they study the basic subjects. As a result, the curriculum, teaching activities and assessment criteria of lecturers will be more suitable for learners because they are based on the learning outcomes of the subjects and major [22].

Assessment of teaching process should be implemented regularly in all modules throughout the course, from assessing knowledge to assessing skills and attitudes. Active teaching activities should be ubiquitously used to obtain multi-dimensional, objective and differentiated assessments. The assessments should also be conducted continuously and intertwined in the teaching-learning process, making students not to be psychologically stressed as when faced with previous periodic assessments.

Through the results of these assessments and the consultation of lecturers and teaching assistants, students may figure out their strengths and weaknesses as well as their relevance to each major. They may not be suitable for the field of research, but they will be able to do well in technical assistance or sales. The assessment activities in the internship section require the criteria tables to be very comprehensive: assess the use of multidisciplinary knowledge in a single project or a system that coordinates single products, assess adaptive skills with technology and specialized production process, and assess the perception of the role and responsibility of the engineer to the society.

We noted that a key component in engineering education is project work. Projects in Industry 4.0 will be increasingly complex and multi-disciplinary in nature. For example, the innovation and development of CPS will require computer scientists and network professionals to work with experts in various disciplines as well as in globalized contexts. Students need to be more proficient in interpersonal skill, in working with people with different background and disciplines from their own. The Learning Factory concept is now gaining popularity as a way to teach students about working under the Industry 4.0 environment

Learners' assessment is also an important factor in the assessment results of the teaching process. These assessment informations may be about student's professional development, his current competencies, the basis for planning for his future, career planning, career management activities...When learners take part in the assessment process, they will recognize the products of the teaching process, the standards achieved, and their progress. Then, they are being motivated to study, research, and improve their awareness and responsibility for learning and training to take part in production areas, adding value to the economy of the country

Practicing many teaching and learning activities may help to test students better. Students also have opportunities to experience many ways to achieve new knowledge. They may take part in real-life problems, practice critical thinking, learn how to access, manage and seek information. Therefore, they may enhance their knowledge and skills and have a good attitude towards learning. They will also not waste their time on nonsense activities. The comprehensive information on many aspects may allow us to have a universal view, helping to avoid evaluating students biased on scores of written exams, increasing their GPA, reducing academic warning cases and the number of expulsions.

Table 1: Positive outcomes

Order	Goals	Positive outcomes
1	Knowledge	Understanding basic and specialized knowledge Applying multidisciplinary knowledge in a project
2	Skills	Effectiveness in communicating, debating, protecting their own views. Improve in time management, tasks delegation, group activities. Improve leadership skills, a sense of responsibility for group activities. Improve problems solving and analyze skill Know how to search and process information and knowledge from many different sources
3	Attitudes	Being more active in the learning process, express opinions in group. Ask more questions for teachers to create an exciting learning environment and close relationship between teachers and students. Open relationship and get close to each other throughout the course.

5. CONCLUSION

Assessment has a key role to play in the university training process. The result of the assessment is "catalyst" for improving the quality of the teaching and learning process, meeting the social needs as well as the development and integration of the country. It is also considered an effort to improve the learner's, teachers, and university's progress

The competency of lectures and support staff has a key role to play in evaluating the learning-teaching engineering program. They should not merely convey knowledge like they used to be, now they should be more active in playing many other roles in teaching process: lecturers, secretaries, instructors, counselors, and psychologists to guide students meet integration needs. To ensure a better education system for our future generation, we should pay much more time, effort, and money in researching a new system.

And the final important emplement in the whole process belongs to your department, your university. The staff, the teachers need to be trained annually. They must have clearly knowledge about the curriculum, programme learning outcomes and course learning outcomes. They have to be provided all kinds of assessment: formative and summative assessment, pre-assessment, ongoing assessment, post-instruction assessment. They have to be instructed to balance assessment through online and face-to-face teaching and learning activities. They have to be given opportunities to participate in factory projects, or some study tours to other development engineering universities...

The article highlights some new ideas drawing from the teaching process in Material Handling Machineries Part, Mechanical Institute of Vietnam Maritime University. We also present our experience in applying CDIO methodology in the teaching and learning process. We appreciate the Mechanical Institute of the Ho Chi Minh City University of Technology, sharing their experience in CDIO methodology implementation.

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