Improving The Quality Of Human Resource Training In The Renewable Energy Industry: A Case Study At Universities In Vietnam

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Abstract

When fossil fuel sources such as coal and oil become increasingly depleted, causing severe environmental pollution, countries must accelerate the restructuring of the energy industry towards clean and sustainable. Training in the renewable energy industry is considered an inevitable solution and trend in the current energy industry in Vietnam. This article studies the factors affecting the quality of training in renewable energy at universities in Hanoi city, Vietnam. The study surveyed 485 questionnaires and used the PLS-SEM model to test the hypothetical model. The study found six factors: state policies, socio-economic environment, learning environment, training programs, lecturers, and teaching methods.

Keywords: Human resources training, Renewable energy, Universities, Vietnam

1. Introduction

In the current context, when fossil fuel sources are gradually depleted and replaced by renewable energy sources (including solar energy, wind energy, and biomass energy...), this energy source becomes one of the issues of great concern in Vietnam in particular and in the world in general ((Roy, N. K., & Das, A, 2018; Kalair et al., 2021)

In Vietnam, due to its long coastline, tropical monsoon climate, and intense agricultural economy, there are diverse and abundant conditions for exploiting and producing wind power, solar power, and fuel biological. Therefore, in Vietnam's Industrial Development Strategy to 2025, with a vision for 2035, the government identifies renewable energy as one of three areas of particular priority (Tien, N. H et al., 2020)

By the end of 2021, renewable energy sources have a total installed capacity of 20,670 MW, accounting for 27% of the total installed capacity of the whole system (76,620 MW); total electricity output from renewable energy sources reached 31,508 billion kWh, accounting for 12.27% of the total production of the entire system.

Specifically, in terms of wind power, Vietnam has 70 projects with a total capacity of 3,987 MW that has been put into commercial operation, generating electricity output of 3.34 billion kWh in 2021, equivalent to 1.3% of work system-wide quantity. Regarding solar power, electricity production from solar energy accounts for about 10.8% of the total electricity output of the whole system in 2021.

In recent years, renewable energy projects in Vietnam have attracted a lot of FDI and private investment in the past few years. In 2021, attracting new and large-scale projects with USD 5.7 billion, accounting for 18.3% of total registered investment capital, has helped the electricity generation and distribution industry

rank 2nd among the most attractive sectors of FDI. (Tien, N. H et al., 2020)

Billions of dollars have been poured into solar and wind power projects, showing that Vietnam has great potential for renewable energy, especially solar and wind power. Vietnam's solar photovoltaic industry has seen strong growth recently, and this is just the beginning of the country's energy transition away from coal. Solar power capacity nationwide increased rapidly from 86 MW in 2018 to nearly 16,500 MW in 2020. Rooftop solar power also accounts for a significant proportion of total solar power capacity in Vietnam. Therefore, Vietnam has surpassed Thailand to become the ASEAN country with the largest installed capacity of solar power.

The wind power sector is considered the "rising star" of the energy industry in Vietnam. With 8.6% of land and water suitable for large wind farms, Vietnam offers enormous potential and investment opportunities. By October 2021, 84 out of 106 wind power projects had been put into commercial operation with a total capacity of 3,980,265 MW. Offshore wind has even more significant potential than onshore wind. According to the "Offshore wind power development roadmap for Vietnam" report by the World Bank, by 2030, offshore wind power capacity can increase from 1 GW to 5 - 19 GW, while wind power capacity mainland could increase from 1.26 GW to 17.34 GW.

According to international experts, if it continues to expand the renewable energy industry, Vietnam will quickly gain a higher position in the market, possibly surpassing countries like Australia or Italy in solutions innovation and development of renewable energy. (Nguyen, P. Q. P., 2019)

Currently, there are only five universities in Vietnam that train in renewable energy: Hanoi University of Science and Technology; Ho Chi Minh City University of Technology; Electric Power University; University of Science and Technology of Hanoi; VNU University of Engineering and Technology. Therefore, it is necessary to improve the quality of human resource training to meet the market's needs.

2. Literature review

2.1. Renewable energy

Renewable energy or clean energy is the complete opposite of fossil fuels. They are created from continuously forming sources, which can be considered infinite, such as wind, rain, sunlight, ocean waves, tides, etc. (Kalairet et al, 2021)

Although relatively new, this is a source of energy that brings positive changes in the future. Clean energy is rapidly spreading on both large and small scales, gradually replacing traditional fuel sources in 4 critical areas: engine fuel, cooling, power generation, and independent power system—in rural settings. Some types of renewable energy in the world include Wind energy, Solar energy, Hydroelectricity, Bioenergy; Geothermal Energy; Solid waste energy.

2.2. Human resources training

Human resource training and development is a kind of organized activity carried out for a certain period to bring about personality change. There are three different activities under this definition: Training, education, and development related to work, individual people, and organizations. The three components of human resource development and training are essential for organizational success and the functional development of people. Therefore, human resource development and training include training, education, and development developed within an organization and other human resource development and training activities. The force made from outside includes Apprenticeship, apprenticeship, and practice. (Townley, B., 2019)

In organizations, the issue of training and development is applied to directly help employees perform better the specific and specialized requirements of the job; Update new skills and knowledge for employees; Avoid outdated management thanks to the guidance of new management methods in line with changes in technological processes, techniques, and business environment; Prepare the next team of managers and professionals by equipping them with necessary skills for future promotion opportunities; Satisfying the development needs of employees by the necessary new professional skills will stimulate employees to perform better and thus have more options for advancement.

Thanh (2011) pointed out that the quality of training results from the positive impact of all the elements constituting the training system and the training process to operate in a given environment. Dang (2011) argues that the quality of training is the fulfillment of the school's set goals. This definition's objectives are understood broadly, including the training program's mission, goals, and characteristics. Purposes must be compatible with the school's functions, tasks, and resources, while training objectives must meet the country's socio-economic development requirements. (Rogoff, B., 2008)

Combining the above definitions, this article uses the term training quality as follows: Training quality is a training product that meets the training goals and output standards that the schools have set, meeting the needs of the student's conditions of learners and the requirements of society.

2.3. Hypothesis

State policies significantly affect training development in terms of the training scale, structure and quality. State policies affecting the quality of vocational training are reflected in the following aspects: Policies on labor, employment, and wages of trained workers; Regulations on responsibilities and relationships between training institutions and employers; and schools and production facilities. In short, the State's policies affect all stages, from input to the training process and the output of training institutions.

H1: State policies have a positive impact on the quality of human resource training in the renewable energy industry

Globalization and international integration trends affect the country's social life, including training activities. Globalization and integration require that the quality of vocational training in Vietnam be improved so that the products created meet the requirements of the market, the region, and the world. At the same time, it also creates opportunities for Vietnamese vocational education to approach advanced levels quickly. Science and technology development requires workers to promptly grasp and regularly study to master new technologies, requiring schools to

renew equipment for research and study. (Tien, N. H et al, 2020; Hieu, H. T et al, 2021)

H2: Socio-economic environment has a positive effect on the quality of human resource training in the renewable energy industry

The learning environment is an essential factor in determining the quality of training. Each training profession requires a system of facilities. Still, generally, the design of facilities in the school includes a method of theoretical classrooms, practice rooms, libraries, dormitories, and equipment for teaching such as textbooks, lesson plans, specialized blackboard systems, projectors, multi-function projectors, computers, internet, tables, models, videotapes, etc. very important, indispensable. It directly affects the school's training quality in addition to other assurance conditions such as teaching staff, programs, learning materials, etc. (Shuzhen, H., 2019; Tien, N. H et al., 2020)

H3: The learning environment has a positive impact on the quality of human resource training in the renewable energy industry

A training program is a system of subjects expressing training objectives, defining standards of knowledge, skills, ethical qualities (attitudes), scope and structure of training content, methods and forms of training, and methods of evaluating training results for each subject, discipline, training level of the training level. It is the standard to assess the quality of training in the school units. The training program must ensure the training objectives must provide the design to fit the general condition of the hardware by the governing body approved and agreed by superiors. In addition, schools must develop software (including discussion hours, field trips, and themed talks) to train students comprehensively in terms of professional knowledge, skills, and moral qualities ethics, which emphasizes practical capacity and a sense of social responsibility, ensuring learners' active learning and practical experience. (Tien, N. H et al, 2020; Hieu, H. T et al, 2021)

H4: Training programs have a positive impact on the quality of human resource training in the renewable energy industry

Lecturers play a decisive role in ensuring the training quality of the school units. Teachers are the ones who transmit knowledge, design and organize students' activities, guide careers, and inspire inspiration and excitement in the learning process of students. Lecturers also have a significant role in developing and stimulating students' creativity, helping students to form professional skills and techniques right from the time they are at school. (Tien, N. H et al, 2020; Hieu, H. T et al, 2021)

H5: Lecturers have a positive impact on the quality of human resource training in the renewable energy industry

Teaching is the process by which a teacher imparts to students a system of knowledge, skills, and techniques to develop their intellectual capacity and form a worldview. The object of the teaching process is human students with diverse perceptions, views, and emotions...making the teaching process a challenging and complicated activity. A teacher cannot teach well if he only masters the knowledge of one subject. That means, in addition to understanding that subject, the teacher has to know many other areas such as knowledge of related topics, psychology, communication, behavior, and handling of teacher situations. So, for teachers, teaching time and experience is a precious asset, playing a crucial role in improving the quality of training. (Tien, N. H et al, 2020; Hieu, H. T et al, 2021)

H6: Teaching methods have a positive impact on the quality of human resource training in the renewable energy industry
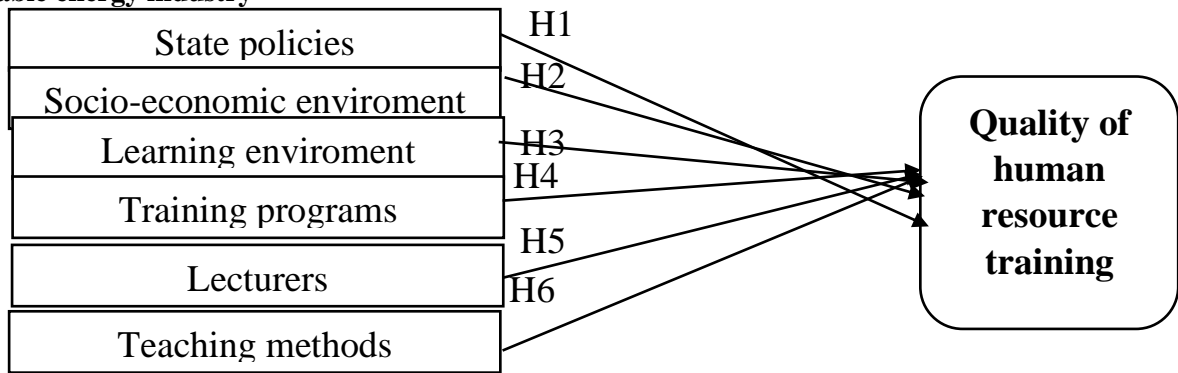

Figure 1. Model research

3. Methodology

The author collects through qualitative research with interview questions and quantitative analysis by conducting surveys.

The author carries out the research through the following steps: First, the research synthesizes the theory from previous studies to build a theoretical model. Secondly, using a group discussion technique with 48 students and trainees studying and researching at five universities to adjust and supplement measurement variables of factors affecting the quality of life amount of training. Third, consult with several managers and lecturers who have many years of directly teaching different training systems at universities and colleges on training

quality issues to adjust the variables measuring training quality. Fourth, the interview and discussion with the above participants were carried out by building a questionnaire focusing on issues related to the research topic. Fifth, for the results, after conducting interviews and discussions, most of the participants agree with the determination of influencing factors with the adjusted research model and also agree with the research model. with observed variables to measure training quality. The scale and research model have been calibrated with qualitative research, and the questionnaire has been prepared for quantitative analysis.

Quantitative research is carried out by collecting data through surveys and surveys with

questions attached to a scale. Teaching and learning activities are the leading determinants of the quality of training. Therefore, within the scope of the research topic, we will conduct an investigation and survey of learners to see how many factors affect the quality of training. We can expand and propose some solutions to improve the quality of training.

The research sample consisted of 485 valid observations collected from 500 distributed questionnaires. The author takes a convenient selection, but the model still ensures the randomness and representativeness of each university.

4. Results

All seven scales have the satisfactory Cronbach's Alpha coefficient since they are more significant than 0.6, and the correlation coefficients of the total variables are higher than 0.3; all remaining observations for seven scales were retained for EFA analysis.

Testing the reliability test construct using composite reliability (CR), the average variable extracted (AVE) is 0.50 or more (Hair Jr et al., 2017), shown in Table 2.

Table 2: Cronbach's alpha, CR, and AVE results

Code	Observed variables	Number of observed variables	Cronbach's alpha results	Composite reliability	Average variable extracted
SP	State policies	4	0.804	0.871	0.629
SE	Socio-economics environment	4	0.880	0.917	0.735
LE	Learning environment	4	0.879	0.925	0.805
TP	Training programs	4	0.775	0.870	0.690
LE	Lecturers	3	0.768	0.896	0.811
TM	Teaching methods	4	0.879	0.917	0.734
QHRT	Quality of human resource training	6	0.637	0.804	0.587

Although the findings of those research yielded a variety of outer loading criteria, the 0.7 standard is the most often employed in the great majority of situations (Hair Jr et al., 2016)

Table 3: Outer Loadings results

|	State policies	Socio-economics environment	Learning environment	Training programs	Lecturers	Teaching methods	Quality of human resource training
SP1	0.833						
SP2	0.882						
SP3	0.738						
SP4	0.756						
SE1		0.922					
SE2		0.882					
SE4		0.887					
SE3		0.873					
LE4			0.793				
LE2			0.825				
LE3			0.837				

	State policies	Socio-economics environment	Learning environment	Training programs	Lecturers	Teaching methods	Quality of human resource training
LE1			0.856				
TP1				0.901			
TP2				0.830			
TP3				0.716			
TP4				0.803			
LE2					0.878		
LE3					0.858		
LE1					0.835		
TM2						0.763	
TM1						0.812	
TM3						0.760	
TM4						0.886	
QHRT1							0.839
QHRT5							0.869
QHRT3							0.833
QHRT2							0.823
QHRT6							0.765
QHRT4							0.789

So, the overall evaluation research model can be expressed well, and we can further proceed with hypothesis testing analysis.

Table 4: Test Results Path Coefficient

	Hypothesis Test	P_value	Results
H1	State policies→ Quality of human resource training	0.041	Supported
H2	Socio-economics environment→ Quality of human resource training	0.000	Supported
H3	Learning environment→ Quality of human resource training	0.000	Supported
H4	Traning programs→ Quality of human resource training	0.008	Supported
H5	Lecturers→ Quality of human resource training	0.010	Supported
H6	Teaching methods→ Quality of human resource training	0.000	Supported

The results of the direct relationship analysis from Table 4 indicate that the hypothesis (H1, H2, H3, H4, H5, and H6 are accepted). (See Figure 2)
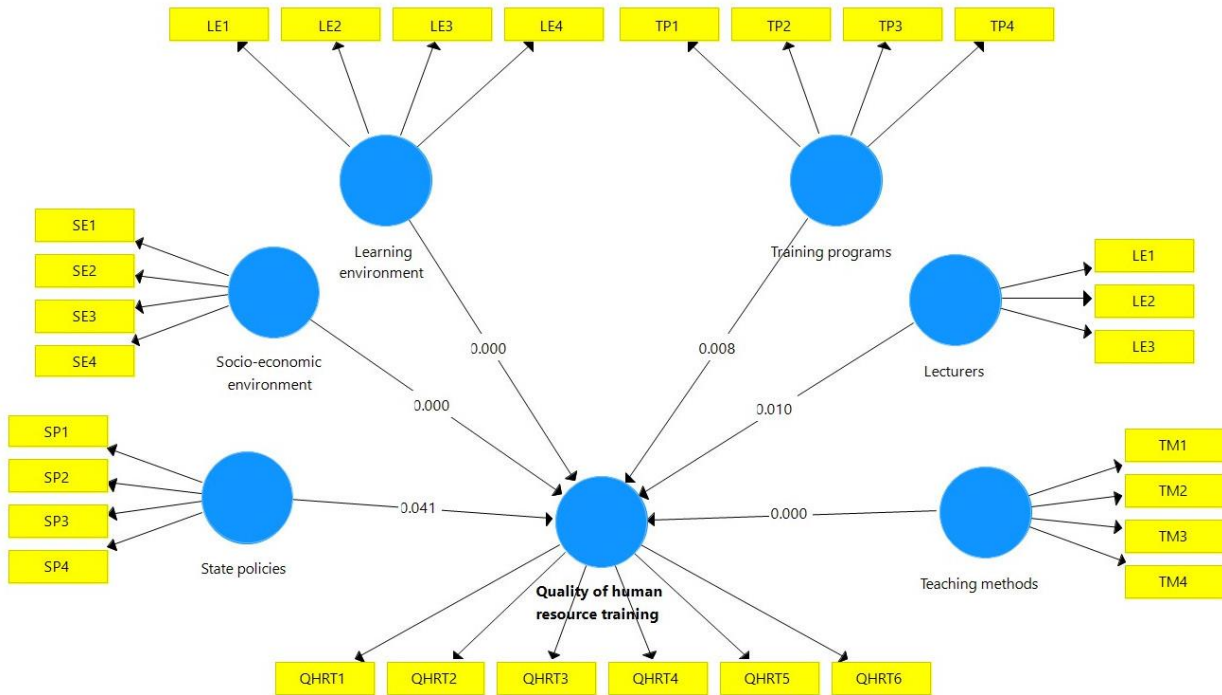
Figure 2. Bootstrapping results

5. Conclusion

Human resources play a decisive role, but different levels of development pose additional requirements for human resources. In the context of the scientific-technological revolution developing like a storm, in the current trend of economic globalization and the spread of the knowledge economy, to absorb and apply the achievements of humanity and create new knowledge.

From the above situation, there is an urgent requirement for Vietnam to improve the quality of human resources to meet the industrialization and modernization requirements associated with the knowledge economy's development. To enhance the quality of human resources, the province needs to focus on implementing the following essential solutions:

First, raise the society's awareness of the need to improve the quality of human resources. Although it has the advantage of population and a large labor force, Vietnam lacks a workforce with high technical expertise and skilled workers to meet the requirements of economic development - society. In today's era, when science-technology becomes a direct productive

force, improving the quality of human resources needs to be a top priority. However, not all levels, sectors, and people fully know this issue. Therefore, the province needs to promote propaganda to raise awareness for the whole society at all management levels, renewing thinking on human resource development towards openness and objectivity.

Second, it is necessary to do well in human resource development planning. It is essential to have a plan to break through to develop high-quality human resources: to build, foster and rationally use the contingent of leaders and officials. The management department is capable and has good moral character; improve the quality and efficiency of the use of science and technology staff such as: creating a favorable environment for them to be creative; budget investment for scientific research and retraining of science-technology staff; improve the material and spiritual life of this team so that they can work with peace of mind; select a contingent of cadres and civil servants with or without a position under the age of 40 who are good at foreign languages, have solid political qualities, and have good morals; Students with fairly good

academic performance and good foreign languages at economic and technical universities across the country prepare to graduate from university; students of high schools in the province, after passing the university entrance exam.... sent abroad for training in several economic, technical, undergraduate, masters and doctoral majors.

Third, develop a talent strategy, and implement policies that respect and reward talents. Up to this point, the province has no policy to attract talented people from many other localities to work. However, even to retain talented people, there is still no good policy - local people. In the coming time, Vietnam needs to form and develop a system of talent development organizations from the stage of detecting, fostering, and training from schools, and education classes for gifted children, to schools and universities. , graduate; it is necessary to improve the recruitment process to ensure the principle that it must be consistent with the trained professional, objectively, accurately but fairly; the arrangement of cadres must be reasonable based on professional capacity, suitable to jobs and titles; perfecting the planning for training, promotion, and appointment of staff to ensure the right people, the proper employment and promptly; implementing the reform of the salary, bonus and allowance regimes commensurate with their ability to contribute, responsibility and efficiency in work to encourage employees to be creative constantly; rent support, construction of apartment buildings on installment payments, support for means of work; eliminate the distinction between central officials stationed in the locality and officials managed by the locality.

Fourth, overcome the unreasonable situation of human resources such as lack of scientific-technical staff, high-level technical workers, the team with a foreign language, and computer skills... the province needs to continue to improve quality training in universities, colleges, and professional secondary schools, creating a breakthrough in vocational training, especially paying attention to vocational training for rural areas; there is a mechanism for linking universities, institutes, and research centers to train high-quality human resources; build quality vocational training institutions to meet the requirements of human resources for industry and tourism; supplementing vocational training functions and tasks for continuing education centers in districts and cities.

Fifth, promote international linkages and cooperation in human resource training, especially high-quality human resources in the following priority areas: human resources for state administration, economic experts, management business administration, information technology; promote the creative labor movement; effectively organize technical creativity contests.

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