A Green Skills Framework for TVET Curricula

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Abstract: *Knowledge, technical skills, and generic skills are quite a synonym in TVET curriculum, but apart from that, the industries are starting look for the manpower with competent in green skills. Besides, the green skills an alternative way to cultivate awareness on environmental and to protect and conserve the environment from climate change and pollution in order to stimulate sustainable development. This article aimed at exploring out the impact of the environmental policies on job opportunities; the domains and elements of green skills which required in green industries; the mismatch of domains and elements green skills between industries and institutions; and the green skills framework for TVET curricula. An exploratory sequential design is used in this study which consists of two-phases. Respectively, the first phase 11 experts in environmental aspect or green practice involve in order to get the consensus and Delphi technique apply, and 200 TVET academicians involve in the second phase. The data from this study is useful in order to reduce knowledge gaps and as the tools in order to revise the existing curricula framework due to the change of skill requirements.*

Keywords : *green skills, environmental,* **exploratory** *sequential design.*

I. INTRODUCTION

Previously, green skills have been practised among the gardeners, but now the situation is changing which the green skills are important among the people [1]. The importance of green practice appears since it has been applying the green economy model, green jobs, green technologies, and green industries [1]. Besides, green skills also important to protect and conserve environmental from climate change and pollution. According to Omar (2010), the main factor contributing to climate change and pollution are industrial, transportation, logging, and urbanization [2].

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The effect of climate change and pollution will bring to drought, flash flooding, global warming, hurricane, and so on [3]. Due to that, it will be effected on social and economies activities [4].

In the past, the effect of climate change events has killed human life; for example, in the United States in 2005 occurred Hurricane Katrina and killed 1,800 people [5]. Doocy, Daniels, Murray, and Kirsch (2013), were reported the highest consequence for humans on flood disasters was death [6]. Based on the report were more than five thousand deaths, three thousand injuries, and almost three million people affected due to flood events from 1980 until 2009 [6]. Sung, Ho, and Jonghyo, (2015), were reported the total affected due to climate change in Asia and the pacific was 6.02 billion people [7]. Due to the report, the total effect by types of climate change are; flood 3.35 billion people, drought 1.62 billion people, storm 871 million people, extreme temperature 10 million people, landslide 8.3 million people, and others 155 million people [7]. Besides that, climate change also brings chronic diseases. According to Abdul Rahman (2015), flood in risk for diseases, injuries, and infection such as diarrhea, food poisoning, cholera, and so on [8]. This is due to the human health effected from unclean water, sufficient food, residential, and social environment.

The main factor due to environmental problems is the lack of knowledge, skills, and attitude among people [1]. Through the past study, the knowledge among respondents was low [9], and most of the participants did not answer correctly regarding the simple question of attitude and knowledge on environmental [10]. Besides that, the majority of respondents did not know how to react before and after the event of climate change [11]. Al Buloshi and Ramadan (2015), the respondents did not sure about the government program for climate change and pollution [12].

Hence, education is one of way to emphasize the environmental practice. Education is a platform to gain knowledge, skill, and value for humans. Furthermore, higher education is one of the platforms to produce workers. Despite this, the workforce with green skills was demanded among the employer [13,14], but green skills are not fully implemented among students [1]. As reported by Benton (1994), the knowledge and attitude of environmental among faculty members were very low [15]. Agboola and Emmanuel (2016), they found the students did not clearly understand the climate change can be affected on agricultural yields [16]. Pruneau, Liboiron, Vrain, Gravel, Bourque, and Langis (2001), had reported the students did not know about the effect of the greenhouse, and they cannot answer correctly for one of the effects of climate change from human activities [17].

Due to that, the worker with green skills cannot be produced and do not fulfill the demanded among industry [1].

Thus, green skills are important among people and not only for gardeners.

II. GREEN SKILLS

Specifically, there are many studied that defined green skills and generally, it is regarding to the knowledge, technical skills, values, and attitudes which required at the industry to stimulate sustainable development on social, economic, and environment [18]. The demands of green skills existence when each country is shifting to the green economy model [19]. Because of that, the demands of green jobs which required green skills among employees have been started [20].

According to Lai, Zaime, and Foong (2018), green skills can be divided into three-dimensions, namely; (1) cognitive for example knowledge of concern towards environmental protection, (2) psychomotor for example the ability to minimize water and energy consumption, and (3) affective for example the attitude to conserve ecosystem and biodiversity [1].

Besides, according to Lai, Zaime, and Foong (2018), they found ten elements of green skills which required among industries such as; (1) design, (2) leadership, (3) management, (4) city planning, (5) landscaping, (6) energy, (7) financial, (8) procurement, (9) waste management, (10) communication [1]. Thus, this study will be developed a green skills framework for TVET curricula in order to fulfill the demand from green industries and to stimulate sustainable development.

III. OBJECTIVES

The objectives of this study are discussed as follows:
- To explore the impacts of environmental policies on the job market related to the green industries.
- To explore domains and elements of green skills required among the employers.
- To identify the comparison between the green skills required by employers and green skills supplied by TVET institutions.
- To develop and validate a new training framework for TVET curricular integrating green skills.

IV. RESEARCH DESIGN

In this study, an exploratory sequential design will be used, which consists of a qualitative and quantitative approach. Thus, this study will be conducted in two phases which is phase one to answer the objectives one, two, and three, and phase two to answer the fourth objective.

A. Population

Phase one in this study will be invited experts from green industries and TVET academicians which they are expert in green practice, and phase two will be involved all the TVET academicians in engineering fields as the population.

B. Sample

A sample of 11 experts from green industries and TVET academicians for the first phase will be chosen, and the second phase a total of 200 TVET academicians in engineering fields as respondents for this phase.

C. Sampling technique

Purposive sampling will be used in phase one, and the characteristics such as background qualification, job position, working experience, and knowledge of the environmental aspect or green practice will be considered. While for the second phase stratified random sampling will be used. The stratified random sampling is used because the population will be stratified into sub-sample based on three departments at the polytechnic and the sub-sample will be chosen randomly, and the formula of the calculation is;

$$\text{No of sub-sample (strata)} = \frac{Ni}{N} \times n$$

Where;

  Ni = No of academicians in the strata
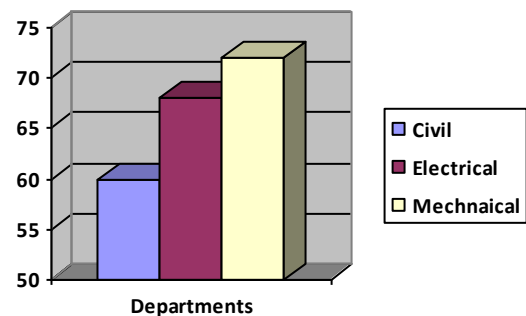 N = Total no of academicians in the population
  n = No of sample for the strata

Table- I: The sum of the sample size for sub-sample

Polytechnic academic departments	The numbers of the academicians	Sample size
Department of civil	957	60
Department of electrical	1092	68
Department of mechanical	1153	72
Total	N=3202	n=200

Referring Table-I shows the sub-sample for the department of civil is 60, the department of electrical is 68, and the department of mechanical is 72. The sum of the three departments will be got 200 sample sizes to fulfill the requirement for SEM.

Figure- I: Showing distribution of the sample size

D. Research instruments

A total of three instruments will be used to collect the data, namely:
- Document analysis- it will be used to identify and clarify the background of the green industries which were participating in ISO 14000.
- Protocol interview- in this study will be used the semi-structured interview to answer the objectives of first, two, and three, and at the same time, the Delphi technique will be implemented to get consensus among the experts in order to determine domains and elements of green skills.

- ▪ Questionnaire- the questionnaire will be used in the second phase of this study. All the random respondents will be answered, and the data are useful to develop the framework.

E. Data collection

The first phase, the data will be collected through the document analysis for certifying the green industries are involved in this study participate with ISO 14000, and next in-depth interview will be conducted to explore the core issue on the impacts of environmental policies on job market related to the green industries for graduate employability and to explore domains and elements of green skills which is required among employers. The interview session will participate 11 experts from green industries and TVET academicians and the Delphi technique will be conducted. The data will be recorded and transcribed by using a recorder, pen, and paper.

Next, after analyzing the data from the first phase, the set of the questionnaire will be administrated. A total of 200 respondents will be involved. The data will be analysed through the statistical analysis namely; 1) Exploratory Factor Analysis (EFA), 2) Confirmatory Factor Analysis (CFA), and 3) Structural Equation Modelling (SEM). As a result, a green skills framework for TVET curricula will be developed and validated.

V. CONCLUSION

The findings of this study is useful in order to narrow the knowledge gaps gaps and as the tools in order to revise the existing curricula framework. Specifically, there will have impacts of the environmental policies on the job market for graduate employability which the graduate must competent with the green practice for supporting the environmental policies and sustainable development. The consensus among expert will be present the domains and elements of green skills which required among the green industries and there no significant mismatch of domains and elements green skills between green industries and TVET academicians due to promote sustainable development on the economy, social, and environment. Lastly, a green skills framework for TVET curricula will be developed and validated in order to fulfill the demand of green industries which required the workers are competent with green skills.

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