ZIBELINE INTERNATIONAL PUBLISHING

Education, Sustainability And Society (ESS)
***DOI** : http://doi.org/10.26480/ess.03.2019.01.04*

ISSN: 2617-9415 (Online)
CODEN: ESSDAX

RESEARCH ARTICLE

NON-TECHNICAL SKILLS AMONG ENGINEERING GRADUATES: THE VALIDATION PROCESS OF INTERVIEW PROTOCOL INSTRUMENTS

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ARTICLE DETAILS

Article History:

Received 01 April 2019
Accepted 30 May 2019
Available online 10 June 2019

ABSTRACT

Electrical and Electronics engineering sector is an important contributor in Malaysia's economy as it is one of the twelve National Key Economic Area (NKEA) in the country's Economic Transformation Program (ETP). There are approximate 1,900 active Electrical and Electronics companies which provide over 35,000 engineers and manager positions. As universities received many complaints regarding to capability of engineering graduates especially in their non-technical skills which resulted non-industry-ready engineers. Less exposures to industrial training or also known as internship is one of the major reasons of the problems that can be fixed by organizing an intensive industrial training program for engineering students. In this paper, several processes of the instruments development and validation are discussed. To conduct an interview protocol, the instrument should be tested for its validity and trustworthiness. After these two processes are done, the instruments are ready to be used in the field study.

KEYWORDS

Engineering, industrial training, higher education, instrument validation, trustworthiness test

1. INTRODUCTION

Higher learning education is responsible in preparing standard curriculum in certain period of time in order for students to be equipped by emphasizing the knowledge and specific skills [1]. Recently, it have been recognized that fresh graduates have less knowledge and skills required by the industries that lead to unemployment issue [2,3]. As mentioned by Ismail (2012) and Rasul, Rauf, & Nor (2014), student development is not only measured in academic performance but also includes the soft skills and qualities required by the industries. Therefore, the challenge for university to provide enough career education to synchronize with the current demands of industries and able to provide skilled and competent graduates according to requirements of the industries [4].

Industrial training program are important to be well organised so that engineering students can gain the optimum non-technical skills which are really demanded by today's employers [5]. This training is an opportunity for undergraduate students to incorporate work-related experience and knowledge into their formal education in a university by taking part in supervised and planned work in real-world professional environments [6]. Industrial training is a platform for students to gain confidence and face challenges at work such as teamwork, working under pressure and dealing with people from all levels of the organization [7].

Rapid growth of electronics industry in Malaysia will demand a lot of competent engineers to be employed. Competencies can be developed effectively through industrial training [8-11].

In a study of identifying the current non-technical skills that are demanded by today's industries and in what way university can provide the best industrial training for their engineering students, two interview protocols instruments were developed and validated to make sure they can be used in the field study. The processes of development and validation will be discussed in the next section.

2. INTERVIEW PROTOCOL INSTRUMENTS DEVELOPMENT FOR EMPLOYERS AND INDUSTRIAL TRAINING COORDINATORS

The first instrument was developed to investigate and identified the non-technical skills needed by industries from engineers while the second instrument was developed to investigate the current practice of industrial training program based on several criteria which are students' placement, training duration, assessment, types of training and training outcomes. The sample for the first instrument would be the employers from industries which are the industry supervisor who has at least 10 years experiences in industries. On the other hand, the second sample is industrial training coordinator which are always among the lecturers in the universities. These instruments were adapted and modified based on Industrial Training Module by a researcher.

Assessment is one of the key elements to measure students' achievement during the industrial training. Many institutions in Malaysia use the concept of associated supervision that involve assessment of the institution (faculty supervisor) and evaluation of the supervisor (industry supervisor). One of the serious issues related to students' assessment during the training is the existence of gap between the assessment of lecturers from the university and the supervisor from the industry. A

researcher said that there are a lot of challenges faced by all parties involved in the assessment and evaluation and suggests that to minimize the gap, a process of empowering and strengthening all parties should be conducted [12].

Research results on assessing the practicum in teacher education conducted by Smith (2003) claimed the same argument where there is disagreement in the aspect of training assessment between mentor (lecturer) and the candidates (students). This disagreement is also common is also common among lecturers from universities and industries. A significant factor related to the existence of gap mentioned above is the lack of guidelines for assessing the industrial training.

The duration for students to undergo industrial training is another dominant issue raised by many parties. This is due to the difference in duration of the training across institutions and faculties. For example, in University of Malaya, the number of weeks students should undergo their training depends on their respective programme. For engineering students, the duration of their training is 10 weeks. Meanwhile, there are also differences in the same period in different university. For example, 20 weeks or five months of industrial training in Faculty of Computing, Universiti Teknologi Malaysia (UTM) and 32 weeks or eight months in Universiti Teknologi PETRONAS (UTP).

This prominent issue has captured the attention of many to investigate deeper into this situation. Result from the research conducted by a group of researchers on students' perception of training organisations in Ghana showed that 85% of the sample stated that industrial training should be longer than six weeks [13]. Thus, due to the differences of perception of the duration for the training, it is rational to look at it based on the standard period to accomplish all the intended outcomes of the training.

3. INTERVIEW PROTOCOL INSTRUMENTS VALIDATION PROCESS

The development of the interview protocol instruments is always based on previous studies with adaptation with current study. The type of interview is semi-structured interview which will make it less formal and allowing the researcher to ask new questions that not in the list as to get in deeper based on what been said by interviewee [14]. Thus, the interview session became more flexible and put both interviewer and interviewee comfortable as they feel more like casual chatting.

In this paper, both instruments are done based on theories or modules that have been studied before. After the interview questions are built, it has been validated based on construct and face. The validators are among the experts of the field which have done their researcher regarding on industry's demands and employability issues for construct validity and the expert in the instrumentation for face validity. There are two experts were chosen for construct validity while one expert for face validity. Original copies of the instruments were given to the both construct validity experts to validate the instruments. The expert will make sure the constructs are suitable to be asked an able to answer the research questions.

After corrections were done based on comments, a form was signed by the experts as proof. Next, the instruments were inspected by an expert for face validity. Face validity is more on language usage either is it understandable or not. The expert will make sure all the language, grammar, spelling is correct. The comments for the construct validity and face validity can be clearly seen in three tables below. These types of validation process for interview protocol instruments were used in several research such as previous researchers who were also studied about non-technical skills.

Table 1: Construct Validity Comments from Two Experts (Instrument for Employers)

Experts' Comments / Original Constructs	Expert 1	Expert 2
Opening	No major comments	No major comments
Introduction Demographic Profile	Expert suggested to remove several questions that are too personal or confidential.	Expert suggested to remove several questions that are too personal or confidential.
Key 1. Non-technical skill development 2. Factors that influence trainees' non-technical skill development	General comments: • Expert suggested to remove terms that might be confused when the questions is being ask to the interviewee. • Expert suggested to sort the questions accordingly to make sure the answers that will be given are related to each other. • Expert suggested to include the five keys from the second instrument. • Expert suggested to simplify the questions to make sure they are easy to understand.	General comments: • Expert suggested to add probe questions to guide interviewee to answer the questions accordingly. • The expert suggested to hide some of the probe questions to avoid bias data. The probe questions will be used when necessary. • Expert suggested to define several terms that might be important to be understood by the interviewee. • Expert suggested to add several questions which are important to every keys. • The researcher has met the expert two times for the validation.
Closing	No major comments	No major comments

As shown in Table 1, it lists all the comments from two experts for construct validity of instrument for employers. Generally, for opening and introduction, there were no major or critical comments. The researcher only needs to remove several questions that seems to be confidential or too personal. For keys of the interview protocol instruments, Expert 1 suggested to remove terms that might be confused for the interviewee to answer. This is very important to avoid wrong data collection. He also suggested to sort the questions accordingly. He said that the answers should be related to each other to make sure the data is fully elaborated and detail. The most important part is he suggested to include the keys from the second instrument to make sure the data is more valid. In addition, the researcher can get two different views from the same key. Lastly, Expert 1 suggested to simplify the questions to make sure no difficult terms used that might be confused the interviewee.

For Expert 2, he suggested the researcher to add probe questions to guide the interviewee in answering the questions accordingly. He said that this is the way to enrich the data. But, he suggested to hide the probe questions

to avoid biased data and only can be used when necessary. Furthermore, he suggested the researcher to define terms that are important to make sure the interviewee fully understand with the whole research. Some questions were added for each key to make sure the researcher can gather valuable data.

Table 2: Construct Validity Comments from Two Experts (Instrument for Industrial Training Coordinators)

Experts' Comments / Original Constructs	Expert 1	Expert 2
Opening	No major comments	No major comments
Introduction Demographic Profile	Expert suggested to remove several questions that are too personal or confidential.	Expert suggested to remove several questions that are too personal or confidential.
Key 1. Students' placement 2. Training duration 3. Assessments 4. Training 5. Learning outcomes	General comments: • Expert suggested to remove terms that might be confused when the questions is being ask to the interviewee. • Expert suggested to sort the questions accordingly to make sure the answers that will be given are related to each other. • Expert suggested to simplify the questions to make sure they are easy to understand. • Expert suggested to add questions to enrich the data that needed by the researcher.	General comments: • Expert suggested to add probe questions to guide interviewee to answer the questions accordingly. • The expert suggested to hide some of the probe questions to avoid bias data. The probe questions will be used when necessary. • Expert suggested to define several terms that might be important to be understood by the interviewee. • Expert suggested to add several questions which are important to every key. • The researcher has met the expert two times for the validation.
Closing	No major comments	No major comments

Based on Table 2, it lists all the comments from two experts for construct validity of instrument for industrial training coordinators. The comments are almost similar with the first instrument.

Table 3: Face Validity Comments from an Expert (Both Instruments)

Expert's Comments / Original Constructs	Instrument 1 (Employer)	Instrument 2 (Industrial Training Coordinator)
Opening	• Expert suggested to add some information regarding to terms and conditions that should be agree by the interviewee before starting the interview session (such as the data only will be used for education purpose, transcription will be validated by the interviewee and permission of voice recording). • Expert suggested to tell the estimated time of interview session to give a rough idea for the interviewee on how he/she will answer all questions according to the time. • Expert suggested the researcher to put the definition of important terms in this part.	• Expert suggested to add some information regarding to terms and conditions that should be agree by the interviewee before starting the interview session (such as the data only will be used for education purpose, transcription will be validated by the interviewee and permission of voice recording). • Expert suggested to tell the estimated time of interview session to give a rough idea for the interviewee on how he/she will answer all questions according to the time. • Expert suggested the researcher to put the definition of importantterms in this part.
Introduction	No major comment	No major comment
Key	General comments: • Expert suggested to remove questions that might be biased the data. • Expert suggested to sort the questions accordingly to make sure the answers that will be given are related to each other. • Expert suggested to simplify the questions to make sure they are easy to understand. • Expert suggested to add questions to enrich the data that needed by the researcher.	General comments: • Expert suggested to remove questions that might be biased the data. • Expert suggested to sort the questions accordingly to make sure the answers that will be given are related to each other. • Expert suggested to simplify the questions to make sure they areeasy to understand. • Expert suggested to add questionsto enrich the data that needed by the researcher.

	• Expert suggested to change some terms to simpler term which easy to understand • Expert have corrected some spelling and grammar errors. • Expert suggested to standardize the words used to avoid misunderstanding.	• Expert suggested to change some terms to simpler term which easy to understand • Expert have corrected some spelling and grammar errors. • Expert suggested to standardize the words used to avoid misunderstanding.
Closing	Expert suggested to ask questions that can summarized the whole interview.	Expert suggested to ask questions that can summarized the whole interview.

Based on Table 3, it lists all the comments from an expert for face validity for both instruments. Contrary with construct validity, face validity is more to language checking to make sure the instrument is easy to understand and can be used effectively in the field study. The expert suggested to add several statements to clarify the interviewee. If the interviewee agrees with all the conditions, the interview may start. Overall comments for key questions, they were almost similar to the construct validity. In addition, the expert has corrected the spelling and grammar error of the instruments. Finally, for closing, the expert suggested to add a question that can summarize the whole interview.

4. DISCUSSIONS AND CONCLUSIONS

In conducting a research, validity and reliability aspects are important. This depends on the researcher to assure the instruments can be used in the field study. A group of researchers has mentioned that the reliability of a research will be questioned if anything seems not right or vague [15]. Before the instruments out for the field study, a pilot study will be done to a focus group by including two interviewees for each instrument. This method is done based on a Ph. D thesis by a scholar. For reliability purpose, a process which is called respondent validation will be done after transcription process [16]. This is important for interviewee to verify and clarify the interview transcripts to make sure the findings and data are valid for the study. Besides, this will give more confident of the data validity for the researcher [17-19].

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