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Non-Technical Skill Level of Electrical Engineering Undergraduates Using the Rasch Measurement Model

Aini Najwa Azmi, Yusri Kamin, Muhammad Khair Noordin, and
Ahmad Nabil Md. Nasir

Abstract--- *Currently, employers seek employees, especially fresh graduates, to have good non-technical skills. They complain that the engineering students lack in non-technical skills but good in technical skills. Thus, it is the responsibility of the university to equip students with enough non-technical skills before entering a competitive workplace. Industrial training provides an opportunity for students to develop their non-technical skills. This study determines the non-technical skills level of electrical engineering undergraduates using the Rasch Measurement Model (RMM). The questionnaire was distributed to 326 electrical engineering undergraduates who had undergone their industrial training from seven public universities in Malaysia after the questionnaire has passed the reliability and reliability tests. The finding shows that the level of overall non-technical skills after industrial training is at Moderately Low. When the non-technical skills are looked as individual skills, the findings show that communication skills, critical thinking, and problem-solving skills and teamwork skills are at Moderately Low and Low levels, respectively. However, other skills like entrepreneur skills, engineering ethics, lifelong learning and computing skills are at Very High Level. To make sure the students can develop those Moderately Low and Low-level skills, the issues in the industrial training involving placement, training duration, type of training/task given, and assessment should be reduced to make sure students can gain the most valuable training which benefits all the parties who are industries, universities, and students.*

Keywords--- *Non-Technical Skills, Industrial Training, Engineering, Rasch Measurement Model (RMM).*

I. Introduction

The Ministry of Higher Education (MOHE) Malaysia needs to ensure the relevance of all the education curriculums with the development of technology in the era of the 4th Industrial Revolution (IR 4.0) which stated in Malaysia Education Blueprint 2015-2025; Higher Education (Kementerian Pendidikan Malaysia, 2012). Statistically, approximately of 350,000 students in technical studies are recorded; who are from certificate to postgraduate levels or 30% from all students in all higher learning institutions in Malaysia (Baharom, Hamid, Yusoff, Ihsan, & Yassin, 2018). Board of Engineers Malaysia (BEM) and Malaysia Qualification Agency (MQA) are the bodies that are responsible for the government to conduct accreditation of technology and engineering programs to enhance the standard of engineering education in Malaysia. An organisation which is under BEM is

Aini Najwa Azmi, Department of Technical and Engineering Education, School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia, UTM, Skudai, Johor Darul Takzim, Malaysia. E-mail: aininajwa.azmi@gmail.com
Yusri Kamin, Department of Technical and Engineering Education, School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia, UTM, Skudai, Johor Darul Takzim, Malaysia. E-mail: p-yusri@utm.my
Muhammad Khair Noordin, Department of Technical and Engineering Education, School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia, UTM, Skudai, Johor Darul Takzim, Malaysia. E-mail: mdkhair@utm.my
Ahmad Nabil Md. Nasir, Department of Technical and Engineering Education, School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia, UTM, Skudai, Johor Darul Takzim, Malaysia. E-mail: ahmadnabil@utm.my

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known as the Engineering Accreditation Council (EAC) accredits engineering programs to be recognised in 18 countries; which include Canada, Turkey, United Kingdom, United States, South Africa, Japan, China, Korea, Singapore, Chinese Taipei, Turkey, Australia and Canada (Baharom et al., 2018).

The universities play an essential role in producing quality engineering graduates with all the skills that enable them to become problem solvers and innovation creators (Baharom et al., 2018; Noordin, 2014). EAC has set seven elements that include Programme Educational Objectives (PEOs), Programme Outcomes (POs), Academic Curriculum, Students, Academic and Support Staff, Facilities and Quality Management Systems (Engineering Accreditation Council Manual, 2017). Industrial training is one of the components that is compulsory to be evaluated, and the engineering undergraduates are required to undergo training for at least eight weeks (Engineering Accreditation Council Manual, 2017). It is supposedly will be the opportunity for engineering students to expose to the work environment and incorporate theories with practices (Azmi, Noordin, Kamin, & Nasir, 2018). Based on Semedo, Newman-Ford, Lloyd, & Thomas (2010), industrial training can provide effectively in developing technical and non-technical skills demanded by the industry when they are still pursuing their study. Thus, they are career-ready once they are graduated. But, recently, in Malaysia, there is too much concerning the gap of competence graduates with industry expectations (Renganathan, Ambri, Abdul, & Li, 2013).

In the Final Report Engineering and Technology Labour Market Study among Engineers Canada and Canadian Council of Technicians and Technologists (2009), engineering graduates were reported having a problem in non-technical skills, for example, communication skills, teamwork, critical thinking, and problem-solving skills and entrepreneur skills. However, most of the employers were satisfied with their technical skills (Hanapi, Safarin, & Che, 2015). A similar result can be found in Rasul, Rose, & Mansor (2013) that have cited Ramlee & Greenam (2002) that showed employers complain about Malaysian engineering graduates lack of non-technical skills. Today's employers need engineering graduates who are good in technical skills but in non-technical skills too (Azmi, Kamin, Noordin, & Nasir, 2018; Noordin, 2014). Non-technical skills are the added values for the engineering graduates to be more employable in the 21st-century industry. Still, technical skills are also important. It is important for engineering graduates to be equipped with non-technical skills to complement their technical skills (Noordin, 2014). Given the identified skills gap between fresh engineering graduates and employers, universities responsible to be more creative in developing the graduate skills set, to embed technical and non-technical skills into an academic curriculum and to do so within a framework of educational learning (Wrye, Chafin, & Higginbotham, 2019).

Furthermore, students feel that their critical thinking and problem-solving skills are good, but the employers in the industries feel that their non-technical skills are at the intermediate level (Husain et al., 2013; Ramlee Mustapha et al., 2008). The gap between students' and employers' perceptions will give an impending problem for fresh engineering graduates to be hired once they are graduated (Rasul, Abd Rauf, Mansor, & Puvanasvaran, 2012). Based on Rasul et al. (2014), an employee who is high in critical thinking and problem-solving skills, according to the employers could demonstrate creative and innovative thinking. They can generate new ideas and able to decide the best alternative as can be seen in Zaharim, Yusoff, Omar, & Mohamed (2009)'s gap analysis between perception and expectation of employers towards engineering graduates in Malaysia. The importance of non-technical skills can

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be seen clearly in Figure 1 when the highest rating went for communication skills when the employers rated 86.7%. Teamwork skills seem to be the second highest with 85.1%, followed by problem-solving skills with 84.6% respectively. However, competence in application and practice is the technical skill where it was ranked in second place after a non-technical skill with 85.5%. The statistics show that the importance of non-technical skills to be equipped with engineering graduates to be competent engineers. Besides, as can be found in Rao (2014), a study from the Carnegie Foundation and the Stanford Research Institute reveals that technical skills and knowledge account for about 15 percent of the reason an individual gets a job, keeps the job and advances in that job. The remaining 85 percent of job success is based on the individual's ‘‘people skills.”. Furthermore, factors of the unemployment occur because the graduates are lack of non-technical skills such as leadership skills, communication skills, teamwork skills, problem-solving skills, entrepreneurial skills, critical thinking and creative skills (Roslidawati, 2015). While a study by Ayub (2014) describes, the graduates do not get jobs after graduation are caused by problems with communication skills, attitude and low self-esteem (Tajuddin et al., 2014).

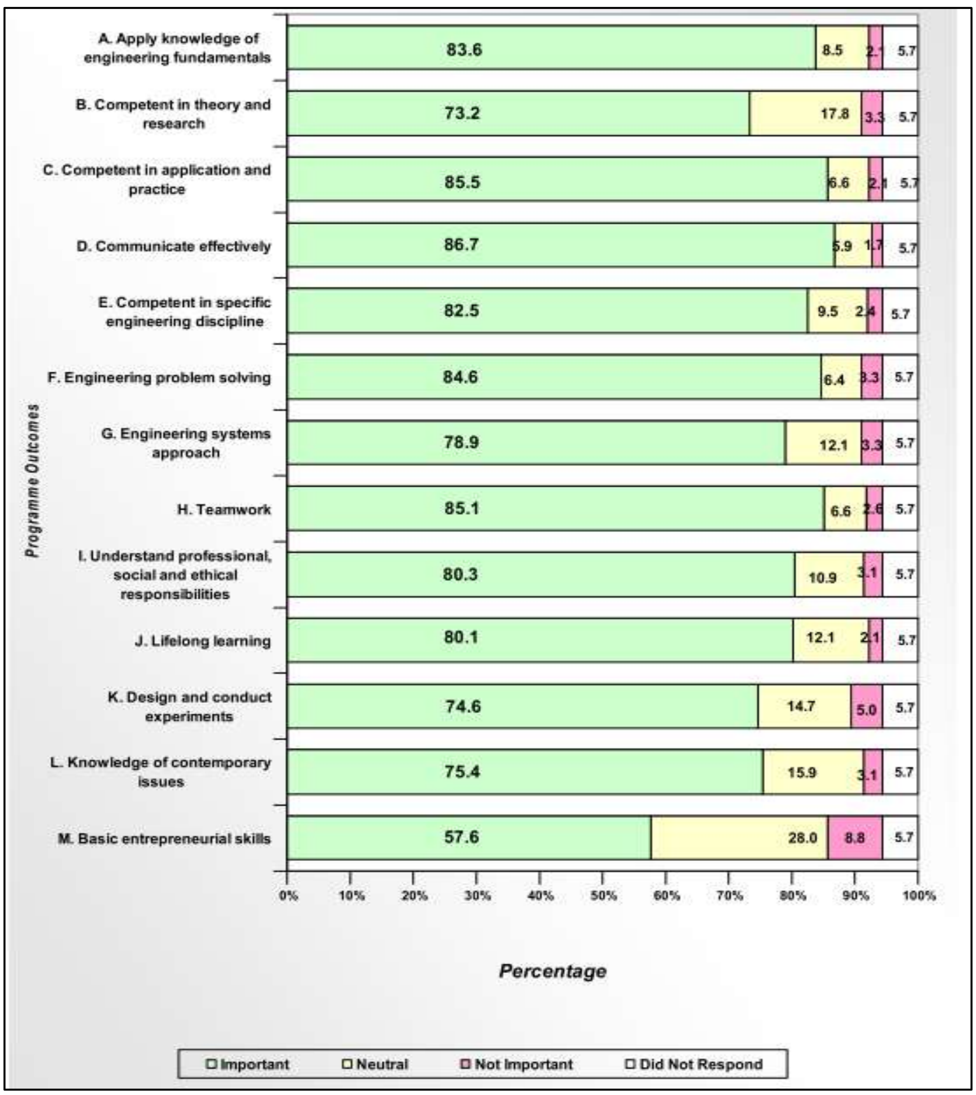

Figure 1: Employer's Expectation of Technical and Non-Technical Attributes of their Engineering Workforce

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Thus, it is necessary to measure the non-technical skills levels of engineering students after undergone industrial training from public universities in Malaysia to measure the effectiveness of industrial training programs based on four factors which are the placement of training, duration, assessment and type of training or task given. A questionnaire is developed to measure students' non-technical skills after industrial training. Item in the questionnaire is evaluated by using the Rasch Measurement Model (RMM). Furthermore, analysis computed from RMM which are person measures and item measured are utilized to identified the level of student's non-technical skills after undergone industrial training. RMM is an Item Response Theory (IRT) based model which becomes the chosen model in examining the quality of items due to its advantages compared to the Classical Test Theory (CTT). Instead of using the raw score as the true score to indicate students' ability in CTT, RMM converts raw-score to measure on the logit scale using logistic transformation to provide better interpretation of the students' ability (Bond & Fox, 2007). In order to develop a quality instrument, RMM has been broadly used by many researchers (Abd. Aziz et al., 2008).

II. RESEARCH METHODOLOGY

Based on Industrial Master Plan 3 (IMP 3), electrical and electronics industries contribute the highest employment at 26.8%. Also, electrical products, electronic parts, and components become the major export items. To enhance Malaysia as a major trading nation, Malaysia should be intensifying export of products of targeted growth areas and electrical products, electronic parts and components are the first products in the list. Therefore, the population for this study is final year electrical engineering students who have undergone industrial training in their third year of study. The total of respondents is 326 students from seven public universities, which were purposely selected. Respondents were chosen from electrical engineering faculty/department/school from seven public universities in Malaysia. The number of sample sizes for each faculty/department/school could not be in the same amount due to the different number of students. The highest respondents were from University A with 101 students, while the lowest was from University G, with only 16 students responded in this study. Refer to Table 1.

Table 1: Sample Size for Field Study

Universities	Sample Size for each Faculty/Department/School
University A	101
University B	65
University C	59
University D	22
University E	21
University F	42
University G	16
Total Sample Size	**326**

In the development of a questionnaire Aziz, Zaharim, Fuaad, & Nopiah (2013) mentioned that the development of the constructs should be based on the theories and concepts. In this research, the questionnaire has two constructs which are non-technical skills development during industrial training, and factors that influence student's non-technical skills during industrial training. The constructs, sub-construct, and dimensions are based on need analysis involving literature review and expert interviews. Tables 2 and 3 show the item distribution for every dimension for both constructs. The total items of both constructs are 80.

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Table 2: Item Distribution for the First Construct

Construct	Dimensions	Item	Number of Items
1	**Non-technical skills development during industrial training**		**Total Questions: 43**
	Communication Skills	1,2,3,4,5,6,7,8	8
	Critical Thinking and problem-solving skills	9,10,11,12	4
	Entrepreneur skills	13,14,15,16,17,18	6
	Engineering Ethics	19,20,21,22,23,24	6
	Lifelong learning	25,26,27,28,29,30,31	7
	Teamwork	32,33,34,35,36,37,38	7
	Computing skills	39,40,41,42,43	5
	TOTAL		**43**

Table 3: Item Distribution for the Second Construct

Construct	Dimensions	Item	Number of Items
2	**Non-technical skills development during industrial training**		**Total Questions: 37**
	Placement	44,45,46,47,48,49	6
	Duration	50,51,52,53,54,55,56	7
	Training/Task	57,58,59,60,61,62,63	7
	Assessment	64,65,66,67,68,69,70	7
	Motivation	71,72,73,74,75	5
	Faculty Support	76,77,78,79,80	5
	TOTAL		**37**

The questionnaire went through to a few validity and reliability tests before it is ready to be distributed to the selected respondents. The questionnaire content was validated by three experts who were the academicians from the technical and engineering education field. Besides, the rater agreement of the experts was calculated by using the Fleiss-Kappa analysis. The analysis can indicate the validity and reliability of the items as referred to Miles & Hubberman (1994) as cited in Hassan (2012). The value of Fleiss Coefficient Value (k) for the questionnaire is 0.95 for both constructs indicated that the items in the questionnaire are applicable and appropriate to be used in this study. Besides, a pilot study was done to the 36 selected respondents. Statistics analysis was done to indicate the reliability and separation of the items. Based on the summary statistic, the item reliability was 0.71, and the item separation was 2, which fulfil the criteria (Bond & Fox, 2007; Linacre, 2015).

Furthermore, statistic analysis by using the Rasch Measurement Model was used to find the Point Measure Correlation values (PTMEA CORR) to all items. The PTMEA CORR value must be a positive value to make sure the item is measuring what it is supposed to measure. Based on the analysis, the value of PTMEA CORR for all constructs is between 0.26 and 0.92.

Also, fit statistics were done to check the infit Mean Square (MNSQ) and Z Standard (ZSTD). Based on Linacre (2010), the value of infit or outfit MNSQ in the range of 0.5 until 1.5. If the MNSQ value for an item is more than 1.5, the item is maybe confusing or unpredictable. On the other hand, if the MNSQ value is less than 0.5, the item is too easy to answer by the respondents. Based on the analysis, all the items are in the range. For ZSTD, the acceptable values are between -2 and 2, where the analysis shows all the values are within the range (Bond & Fox, 2007).

In addition, the standardized residual correlation was done to check either one item is correlated to another item or not which the value should not more than 0.7. Based on the analysis, all the value of the standardized residual

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correlation is less than 0.7 show no correlation between items.

Lastly, in order to check the unidimensionality of each sub-construct and dimension, the eigenvalue of Raw Variance Unexplained in 1st contrast should be less than 3 in practical. Based on the pilot study analysis, most of the eigenvalues for raw variance unexplained variance in first contrast are less than three, except for sub-construct teamwork, in which the eigenvalue is slightly more than three, which is 3.1. However, the value is acceptable since some experts said that the eigenvalue could be less than five (Suhairom, 2015). As a conclusion, all the items passed the reliability and the validity test and can be used in the field study.

The non-technical skill level was interpreted by finding the threshold (cut value) by calculating based on the formula H = (4Q +1)/3, where Q is item separation which is obtained from the Winstep (Suhairom, 2015; Yusof 2019). Next, the respondents were classified based on the value of the person measure (logit value).

III. RESULTS OF ANALYSIS

To find the non-technical skills level, only the findings from the first construct was interpreted. The data obtained from 326 respondents from seven public universities in Malaysia, which is non-technical skills development during industrial training (Construct 1), has resulted in the item reliability of 0.97 with item separation of 6.08 (rounded to 6). High reliability and high separation have indicated that the sample in the study is large enough to confirm the hierarchy. Refer to Table 4.

Table 4: Item Statistics

Item Reliability	0.97
Separation	6.08
Strata	6 levels of abilities
Mean	0.00
Standard Deviation	0.54

Six levels of abilities are classified as Very Low, Low, Moderately Low, Moderately High, High and Very High. Table 5 shows the threshold range and threshold logit. Respondents who have person logit less or equal to -2SD (-1.08) are classified as Very Low in non-technical skill development during industrial training. On the other hand, respondents who have person logit more or equal to +2SD (+1.08) are classified as Very High in non-technical skills development during industrial training.

Furthermore, the Low and High levels are classified in the ranges of -1SD to-2SD (-1.08 to -0.54) and 1SD to 2SD (0.54 to 1.08), respectively. Finally, the Moderately Low and Moderately High levels are classified in the ranges of -1SD to Mean (-1.08 to 0.00) and Mean to 1SD (0.00 to 0.54), respectively.

Table 5: Threshold Logit of Non-Technical Skill Development Levels

Non-technical skills development during industrial training	**Threshold Range**	**Threshold Logit**
Very Low	≤ -2SD	≤ -1.08
Low	-2SD < Low < -1SD	-1.08 < Low < -0.54
Moderatey Low	-1SD ≤ ML < Mean	- 0.54 ≤ ML < 0.00
Moderately High	Mean ≤ MH < 1SD	0.00 ≤ MH < 0.54
High	1SD ≤ High < 2SD	0.54 ≤ High < 1.08
Very High	≥ 2SD	≥ 1.08

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As can be seen in Table 6, the Mean Ability Logit showed that the overall non-technical skills development among the students during their industrial training is -0.48 which is judged as Moderately Low. Figure 6 shows the distribution of respondents in non-technical skills development according to levels. It is proven in the bar graphs when only 5.52% of respondents are in the Very High level while 26.69% and 23.62% are in Low and Very Low levels, respectively.

The same finding is found in sub-construct Communication Skills when the Mean Ability Logit is found to be -0.35 and is indicated as Moderately Low. Figure 2 shows the distribution of respondents in non-technical skills development according to levels Communication Skills. It is proven in the bar graphs when only 13.8% of respondents are in the Very High level while 25.77% and 34.05% are in Moderately Low and Very Low levels, respectively.

Table 6: Mean Ability Logit for Overall Non-Technical Skills and Each Skill

Construct and sub-constructs	Mean Ability Logit	Judgment
Overall non-technical skill	-0.46	Moderately Low
Communication skills	-0.35	Moderately Low
Critical Thinking and Problem-solving skills	-0.89	Low
Entrepreneur skills	2.04	Very High
Engineering Ethics	2.86	Very High
Lifelong Learning	2.84	Very High
Teamwork	-0.68	Low
Computing skills	2.25	Very High

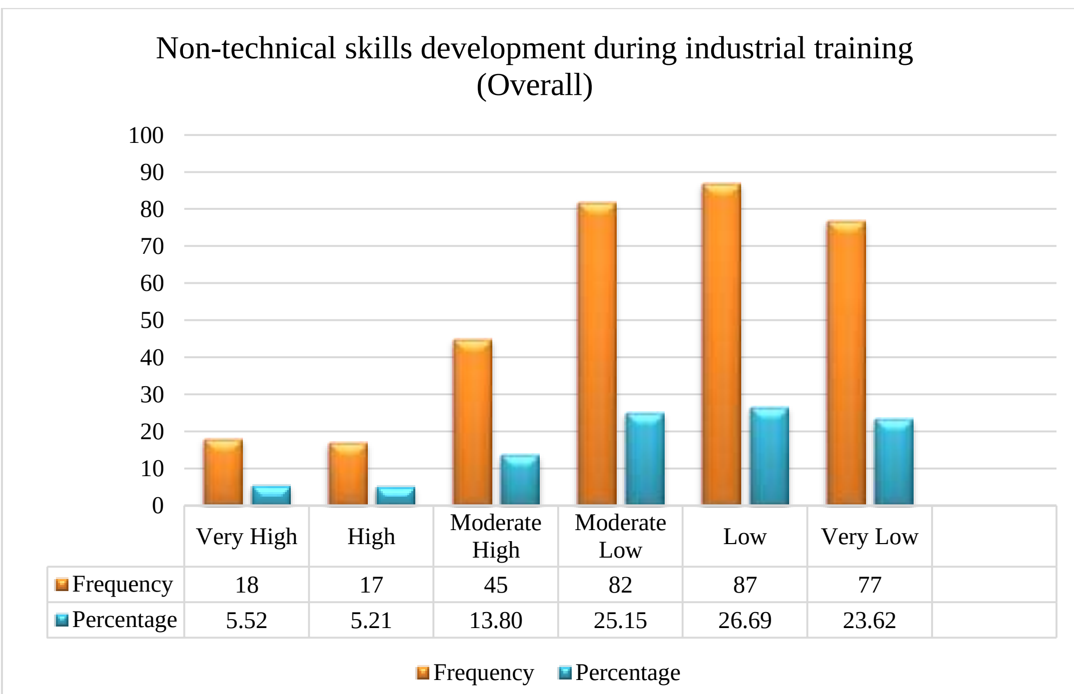

Figure 2: The Distribution of Respondents in Non-Technical Skills Development According to Levels (Overall)

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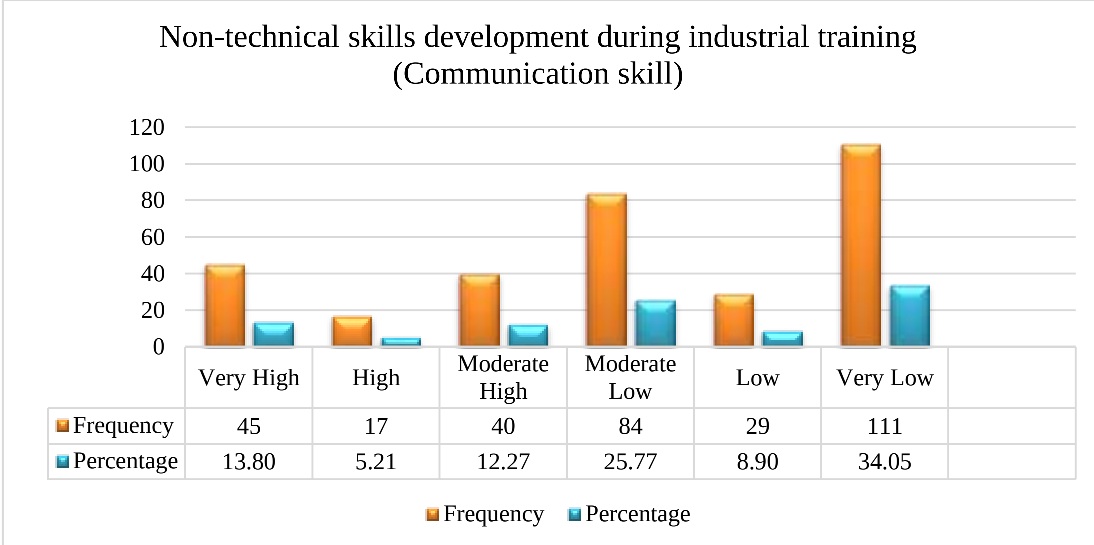
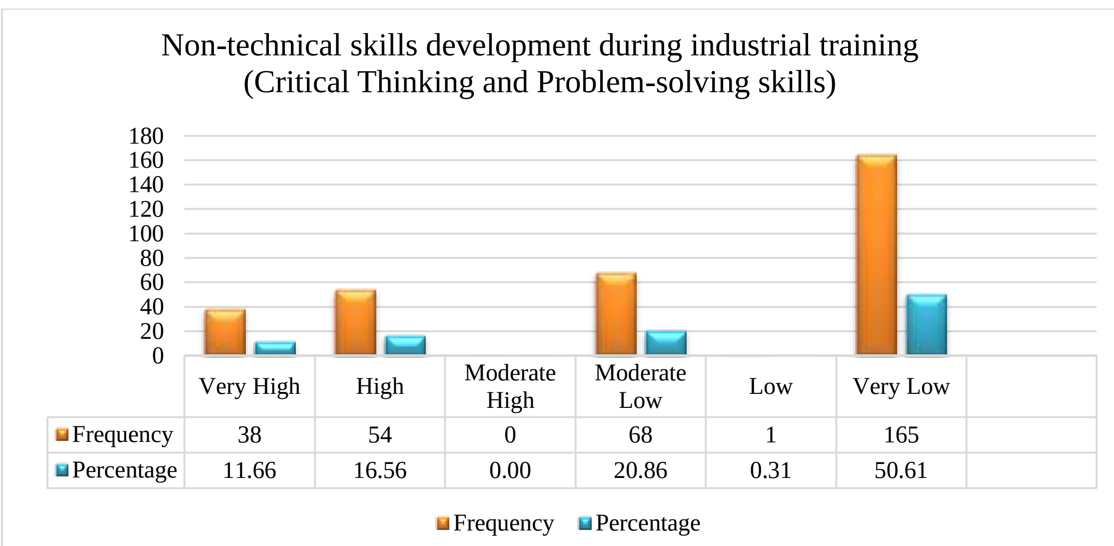


	Very High	High	Moderate High	Moderate Low	Low	Very Low
Frequency	45	17	40	84	29	111
Percentage	13.80	5.21	12.27	25.77	8.90	34.05

Figure 3: The Distribution of Respondents in Non-Technical Skills Development According to Levels (Communication Skills)

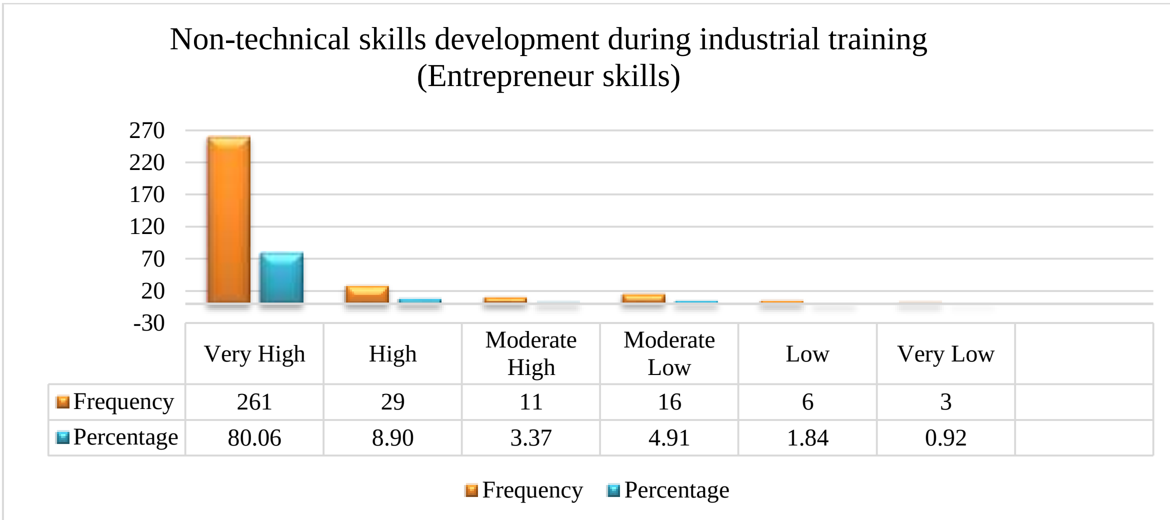
Furthermore, Critical Thinking and Problem-solving skills are another skill that has the Mean Ability Logit -0.89 and is indicated as Low. Figure 4 shows the distribution of respondents in non-technical skills development according to levels for Critical Thinking and Problem-solving skills. It is proven in the bar graphs when only 11.66% of respondents are at the Very High level while 20.86% and 50.61% are in Moderately Low and Very Low levels, respectively.



	Very High	High	Moderate High	Moderate Low	Low	Very Low
Frequency	38	54	0	68	1	165
Percentage	11.66	16.56	0.00	20.86	0.31	50.61

Figure 4: The Distribution of Respondents in Non-Technical Skills Development According to Levels (Critical Thinking and Problem-Solving Skills)

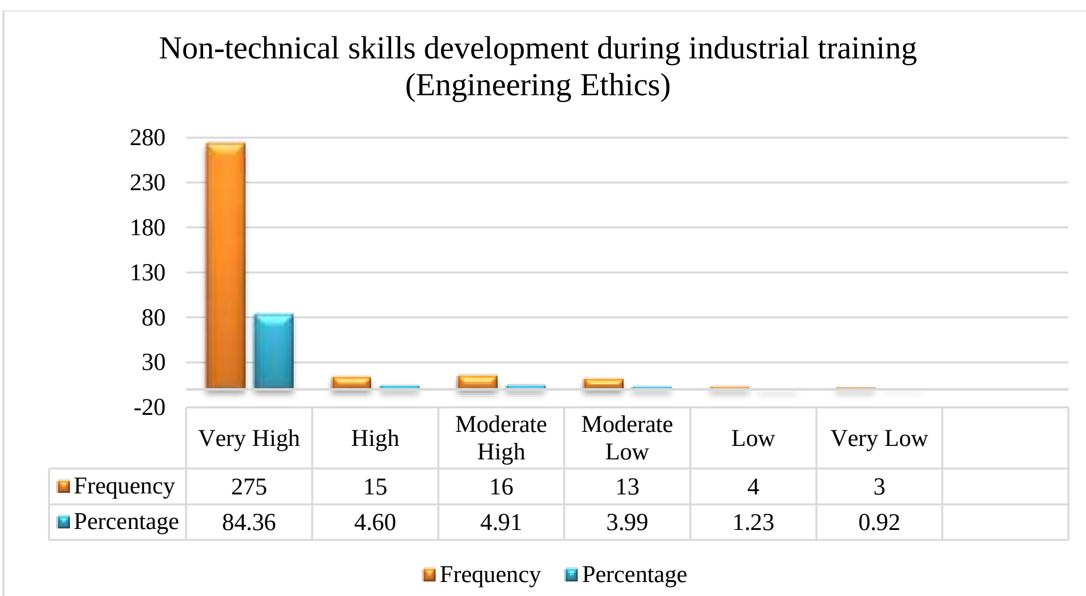
On the other hand, Entrepreneur skills showed different findings when the Mean Ability Logit is 2.04 and judged as Very High. The result indicated that the entrepreneur skills of the students are very high during their industrial training. Figure 5 shows the distribution of respondents in non-technical skills development according to levels for Entrepreneur Skills. It is proven in the bar graphs when 80.06% is in the Very High level, and only 0.92% is in the Very Low level.



	Very High	High	Moderate High	Moderate Low	Low	Very Low	
Frequency	261	29	11	16	6	3	
Percentage	80.06	8.90	3.37	4.91	1.84	0.92	

Figure 5: The Distribution of Respondents in Non-Technical Skills Development According to Levels (Entrepreneur Skills)

Moreover, Engineering ethics among students is very high during industrial training. It is proven when the Mean Ability Logit is 2.04 and judged as Very High. Figure 6 shows the distribution of respondents in non-technical skills development according to levels for Engineering ethics. It is proven in the bar graphs when 84.36% is at a Very High level, and only 0.92% is at a Very Low level.



	Very High	High	Moderate High	Moderate Low	Low	Very Low	
Frequency	275	15	16	13	4	3	
Percentage	84.36	4.60	4.91	3.99	1.23	0.92	

Figure 6: The Distribution of Respondents in Non-Technical Skills Development According to Levels (Engineering Ethics)

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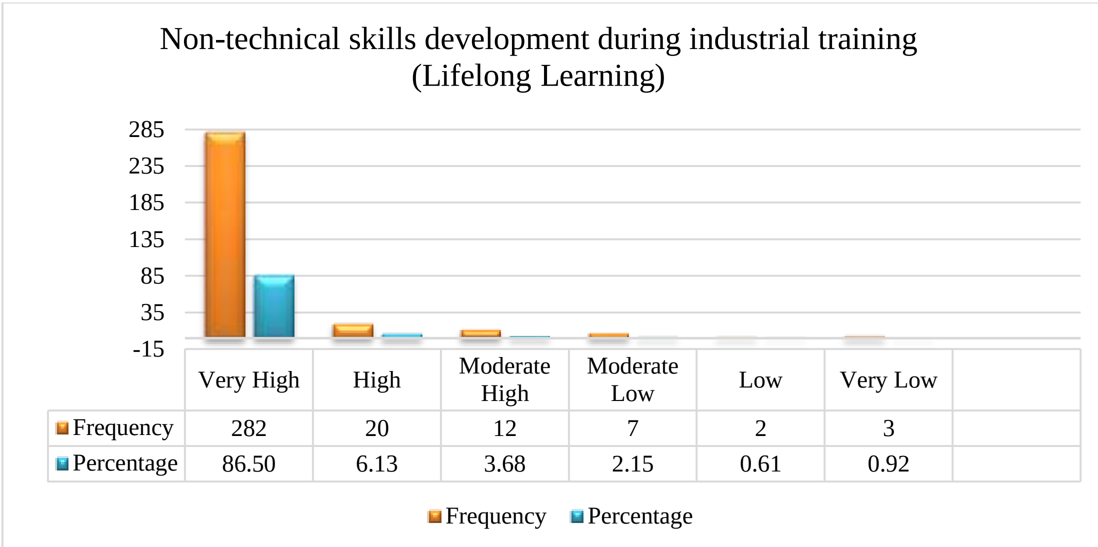
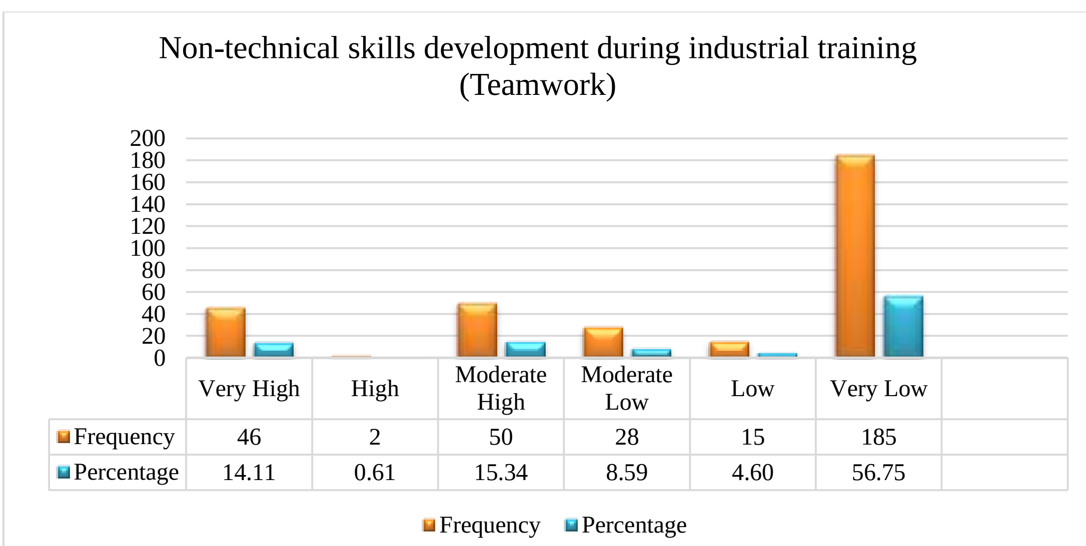


	Very High	High	Moderate High	Moderate Low	Low	Very Low
Frequency	282	20	12	7	2	3
Percentage	86.50	6.13	3.68	2.15	0.61	0.92

Figure 7: The Distribution of Respondents in Non-Technical Skills Development According to Levels (Lifelong Learning)

A similar finding was found in Lifelong Learning when the Mean Ability Logit 2.84 and is judged as Very High. Figure 7 shows the distribution of respondents in non-technical skills development according to levels for Lifelong Learning. It is proven in the bar graphs when 86.50% is at a Very High level, and only 0.92% is at a Very Low level, respectively.

On the contrary, Teamwork is another skill that has the Mean Ability Logit -0.68 and is judged as Low. It is indicated the teamwork skills among the students are relatively low. Figure 8 shows the distribution of respondents in non-technical skills development according to levels for Teamwork skills. It is proven in the bar graphs when only 14.1% of respondents are in the Very High level while 56.75% in Very Low levels, respectively.



	Very High	High	Moderate High	Moderate Low	Low	Very Low
Frequency	46	2	50	28	15	185
Percentage	14.11	0.61	15.34	8.59	4.60	56.75

Figure 8: The Distribution of Respondents in Non-Technical Skills Development According to Levels (Teamwork)

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Finally, the Mean Ability Logit for Computing skills has resulted as 2.25 which is indicated as Very High. Figure 9 shows the distribution of respondents in non-technical skills development according to levels for Computing skills. It is proven in the bar graphs when 74.85% of respondents are at the Very High level while only 0.92% of the respondents at the Very Low level, respectively.

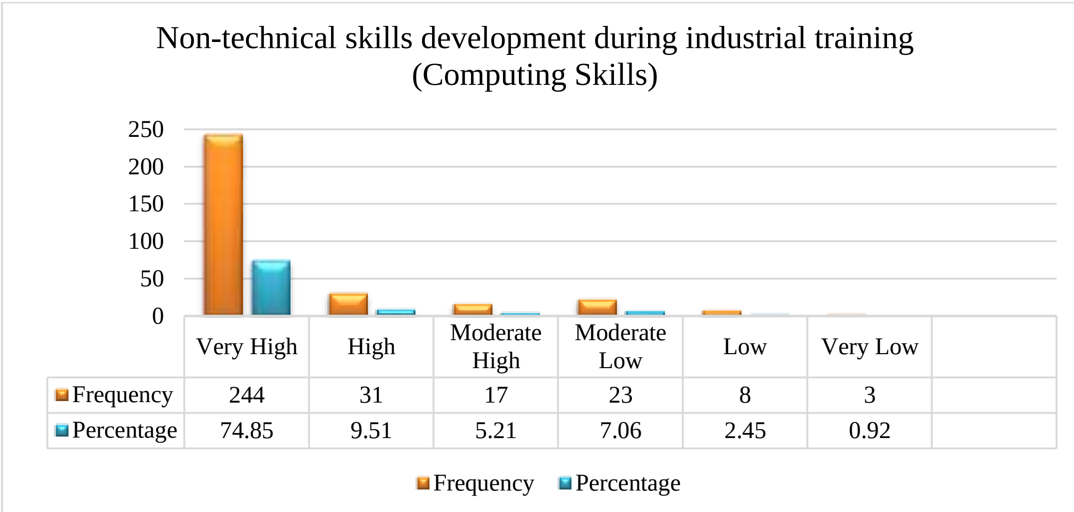

Figure 9: The Distribution of Respondents in Non-Technical Skills Development According to Levels (Computing Skills)

As a summary, it can be seen that the overall non-technical skills development during industrial training is moderately-low. Based on the results, students are still having problems in communication skills, critical thinking, and problem-solving skills and teamwork skills. Otherwise, results showed that entrepreneur skills, engineering ethics, lifelong learning, and computing skills are fine among them.

IV. DISCUSSIONS

The researcher is intended to find the level of trainees' non-technical skills among electrical engineering students during industrial training. The findings of the person separation value from the first construct can do the hierarchy of the trainees' non-technical skills. Firstly, the overall level of trainees' non-technical skills during industrial training is at a Moderately low level. The result proves the findings in Hanapi, Safarin, & Che (2015) and Rasul, Rose, & Mansor (2013). Moreover, it is important for engineering graduates to be equipped with non-technical skills to complement their technical skills. The case becomes worse when industries are starting to argue about fresh graduate engineers lack of non-technical skills (Husain et al., 2013; Muhammad Khair & et al., 2016; Rasul et al., 2013). In research by Rasul, Ismail, Ismail, Rajuddin, & Abdul Rauf (2008), the employers agreed that the non-technical skills among engineering students are in a Moderately level.

When each non-technical skill is looked at as an individual skill, there is one skill that falls under Moderately Low level which is communication skill. The skill is very important when a previous study has revealed that communication skill is the most important and demanded by employers (Hatib, Rosmin, & Bin, 2016). The finding from this research shows that not all of the engineering students are good in communication skills during their

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industrial training. It will become worse when a study that is cited in Hatib et al. (2016) has mentioned about 80% of employees fail in their careers because of failing in communication. Moreover, English language communication is the most important determinant of access to employment possibilities (Maran & Shekar, 2015). For instance, a study from Kassim and Ali (2010) to engineers working in Malaysian multi-national companies who were investigating the types of communicative events where engineers need to use the English language. Activities such as teleconferencing, formal discussion of work-related matters, giving oral presentations, networking, instructing, explaining and demonstrating were rated with the highest frequency mean. They revealed that engineers need to use the English Language in most of their working events (Abdullah, Noor Raha, Hafizoah, & Mohammad, 2014). Besides findings from Malaysia, there are studies from Thailand and Taiwan that revealed the communicative events that involve English language skills in the engineering workplace by Kaewpet (2009) and Spence & Liu (2013) which are reading, speaking, writing and listening. Recently, the researcher has found out similar findings from the interviews when employers are emphasising in English language communication skills. Worse case, the fresh graduates could not be employed because of a poor command of the English language which is the highest problem faced by employers in hiring fresh graduates (Rahim & Mohd Lajin, 2015).

Worse case, critical thinking, and problem-solving skills are the worst skills that reported when the mean ability logit is the lowest, which is -0.89 indicated that these skills are under Low level. The result is supported by research by Malhi (2016) when graduates in Malaysia are weak in critical thinking and problem-solving skills. Based on research done by Husain et al., (2013), critical thinking and problem-solving skills are below the ranking compared to teamwork skills, which is in the first ranking. Engineers often define themselves as problem-solvers. Their critical thinking and problem-solving abilities will distinguish them from another graduate, help them to land the job they want and make a valuable contribution to society (El-Zein & Hedemann, 2016). Unfortunately, the rapid change of technology in society does not produce a corresponding change in the training and education of engineering education (Kashefi, Ismail, & Yusof, 2012). As pointed by Lumsdaine & Voitle (1993a), the students have been taught with the same methods and tools since fifty years ago. Furthermore, according to them, the conventional approach is not working well now, and not capable to produce future engineering graduates as demanded by modern industries. The old method is believed to use left-brain only that caused engineering students to face a lot of problems in the learning process (Lumsdaine & Voitle, 1993a; Lumsdaine & Lumsdaine, 1995b). The statements are also agreed by Noordin (2014) and Yusof (2005) when traditional lectures, laboratories, and paper-based examinations are becoming old-fashioned since these methods are not able to develop students' non-technical skills.

Teamwork is the non-technical skill that falls at Low level among the electrical engineering students. The finding is proving the study by Rodzalan (2016) when engineering students are given group task which intendedly to develop their teamwork skill; they tend to divide the task individually which end up with no collaboration between the team members. Similar to communication, critical thinking, and problem-solving skills, teamwork is the skill that always mentioned by previous researchers that the engineering students lack. Alas, employers do not look at certificates, but communication, teamwork, and entrepreneur skills are the most important (Hanapi et al., 2015). Unfortunately, based on Syed Husman (2005), almost 62.3 % of the technical graduates are unemployed due to the lack of employability skills compared to the technical skills. Teamwork skills are important for a fresh graduate's

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engineer to survive in the industry because they do not work with machines only (Noordin, 2014). Their scopes of work are changing as they need to deal with people from a variety of backgrounds, which requires a set of non-technical skills

Entrepreneur skills are one of the skills that found to be at a Very High Level among the trainees during their industrial training. Entrepreneur skills seem to be significant due to the current crisis and its high unemployment rates. Thus, the labour market increasingly requires multidisciplinary engineers with additional skills to their own (Barba-Sánchez & Atienza-Sahuquillo, 2018). A research paper by Rahim & Mohd Lajin (2015), stated that social entrepreneurship able to teach important interpersonal skills that were reported by the Ministry of Higher Education as lacking among graduates in securing jobs. Hence, engineering students should involve themselves in social entrepreneurship activities during the study to develop their non-technical skills which they lack for. On the other hand, the results obtained from a study by Alias, Mohd Hamzah, & Yahya (2013), the employers consider entrepreneurial skills as the least required skill, although the mean score was still quite high. However, as mentioned by the previous researcher, an employee with good entrepreneur skills, he or she is thorough or good in planning and willing to take any risks. Additionally, they tend to be more concerned with, goal-oriented and strive to achieve the aims (Hutt, 1994), having good critical thinking, a good problem solver and decision-maker (Abd. Rashid, 2004). Finally, they are said to have high in confidence (Norasmah & Hariyaty 2006; Nawawi 1992; Chek 1996; Timmons 1997). These findings from previous researchers have some contradictory with the findings from this research, where the entrepreneur skills among the respondents are high, but their communication skills and communication skills are at moderately low and low respectively. As a conclusion, the researcher can say that if the entrepreneur skills of students are good, it is not necessarily their other skills are good too.

Engineering ethics are one of the skills that found to be at a Very High Level among the trainees during their industrial training. The finding is similar to research from Rasul et al. (2013), where students felt their ethics and morals were at a high level. The findings show some contradiction between students' and employers' perceptions when employers classified their non-technical skills were at a Moderately level. The different perspectives between stakeholders create a gap that needs to look closer to reduce it. On the contrary, a finding in a preliminary study done by Noordin (2014) had mentioned that the employers agreed that the engineering ethics of the fresh graduate's engineer were well-equipped. Based on the hypotheses done by Rodzalan & Saat (2012b), the students will experience significant improvement in moral and professional ethics skills after their industrial training. Moreover, S. N. H. Hassan et al. (2012) mentioned in their study that employers believed that their trainees have an excellent moral ethics element in themselves as the overall mean shows the highest score.

Lifelong learning is one of the skills that found to be at a Very High Level among the trainees during their industrial training. S. N. H. Hassan et al. (2012) found similar results but from the employer's perspective that the trainees have good lifelong learning skills. Most programs in universities are striving to foster a love for lifelong learning and to develop graduates who are engaged citizens in their communities. Moreover, Zaharim, Yusoff, Omar, & Mohamed (2009) found that lifelong learning is important with mean value 3.93 in terms of employers' perspective. As a conclusion, lifelong learning is important for continuous skills and knowledge upgrading (Tripathi, Shastri, & Agarwal, 2013).

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Computing skills are one of the skills that found to be at a Very High Level among the trainees during their industrial training. Computing or technological skills were in the third rank in the study by Rahim & Mohd Lajin (2015) where recently these skills become important with the very rapid diffusion of computer technology. Since the year 2002, computing skills are the non-technical skills that especially stand out as expanding rapidly (Dickerson & Green, 2002). Thus the diffusion of computing technology has not reached a saturation point. Based on Garrido, Sullivan, & Gordon (2010), changing skill set is both expanding employment opportunities and imposing new demands on disadvantaged groups Thus, basic computing skills are considered essential for people entering the workforce and for those trying to find a better job in today's industry. Moreover, computing skills become more important in the era of Industry 4.0, where Cloud Computing, Internet of Things, and such are widely used (Huba & Kozák, 2016).

To summarise this section, there are three non-technical skills need to be focused which are communication skills, critical thinking, and problem-solving skills, and teamwork where the respondents rated themselves as low and moderately low levels. On the other hand, entrepreneur skills, engineering ethics, lifelong learning, and computing skills are at a very high level among the respondents. With these situations, higher learning institution needs to revise or re-organise the industrial training program to boost up the non-technical skills that they still lack.

V. CONCLUSIONS

In making the instrument reliable and valid, the study used the Rasch Measurement Model to do both testings. The result of this study could give some awareness about the recent condition and also the struggles and difficulties faced by the engineering student in getting into the career world. This study found out that the non-technical skills level among electrical engineering students who had undergone industrial training was at Moderately Low. Based on individual skills, they performed low in communication skills, critical thinking and problem-solving skills, and teamwork skills. Those skills are the most mentioned skills that our graduates are lacking for. As industrial training can be a platform for students to develop those skills, the issues in industrial training such as in placement, training duration, type of given training and assessment should be minimized. The collaboration between universities and industries is very important to make sure the effectiveness of industrial training programs for engineering undergraduates.

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