International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume 5 Issue 17 (June 2023) PP. 120-138
DOI: 10.35631/IJMOE.517010

INTERNATIONAL JOURNAL OF MODERN EDUCATION (IJMOE)
www.ijmoe.com

GLOBAL ACADEMIC EXCELLENCE

THE INDUSTRY AND HIGHER EDUCATION INSTITUTIONS (HEIS) COOPERATION IN IMPROVING THE MARKETABILITY OF TECHNICAL STREAM STUDENTS

Siti Nur Amirah Md Jamain[1], Nurul Aini Mohd. Ahyan[2*], Hanifah Jambari[3], Nur Hazirah Noh@Seth[4], Mohamad Rasidi Pairan[5]

[1] School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia, Malaysia
Email: mierajamain98@gmail.com
[2] School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia, Malaysia
Email: nurul.aini@utm.my
[3] School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia, Malaysia
Email: hanifah-j@utm.my
[4] School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia, Malaysia
Email: nurhazirah.n@utm.my
[5] School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia, Malaysia
Email: rasidi@utm.my
[*] Corresponding Author

Article Info:

Article history:
Received date: 14.03.2023
Revised date: 19.04.2023
Accepted date: 30.05.2023
Published date: 06.06.2023

To cite this document:

Jamain, S. N. A. M., Ahyan, N. A. M., Jambari, H., Noh, N. H., & Pairan, M. R. (2023). The Industry And Higher Education Institutions (HEIS) Cooperation In Improving The Marketability Of Technical Stream Students. *International Journal of Modern Education, 5* (17), 120-138.

DOI: 10.35631/IJMOE.517010

Abstract:

Marketability skills of technical students can be enhanced by fostering a strong cooperation between the industry and educational institutions. Therefore, this study was conducted to examine the roles played by the industry and Higher Education Institutions (HEIs) in increasing the marketability of technical students. This study was conducted to achieve two main objectives, first, to identify the role of HEIs in improving the quality of their curriculum and second, to identify the role of the industry in improving students' performance during industrial training. This quantitative study involved 25 CISEC officers and lecturers of polytechnics across Johor and 210 students enrolled in the mechanical engineering programme at the same polytechnics who are undergoing industrial training. The mean value obtained from the analysis using Statistical Package for Social Science (SPSS) version 26.0 indicate that HEIs play a role in balancing the curriculum content, develop generic skills, and cultivating science and technology in teaching. Meanwhile, the industry plays a very important role in increasing graduates' marketability skills, specifically in terms of their self-skills, knowledge, and personal attributes during industrial training. The finding indicates there is an-going collaboration between the industry and HEIs in improving the marketability of technical

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume 5 Issue 17 (June 2023) PP. 120-138
DOI: 10.35631/IJMOE.517010

stream students. Therefore, the Vocational Training and Technical Education Division should encourage various industrial sectors to collaborate with HEIs ensure to increase marketability of technical stream graduates.

Keywords:

Marketability, Polytechnic, Graduates, Industry, Curriculum

Introduction

In today's world, marketability is not a novel issue. It has become a global issue that has been discussed extensively in line with critical graduate unemployment problem that has raised concerns worldwide. Various studies conducted in Malaysia and abroad had tried to identify the causes and measures to overcome this problem. According to Ali et al. (2019), graduates' failure to obtain employment is due to their high reliance towards their academic qualifications and inability to demonstrate high marketability skills. Furthermore, many employers have set distinctive characteristics for graduates they will hire. Most employers consider that academic qualifications alone are not sufficient; graduates should also be skilful, meet the market's needs and show that they are valuable human resources to fill the industry's demands (Mohd Safiee & Mohd Isa, 2016).

The marketability or employability of graduates has served as an indicator of an educational institution's quality and effectiveness (Hazrul, 2012). There are several significant factors affecting the marketability of technical and engineering students in polytechnics including the industry expectation, the nature of training provided by the polytechnics and the curriculum offered. According to Muhammad (2019), academic achievement no longer guarantees job opportunities to graduates as employers will most likely hire employees with skills that could benefit their company. Thus, collaboration between the industry and technical and vocational stream education (TVET) providers, specifically public and private Higher Education Institution (HEIs) could help improve graduates' marketability. However, it is difficult for both parties to reach a consensus in developing a quality curriculum (Norsyuhaili, 2016).

As the industry is a potential employer for technical graduates, the industry's demands and needs have become critical in addressing marketability of these graduates. John Aliu et al. (2019) posited that the industrial training can help train graduates or prospective employees without the required skills through various appropriate methods and strategies. At the same time, polytechnics helps prepare students with the adequate theoretical and practical knowledge to be used in the industry. Polytechnics and other HEIs also play an important role in producing graduates with diverse abilities. Hence, close cooperation between the two HEIs and industry could reduce the gap between knowledge and skills, increasing graduates' marketability (Mohd Kamarul, 2013).

The country is on the verge of the fourth industrial revolution and more skilled workers are needed than ever before. The fourth industrial revolution or IR 4.0 demands graduates with specific skills to operate machineries and interact with other individuals. Accordingly, HEIs need to re-evaluate and improve their curriculum and provide the skills needed by future employees in line with the current developments. This statement is supported by Muhammad Hazrul (2012) who posited that low graduate marketability is attributed to the mismatch of skills arising from the failure of HEIs in shaping the quality of education, academic staff and pedagogy to adapt academic programs according to market needs.

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume 5 Issue 17 (June 2023) PP. 120-138
DOI: 10.35631/IJMOE.517010

In comparison to public universities, private higher education institutions, and community colleges, the employability of polytechnic graduates has increased by a higher percentage, with a retention rate of more than 80% in the last two years. There are several possibilities that can encourage the increase in the marketability statistics of polytechnic graduates in this field of engineering. If referring to the fourth leap of the Malaysia Education Development Plan 2015-2025 (Higher Education), it asserts that industry and institutions need to play a role together, which, previously was seen as an individualistic responsibility in ensuring the success of students getting jobs upon graduation. In order to do this, apprenticeship programmes, hands-on training, and specialised training are held. The industry is also involved in the design and implementation of the curriculum. But in practise, how much of this objective is actually accomplished? If so, what qualities are stressed by the industry to guarantee that the students under their supervision are indeed qualified to be hired as employees?

Additionally, prior studies have shown that graduates must also possess the information, abilities, and qualities required by the sector in order to succeed in the workplace. Therefore, this study was carried out to determine the impact of the industry on whether it would be feasible for students to receive industrial training at their company. The implementation of this study covers a number of student-possessed characteristics that have been recognised as the catalyst for raising the rate of marketability of mechanical engineering programme graduates at the Johor State Polytechnic.

Literature Review

Industry players should share their needs with HEIs. Oloyo (2019) pointed out that the imbalance between the curriculum and employers' needs in the industry can be overcome by a direct collaboration between available employment information and the planned curriculum. According to Mamat et al. (2019), the inconsistency between supply and demand of graduates in the market raises over on the role of institutions the programs offered and the quality of graduates born. In the study, he found that the performance expected by the employers on the graduates was not commensurate with the actual work performance shown by the graduates. This proves that there is a gap between the needs of the industry and the abilities possessed by graduates. Among the employees desired by the industry are employees who are skilled in communication, ICT and critical thinking (Muhammad, 2019). This means that graduates must meet certain qualifications and skills set by the industry to be accepted for employment. To fill the gap, Higher Education Institutions (HEIs) and the industry need to play an important role in improving TVET education. Aini et al. (2018) argued that universities and industry players need to work together to provide the curriculum and skills needed by the current industry to benefit both parties.

Industrial training has been introduced as a compulsory component for diploma and Bachelor's degree students in Malaysia. It aims to provide graduates with industrial placement and experience to narrow the gap between HEIs and industry. It is deemed as one of the best ways to expose students to the realities of the working environment. The Ministry of Higher Education (2010) stated that industrial training exposes students to the practical side of their field to increase their marketability. In other words, the introduction of industrial training helps increases graduates' marketability by empowering them with industry-required competencies (Salleh, 2014). The industrial sector is constantly changing according to the current trend and technological developments. Therefore, the industry needs graduates with both technical and soft skills. Soft skills are important as it allows employees to socialise and communicate with

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume 5 Issue 17 (June 2023) PP. 120-138
DOI: 10.35631/IJMOE.517010

other individuals efficiently. These skills are critical in the current climate where technology has made human more mechanistic and robotic, resulting in reduced emotional, social, and humanistic values (Mohd Zaidi, 2016).

Knowledge can help graduates apply the skills they possess effectively. According to Laughton and Montanheiro (1996) in Hanafi (2015), general skills can be divided into two main categories, namely soft skills and hard skills. Employers often emphasise soft skills like self-management, cooperation with others, communication and problem solving, while hard skills consist of applying mathematics, technology, design and technical knowledge. Furthermore, employers nowadays mainly demand employees with good communication skills because these employees will be able understand work instructions better and provide good feedback (Dziatul Nadiah, 2020).

In the meantime, possessing high knowledge and skills alone are not sufficient to fill job vacancies in the industry. Norman et al. (2017) emphasised that attitude, communication skills, and leadership are assets sought by employers. This is supported by Saidin et al. (2018), who stated that personality and characters are aspects assessed by employers during interview sessions. A study conducted by Hazrul (2012) found that employers ranked personality and personality as the most important criteria in filling the needs of their workforce, followed by confidence and appearance.

Methodology

This study was conducted quantitatively. The study involved two different groups of respondents, officers and lecturers in polytechnics and mechanical engineering students from the respective polytechnics. The data were collected from primary and secondary sources. Primary data are data collected by researchers themselves through a set of questionnaires. In this study, the researcher also used secondary data obtained from written materials such as books, journals, magazines, newspapers, reports, the internet to support the arguments in the literature review and discussion chapters.

As shown in Table 1, information related to the role of polytechnics were obtained from 25 CISEC officers and lecturers in polytechnics. The respondents in this group were chosen using purposive sampling. In the meantime, the number of students undergoing industrial training was determined using Krejcie and Morgan (1970) sampling guideline. 210 mechanical engineering students of polytechnics across the Johor state who were undergoing industrial training were randomly selected from the total population of 460.

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 5 Issue 17 (June 2023) PP. 120-138
DOI: 10.35631/IJMOE.517010

Table 1 : Categories of Study Respondents

	Sample of study			
		Objective 1 : Role of HEIs		Objective 2 : Role of Industry
Category of Respondent		Lecturer (CISEC Representative)	CISEC Officer	Students of Mechanical Eng.
Number of respondent	Polytechnic A	9	3	158
	Polytechnic C	10	3	52
Total		19	6	210

Validity of the instrument was measured by referring to several experts in the field of study. The experts' views and comments on how to improve the instrument were collected. The data were analysed using Statistical Package for Social Science (SPSS) software to obtain the values of frequency, percentage and mean score. Each group of respondents was asked to answer a different set of questionnaires; officers directly involved with curriculum coordination in polytechnics were asked to answer the questionnaires on HEIs' role. In contrast, the mechanical engineering students were asked to answer the questionnaire on the industry's role on knowledge, self-skills and self-attributes development during industrial training. Both questionnaires were distributed using Google Form as an instrument for data collection. This is in line with the recommendation by Rohana Yusof (2003, who stated that questionnaires could be used to collect data more effectively for studies involving large populations. Each item in the questionnaires used a 5-point Likert scale. This scale is a commonly used scale and is familiar unfamiliar to the respondents. This makes it easier for them to understand how to answer the questionnaire. The measurement levels for the Likert scale are as shown in Table 2.

Table 2 : Likert Scale

Measurement level	**Scale**
Strongly Disagree (SD)	1
Disagree (D)	2
Neutral (N)	3
Agree (A)	4
Strongly Agree (SA)	5

The researcher used references from other studies as well as interviews to gather the essential data before developing the items included in this questionnaire. The design of this collection of surveys reveals two key components: the respondents' backgrounds and the use of marketability abilities by mechanical engineering graduates at the Johor State Polytechnic when they were undergoing industrial training.

Part A : Demographic Data
Part B : Harnessing the Marketability Skills of Technical Stream Students During Industrial Training

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 5 Issue 17 (June 2023) PP. 120-138
DOI: 10.35631/IJMOE.517010

Descriptive statistics were used to summarise the data obtained which were then presented in tables, diagrams or graphs (Mohd Majid, 1990). For this study, the mean scores were interpreted accordingly to answer the research questions. The interpretations of the mean score are shown in Table 3 below.

Table 3 : Mean Score and Interpretation Scales

Mean score	Mean score interpretation
1.00 - 2.33	Low
2.34 - 3.66	Medium
3.67 - 5.00	High

Data Findings

Respondents' Profile

The Role of Industry Towards the HEIs Curriculum (HEIs Officer Respondents)

The acquisition of data on the role of polytechnics on the marketability of TVET graduates involved 23 CISEC officers and lecturers who were directly involved with the CISEC unit at the Johor state polytechnic. Table 4a shows the demographic distribution of the respondents involved in this study.

Table 4a: Demographic Distribution of Respondents (Lecturers/CISEC Officers)

Background	Details	Frequency	Percentage
Gender	Male	16	69.6
	Female	7	30.4
Age	30-39 y.o	12	52.2
	40-49 y.o	10	43.5
	50-59 y.o	1	4.3
Post held	Head of Department	3	13.0
	Head of Unit	10	43.5
	Senior Lecturer	6	26.1
	Lecturer	4	17.4
Polytechnic	A	7	30.4
	B	12	52.2
	C	4	17.4
Qualification	Master Degree	17	73.9
	Bachelor Degree	6	26.1
Period of Working Experience	6-10 years	2	8.7
	11-15 years	9	39.1
	16-20 years	6	26.1
	21 years and above	6	26.1

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume 5 Issue 17 (June 2023) PP. 120-138
DOI: 10.35631/IJMOE.517010

The Role of Industry Towards the IPT Curriculum (Student Respondents)

The acquisition of data on the role of industry on the marketability of graduates involved 210 mechanical engineering students at the Johor state polytechnic who are undergoing industrial training. Table 4b shows the demographic distribution of the respondents involved in this study.

Table 4b: Demographic Distribution of Respondents (Students of Mechanical Engineering)

Background	Details	Frequency	Percentage
Gender	Male	146	69.5
	Female	64	30.5
Age	18-20 y.o	13	6.2
	21-23 y.o	197	93.8
Race	Malay	171	81.4
	Chinese	7	3.3
	Indian	28	13.3
	Others	4	1.9
Polytechnic	A	142	67.6
	B	68	32.4
Program	Mechanical Engineering	149	71
	Petrochemical Engineering	61	29

The Role of HEIs in Improving Study Structure

The study examined the role of HEIs, specifically, polytechnics in Johor on increasing the marketability of engineering graduates. Table 5 shows that each item on the role of polytechnics in improving the structure of education has a high mean score. The highest mean score is 4.61 which was recorded by the sixth item, 'cultivating the use of science and technology (e.g., internet and ICT)'. The lowest mean score was obtained for item 'improving infrastructure (e.g., network, local content, incentives and legislation)' with the mean score of 4.30. In all, the results show that mean scores for the role of polytechnics in improving the structure of education is high, with an overall mean score of 4.46.

Table 5: Interpretation of Mean Score on Polytechnics' Role on The Study Structure

No	Item		Interpretation
1.	Offer curriculum according to the needs of industry/stakeholders	4.52	High
2.	Offer a curriculum that suits the needs of the industry	4.48	High
3.	Provide opportunities for lecturers to further their studies	4.39	High
4.	Provide courses to lecturers (periodic and continuous)	4.52	High
5.	Improving infrastructure (e.g. network, local contents, incentives and legislation)	4.30	High
6.	Cultivate the use of science and technology (e.g. internet and ICT)	4.61	High

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 5 Issue 17 (June 2023) PP. 120-138
DOI: 10.35631/IJMOE.517010

7.	Enhancing research and development (R&D) innovation	4.43	High
8.	Diversify the teaching and facilitation process (PdPc) using video clips, E-learning, and technology)	4.52	High
9.	Establish a mentor-mentee system between lecturers and students	4.35	High
10.	Provide training (staff attachment) to increase career-related skills.	4.48	High
	Overall Mean Score	**4.46**	**High**

The Role of HEIs in Curriculum Quality Improvement

This study also examined role of HEIs, specifically polytechnic, in increasing the marketability of engineering graduates through improving the quality of the curriculum.

As shown Table 6, the mean score for each item on the aspect of curriculum quality improvement is high, and only one item scored a moderate mean score. The highest mean score is 4.57 for the first and third items, namely "applying generic skills to lessons (soft-skills)" and "balancing the curriculum (compulsory subjects, core, engineering and specialisation)". The lowest mean score is recorded for the fourth item, "offering entrepreneurship courses," of 3.48. The overall results show that HEIs play a major role in improving the quality of the curriculum, with an overall mean score of 4.42.

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 5 Issue 17 (June 2023) PP. 120-138
DOI: 10.35631/IJMOE.517010

Table 6: Mean Scores and Interpretations for Aspects on HEIs' role in Curriculum Quality

No.	Item	Mean	Interpretation
1.	Apply generic skills to lessons (soft skills)	4.57	High
2.	Combine elements of education, pedagogy and technical knowledge.	4.52	High
3.	Balancing the curriculum (compulsory, core, engineering and specialisation subjects)	4.57	High
4.	Offer entrepreneurship courses	3.48	Medium
5.	Encourage the use of computers and the internet for students' formal and informal learning.	4.65	High
6.	Apply humanistic elements (physical emotional, spiritual and humanity)	4.52	High
7.	Have regular meetings with the industry	4.13	High
8.	Provide field assignments for students (e.g. Service Learning, Site Visit and Experience Based Learning)	4.22	High
9.	Cultivate Problem-Based learning among students	4.22	High
10.	Reducing one-way communicative learning to students	4.30	High
11.	Cultivate hand-ons activities among students.	4.43	High
	Overall Mean Score	**4.42**	**High**

The Role of Industry in Improving Students' Knowledge

This study also probed the industry's role on improving the marketability of Johor polytechnics mechanical engineering graduates by increasing their knowledge while undergoing industrial training. Table 7 shows that each item on knowledge during industrial training recorded a high mean score. The highest mean score is 4.30 for the first and second items, namely "understand the knowledge related to my field of engineering more clearly" and "apply knowledge related to my field of engineering". The lowest mean score was recorded for the fourth item, "identifying the principles of sustainable development," with 3.91. Overall, industrial training plays a significant role in increasing students' knowledge, with an Overall Mean Score of 4.16.

Table 7: Mean Score and Interpretation of Industry's Role on Students' Knowledge

No.	Item	Mean	Interpretation
1.	Understand knowledge related to the field of engineering more clearly.	4.30	High
2.	Apply knowledge related to my field of engineering	4.30	High
3.	Identify the principles of engineering design	4.18	High
4.	Identify the principles of sustainable development	3.91	High
5.	Take note of current issues in general, especially in the field of engineering	4.08	High

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume 5 Issue 17 (June 2023) PP. 120-138
DOI: 10.35631/IJMOE.517010

6.	Produce engineering designs systematically	4.12	High
7.	Analyse engineering design systematically	4.18	High
8.	Identify various disciplines in the field of engineering	4.26	High
9.	Plan an experiment to solve a problem	4.20	High
10.	Interpret data in engineering procedures.	4.13	High
11.	Make a conclusion on a problem related to engineering systems	4.09	High
	Overall Mean Score	**4.16**	**High**

The Role of the Industry in Enhancing Students' Self- Skills

This study also focused on the industry's role on improving the marketability of Johor polytechnics mechanical engineering graduates by increasing their personal skills while undergoing industrial training. Table 8 shows that each item for personal skills recorded a high mean score. The highest mean score is 4.34 which was recorded by the item "using correct engineering techniques while performing tasks". The lowest mean score was recorded is 4.05, which was reported for the item, "analysing data in engineering procedures". Overall, the industry plays an important role in improving marketability through enhancing graduates', with an Overall Mean Score of 4.23.

Table 8: Mean Score and Interpretation of Aspects Regarding Students' Self- Skills

No.	Item	Mean	Interpretation
1.	Strive to fulfil work quality specification standards	4.28	High
2.	Be creative and innovative in problem-solving	4.31	High
3.	Identify various disciplines in the field of engineering	4.15	High
4.	Acquire comprehensive technical skills	4.16	High
5.	Use the right tools for a particular task	4.32	High
6.	Use proper engineering techniques while performing assignments	4.34	High
7.	Using the latest engineering technology	4.25	High
8.	Plan an experiment to solve a problem	4.21	High
9.	Perform work perfectly based on written instructions	4.20	High
10.	Analyse the causes of problems related to engineering systems	4.14	High
11.	Analyse data in engineering procedures	4.05	High
	Overall Mean Score	**4.23**	**High**

The Role of Industry in Improving Students' Self attributes

Another focal point for this study is the role of the industry in increasing Johor polytechnics' mechanical engineering graduates' marketability while undergoing industrial training in terms of their personal attributes. Table 9 shows that each item on the self-attribute aspect has a high

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume 5 Issue 17 (June 2023) PP. 120-138
DOI: 10.35631/IJMOE.517010

mean score. The item with the highest mean score "receiving feedback from teammates to improve the way we work" with 4.33. Meanwhile, the item "mastering more than one language" obtained the lowest mean score of 3.94. Overall, the industry plays a significant role in improving graduates' marketability by increasing their personal attributes, with an Overall Mean Score of 4.16.

Table 9: Mean Scores and Interpretations for Aspects Regarding Students' Self Attributes

No.	Item	Mean	Interpretation
1.	Present ideas more confidently and effectively orally	4.26	High
2.	Present ideas more confidently and effectively in writing	4.27	High
3.	Give work instructions to colleagues clearly	4.21	High
4.	Understand work instructions given quickly	4.13	High
5.	Ask questions related to engineering problems with confidence	4.16	High
6.	Master more than one language	3.94	High
7.	Play individual roles in group assignments	4.11	High
8.	Use self-function as much as possible in group assignments	4.20	High
9.	Provide constructive feedback on teammates' ideas	4.32	High
10.	Receive feedback from teammates to improve work performance	4.33	High
11.	Be a leader in a group	4.18	High
12.	Recognise the need for lifelong learning	4.12	High
13.	Engage in lifelong learning	4.04	High
14.	Set personal learning goals	4.11	High
15.	Plan efforts to achieve learning goals	4.15	High
	Overall Mean Score	**4.16**	**High**

Level Of Knowledge, Self-Skills, Personal Attributes And Marketability Of Graduates Of Mechanical Engineering Programs At Johor State Polytechnics During Industrial Training With Student Programs

Table 10a and 10b shows the group statistics and independent t-test analysis for knowledge level, self-skill level, personal attribute level and marketability level of mechanical engineering program graduates in 2 Johor state polytechnics during industrial training with student program factors (n = 201) accordingly.

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 5 Issue 17 (June 2023) PP. 120-138
DOI: 10.35631/IJMOE.517010

Table 10a : Group Statistics

Group Statistics					
	Engineering Program	N	Mean	Std. Deviation	Std. Error Mean
MeanKnowledge	Mechanical	142	4.1978	.48605	.04079
	Petrochemical	59	4.2419	.38444	.05005
MeanSkill	Mechanical	142	4.2580	.50420	.04231
	Petrochemical	59	4.3467	.37992	.04946
MeanAttribute	Mechanical	142	4.2146	.48784	.04094
	Petrochemical	59	4.2734	.43553	.05670
MeanMarketability	Mechanical	142	4.2235	.45268	.03799
	Petrochemical	59	4.2873	.36779	.04788

Table 10b : Independent t-test Analysis (With Student Program Factors)

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Mean Knowledge	Equal variances assumed	6.538	.011	-.620	199	.536	-.04409	.07106	-.18421	.09604
	Equal variances not assumed			-.683	135.957	.496	-.04409	.06457	-.17177	.08360
MeanSkill	Equal variances assumed	5.999	.015	-1.215	199	.226	-.08868	.07301	-.23266	.05529
	Equal variances not assumed			-1.362	142.549	.175	-.08868	.06509	-.21735	.03998
Mean Attribute	Equal variances assumed	1.199	.275	-.804	199	.423	-.05889	.07329	-.20342	.08564
	Equal variances not assumed			-.842	120.736	.401	-.05889	.06994	-.19735	.07957
Mean Marketability	Equal variances assumed	4.815	.029	-.960	199	.338	-.06389	.06655	-.19513	.06735

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 5 Issue 17 (June 2023) PP. 120-138
DOI: 10.35631/IJMOE.517010

	Equal variances not assumed			-1.045	132.414	.298	-.06389	.06112	-.18479	.05701

From the table, mechanical program students show a mean achievement score of M = 4.20, standard deviation value = 0.48. While petrochemical program students showed a mean achievement score of M = 4.24, with a standard deviation value = 0.38. The independent t-test performed showed that the hypothesis was accepted. There was no significant difference in the mean score of knowledge level of mechanical engineering program graduates at Johor state polytechnic during industrial training with student program, t (201) = -0.620, p> 0.05 (given p = 0.536).

Additionally, mechanical program students show a mean achievement score of M = 4.26, standard deviation value = 0.50. While petrochemical program students showed a mean achievement score of M = 4.35, with a standard deviation value = 0.38. The independent t-test performed showed that the hypothesis was accepted. There was no significant difference in the mean score of self -skill level of mechanical engineering program graduates at Johor state polytechnic during industrial training with student program, t (201) = -1.215, p> 0.05 (given p = 0.226).

As mechanical program students show a mean achievement score of M = 4.21 with standard deviation value = 0.48. While petrochemical program students showed a mean achievement score of M = 4.27, with a standard deviation value = 0.44. The independent t-test performed showed that the hypothesis was accepted. There was no significant difference in the mean score of self -attribute level of mechanical engineering program graduates at Johor state polytechnic during industrial training with student program, t (201) = -0.804, p> 0.05 (given p = 0.423).

Mechanical program students show a mean achievement score of M = 4.22, standard deviation value = 0.45. While petrochemical program students showed a mean achievement score of M = 4.29, with a standard deviation value = 0.37. The independent t-test performed showed that the hypothesis was accepted. There was no significant difference in the mean score of marketability level of mechanical engineering program graduates at Johor state polytechnic during industrial training with student program, t (201) = -0.960, p> 0.05 (given p = 0.338).

Level Of Knowledge, Self -Skills, Personal Attributes And Marketability Of Graduates Of Mechanical Engineering Programs At Johor State Polytechnics During Industrial Training With Polytechnics

Table 11a and 11b shows the group statistics and independent t-test analysis for knowledge level, self-skill level, self-attribute level and marketability level of mechanical engineering program graduates in 2 Johor state polytechnics during industrial training with polytechnic factor (n = 201) accordingly.

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 5 Issue 17 (June 2023) PP. 120-138
DOI: 10.35631/IJMOE.517010

Table 11a : Group Statistics

Group Statistics					
	Polytechnic	N	Mean	Std. Deviation	Std. Error Mean
MeanKnowledge	A	135	4.1993	.47557	.04093
	B	66	4.2342	.42253	.05201
MeanSkill	A	135	4.2566	.49418	.04253
	B	66	4.3402	.42079	.05180
MeanAttribute	A	135	4.2030	.48052	.04136
	B	66	4.2909	.45436	.05593
MeanMarketability	A	135	4.2196	.44158	.03801
	B	66	4.2884	.40326	.04964

Table 11b : Independent t-test Analysis (With Polytechnic Factors)

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Mean Knowledge	Equal variances assumed	2.743	.099	-.505	199	.614	-.03483	.06893	-.17075	.10109
	Equal variances not assumed			-.526	143.707	.599	-.03483	.06618	-.16565	.09599
Mean Skill	Equal variances assumed	1.885	.171	-1.181	199	.239	-.08365	.07081	-.22329	.05599
	Equal variances not assumed			-1.248	149.287	.214	-.08365	.06702	-.21609	.04878
Mean Attribute	Equal variances assumed	.083	.773	-1.240	199	.216	-.08795	.07091	-.22778	.05189
	Equal variances not assumed			-1.264	135.821	.208	-.08795	.06956	-.22550	.04961
Mean Marketability	Equal variances assumed	1.161	.283	-1.067	199	.287	-.06881	.06450	-.19600	.05838
	Equal variances not assumed			-1.101	140.179	.273	-.06881	.06252	-.19241	.05479

International Journal of Modern Education
EISSN: 2637-0905
Volume 5 Issue 17 (June 2023) PP. 120-138
DOI: 10.35631/IJMOE.517010

Polytechnic A students showed a mean achievement score of M = 4.20, standard deviation value = 0.48. Meanwhile, Polytechnic B students showed a mean achievement score of M = 4.23, with a standard deviation value = 0.42. The independent t-test performed showed that the hypothesis was accepted. There was no significant difference in the mean score of knowledge level of mechanical engineering program graduates at Johor state polytechnic during industrial training with polytechnic students, t (201) = -0.505, p> 0.05 (given p = 0.614).

Polytechnic A students showed a mean achievement score of M = 4.20, standard deviation value = 0.48. Meanwhile, Polytechnic B students showed a mean achievement score of M = 4.29, with a standard deviation value = 0.45. The independent t-test performed showed that the hypothesis was accepted. There was no significant difference in the mean score of self -attribute level of mechanical engineering program graduates at Johor state polytechnic during industrial training with polytechnic students, t (201) = -1.240, p> 0.05 (given p = 0.216).

Male students show a mean achievement score of M = 4.22, standard deviation value = 0.44. While female students showed a mean achievement score of M = 4.29, with a standard deviation value = 0.40. The independent t-test performed showed that the hypothesis was accepted. There was no significant difference in the mean score of marketability level of mechanical engineering program graduates at Johor state polytechnic during industrial training with student age, t (201) = -1.067, p> 0.05 (given p = 0.287).

Discussion

The result of the mean score analysis for each item is shown in Figure 1. HEIs' role in the study structure obtained the highest mean with 4.46. This is followed by the role of HEIs in curriculum quality (4.42) and the role of the industry in students' self- skills (4.23). The role of industry in students' knowledge and the role of industry in students' self attributes (4.16) recorded the same and the lowest mean score.

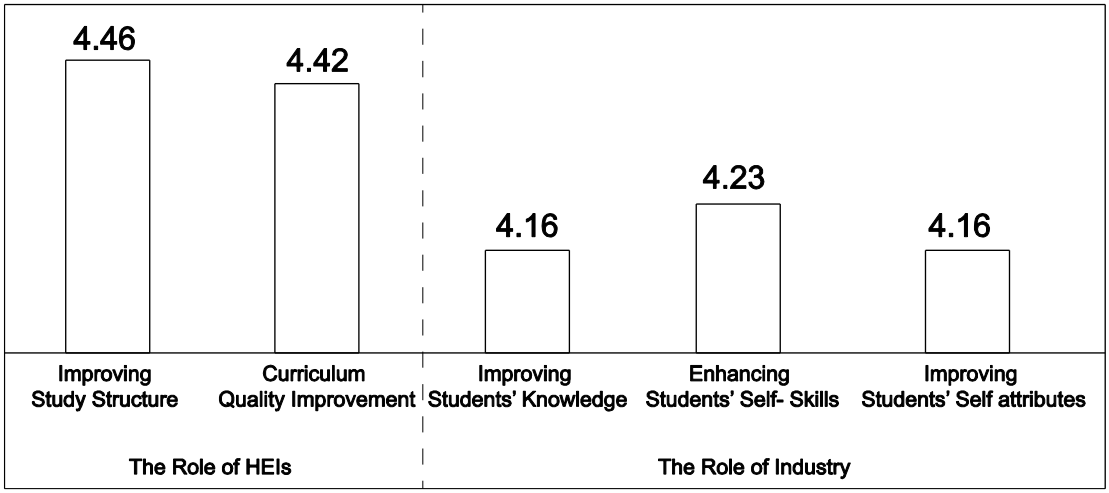

Figure 1 : Overall Findings

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume 5 Issue 17 (June 2023) PP. 120-138
DOI: 10.35631/IJMOE.517010

Cultivation of science and technology in learning at the institution level is important. Hazrul (2012), posited that employees desire employees who are skilled in communication, ICT, and critical thinking in line with the rapidly evolving world of information technology. This situation is highly relevant as Malaysia is ready to enter IR 4.0, which requires the application of various technological facilities in the industry. In this regard, cultivating science and technology in education could prepare students for the use of technology when they enter the job market.

This study also clearly shows that the quality of curriculum used by HEIs, including polytechnics, plays an important role in producing quality and marketable graduates. It is in line with the study conducted by Farahana et al. (2019), who stated that institutions need to ensure that the curriculum used by the courses offered meets the demands of the industry. Among the curriculum quality improvements implemented by polytechnic is applying generic skills in teaching. This coincides with the findings of by Ali et al. (2019) that the failure of graduates to obtain employment is due to their reliance towards academic qualifications without demonstrating the ability to use generic skills. In this light, generic skills are one of the important factors to increase the marketability of graduates because they can help graduates present themselves confidently in the interview session. According to Zakaria et al. (2016), students' soft skills is a global issue because competent, ethical, creative, and highly competitive employees are needed in this highly competitive world. He also stressed that employees with soft skills will be able to adapt themselves to various situations and perform various tasks well based on the needs of the industry today.

Abd Rahman et al. (2015) in a study conducted by the National Higher Education Research Institute (IPPTN) (2004), employers prioritise a knowledgeable and skilled workforce that not only able to complete their work but also possess various skills. Furthermore, Sani (2005) suggested that industrial training and skills training packages should be offered together to help prospective graduates improve their skills. The high mean values for items on knowledge clearly show that the industry plays an important role in improving the knowledge of graduates during industrial training.

The industry's role in graduates' self-skills scored the highest mean score compared to knowledge and self attributes. This indicates that industry plays the most important role in developing graduates' self-skills during industrial training. Dutta (2017) stated that specialisation in software-based skills and interpersonal skills can help individuals become more proactive and efficient in their work. Zaidul and Suffian (2015) stated that graduates who possess various skills are more in demand by employers because it can save the industry's cost in providing additional training to new employees. In addition, TVET students who have an advantage in technical skills should also demonstrate self -skills including computer software skills and handling current technology. Ali et al. (2019) stated that employee productivity could be increased by exposing prospective graduates to the knowledge of related skills and technologies. Meanwhile, Husain et al. (2013) stated that technical skills in graduates include specific knowledge and analytical ability in the use of tools and techniques in certain fields, especially engineering.

The items on self-attribute scored the same mean value as items on knowledge. This indicates that the industry plays an equally important role in improving graduates' self attributes and knowledge during industrial training. Holtmann (2015) argued that the attributes shown by

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume 5 Issue 17 (June 2023) PP. 120-138
DOI: 10.35631/IJMOE.517010
employees in the workplace can provide an impression of the quality of work they will produce. Personal attributes are also closely related to personal factors, namely personality traits and a person's attitude towards something (Nisa & Murniawaty, 2020). According to Flint-Taylor et al. (2014), a person with stable self -attributes will be more resilient in the face of job demands, workplace stress, and challenges in their career. He also added that the advantages of the attributes could provide confidence for employees to work independently and interact positively with colleagues and customers. This, in turn, can increase the productivity of workers and the industry where they operate.

Conclusion

Based on the findings and discussion, it can be concluded that HEIs play a critical role in collaborating with the industry to improve the marketability of technical stream students. Polytechnics could improve their study structure to cultivate the use of science and technology through facilities such as the internet and ICT, align curriculum with the needs of the industry/stakeholders, provide training to lecturers regularly and continuously and encourage teaching staff to diversify their teaching and facilitation. (PdPc) approaches. Quality of the curriculum could also be enhanced by encouraging the use of computers and the internet for formal and informal learning, applying generic skills to lessons, balancing the curriculum, applying humanitarian elements to learning and offering entrepreneurship courses to students.

In the meantime, industry players could collaborate with HEIs to improve the marketability of technical students through industrial training. In regard to knowledge, it can be concluded that the industry plays a role in helping graduates to understand knowledge related to engineering, apply knowledge related to engineering, and identify various disciplines in the field of engineering. Furthermore, in terms of their personal skills, the industry trains graduates to use the correct engineering techniques while performing tasks, use the right tools for certain tasks and be creative and innovative in solving problems. During industrial training, graduates could also develop their personal attributes. They are given the opportunity to receive feedback from teammates on how to improve the way they work, provide constructive feedback for their teammates' ideas and present ideas more confidently and effectively in writing.

Several suggestions are put forward to guide the parties involved to further strengthen the industry's role in the improving marketability of technical graduates. Engineering students need to better appreciate and make full use the collaboration between industry and institutions. In this light, their experience can add values to increase their marketability after they graduate. For instance, engineering students should use their industrial training to gain practical skills, knowledge and experience that will be valuable in their respective fields. Nevertheless, knowledge and personal attributes are equally important because today's industry demands students who are equally competent in these three aspects.

Ali et al. (2019) claimed graduates' lack of skills and failure to meet the industry's needs have raised concerns. Therefore, the industry could highlight critical aspects they look for to help train future engineering graduates. The industry will also benefit from the effort when these graduates enter the workforce. For HEIs, the elements of marketability can be emphasised during the teaching and learning process, such as offering courses that can directly cultivate students' marketability skills. Warraich and Ameen (2011) stated that students must possess the element of marketability to meet the needs of the current and future job market. Discussions with the industry advisory panel can also improve cooperation between institutions and

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume 5 Issue 17 (June 2023) PP. 120-138
DOI: 10.35631/IJMOE.517010

industries in Malaysia. In addition, the Vocational Training and Technical Education Division (BPLTV) can design and implement certain initiatives involving the industry and institutions in ensuring future graduates can be employed by the industry. This can ultimately solve skilled workers shortage in the country. As noted by Husain et al. (2013), a quality education system and a skilled workforce are the main weapons for facing global competition.

Acknowledgement

The authors would like to acknowledge the financial support from Universiti Teknologi Malaysia for the funding under Tier-2 Research Grant (Q.J130000.2653.16J07).

References

Abd Rahman, S. H., Mat Jusoh, Z. Y., Muhammad Serji, R., & Salleh, M. (2015). Faktor-faktor Kepuasan Majikan Terhadap Pelajar Latihan Industri Di Institut Pengajian Tinggi (IPT): Satu Sorotan. *ICASiC2015 (e-ISBN 978-967-0792-02-6)*, *2015*(March), 619–627.

Aini Najwa, Y. K. (2018). Towards Industrial Revolution 4.0: Employers' Expectations on Fresh Engineering Graduates. *International Journal of Engineering & Technology*, 267-272.

Ali, S. H., Vin, T. L., & Jack, C. (2019). *Kepuasan Majikan Terhadap Graduan Politeknik Malaysia: Kajian Di Politeknik Kota Kinabalu, Sabah, Malaysia*.

Aliu, J., Aigbavboa, C., & Thwala, W. (2019). Role of industry employers in fostering employability skills. *ISEC 2019 - 10th International Structural Engineering and Construction Conference*, *August*.

Dutta, A. (2017). *Personal Skill development by Applying 'KAIZEN': An Experimental Case Study Personal Skill development by Applying 'KAIZEN': An Experimental Case Study*. December.

Dziatul Nadiah, D. U. (2020). Keberkesanan Latihan Industri Graduan Diploma Pengurusan Perhotelan, Kuim (Kohort 35 & 36): Tinjauan Dari Perspektif Majikan. *Jurnal Hospitaliti dan Jaringan*, *1*, 45-52.

Farahana Misni, N. H. (2019). The effect of curriculum design on the employability competency of Malaysian graduates. Kuala Lumpur: Universiti Teknologi Malaysia.

Flint-Taylor, J., Davda, A., & Cooper, C. L. (2014). Stable personal attributes and a resilient approach to work and career. *SA Journal of Industrial Psychology*, *40*(1), 1–10.

Hanafi, Z. (2015). *Kesepadanan Latihan Terhadap Pekerjaan Dalam Kalangan Graduan Kejuruteraan Elektrik Di Kolej Komuniti* (Doctoral dissertation). Fakulti Pendidikan, Universiti Teknologi Malaysia.

Hazrul, I. M. (2012). Kajian Mengenai Kebolehpasaran Siswazah di Malaysia: Tinjauan dari Perspektif Majikan. *Persidangan Kebangsaan Ekonomi Malaysia ke VII (PERKEM VII)*, (pp. 906-913). Ipoh, Perak.

Hazrul, M. (2012). *Kajian Mengenai Kebolehpasaran Siswazah di Malaysia: Tinjauan dari Perspektif Majikan*. Prosiding PERKEM VII, *2*(2012), 906–913.

Holtmann, P. (2015). *Personal Attributes as a Predictor of Continuing Competency*.

Husain, M. Y., Rasul, M. S., Mustapha, R., Malik, S. A., & Rauf, R. A. A. (2013). Tahap kemahiran employability pelajar kejuruteraan dari perspektif majikan. *Jurnal Teknologi (Sciences and Engineering)*, *62*(1), 31–39.

Kementerian Pengajian Tinggi (2010). Dasar Latihan Industri Institusi Pengajian Tinggi.

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 5 Issue 17 (June 2023) PP. 120-138
DOI: 10.35631/IJMOE.517010

Mamat, M., Daiman, D., Musa, R. M., Athirah, N. U. R., Mun, W. K. O. K., & Yau, Y. V. (2019). Kebolehpekerjaan Graduan Institut Latihan Perindustrian Kuala Langat, Selangor. *Malim: Jurnal Pengajian Umum Asia Tenggara (Sea Journal of General Studies)*, *20*, 46–63.

Mohd Kamarul, A. M. (2013). *Pelaksanaan Program Kerjasama Institusi Industri Di Politeknik Merlimau Melaka*. Johor: Universiti Tun Hussein Onn.

Mohd Majid Konting (1990). *Kaedah Penyelidikan Pendidikan*. Kuala Lumpur: Dewan Bahasa Dan Pustaka.

Mohd Safiee, I., & Mohd Isa, S. (2016). Pengetahuan Penyeliaan Dalam Kalangan Pelajar Diploma Kejuruteraan Mekanikal (Automotif) Politeknik Malaysia. *NCTVET 2016 National Conference on TVET*, 1–23.

Mohd Zaidi, H. (2016). Strategi Menghasilkan Generasi Cemerlang Melalui Pendidikan: Peranan Universiti. *International Seminar on Education 2016* (pp. 15-22). Selangor: Universiti Selangor, Malaysia.

Muhammad, H. (2019). *Kajian Kebolehpasaran Graduan Sarjana Muda Kemahiran Hidup Menurut Persepsi Graduan.* Johor: Universiti Teknologi Malaysia, SOE.

Nisa, K., & Murniawaty, I. (2020). Pengaruh Atribut Personal, Lingkungan Keluarga, dan Pengetahuan Kewirausahaan terhadap Minat Berwirausaha Mahasiswa. *Economic Education Analysis Journal Terakreditasi SINTA5*, *9*(1), 84–99.

Norman, H., Zainon, R., & Yahya, R. (2017). Personaliti Graduan Yang Menjadi Tarikan Organisasi. *Journal of Business Innovation*.

Norsyuhaili, S. K. (2016). *Memperluas TVET Bagi Melahirkan Tenaga Kerja Berpendapatan Tinggi*. Kuala Lumpur: Majlis Amanah Rakyat.

Oloyo, R. A. (2019). Cultivation of Polytechnic-Industry Linkage for Development and Delivery of Curriculum for Technical Education: A Case Study of the Federal Polytechnic, Ilaro. *Journal of Educational and Developmental Psychology*, *9*(1), 69.

Rohana Yusof (2003). *Penyelidikan Sains Sosial.* Pahang: PTS Publications & Distributors Sdn. Bhd

Saidin, S. S., Ismail, I., dan Khari, Z. M., (2018). Keberkesanan Latihan Industri Sebagai Faktor Kebolehpasaran Graduan Kolej Komuniti Baling. E-Proceedings National Innovation and Invention Competition through Exhibition 2018.

Salleh, N., H. (2014). Kepuasan Majikan Terhadap Prestasi Pelajar Letika Menjalani Latihan Industri. *Kertas Kajian Pengurusan Perniagaan.*

Sani, S. (2005). Nilai Tambah Dalam Kurikulum Sains Sosial dan Sastera: Satu Perspektif (Added Value in the Social Science and Literature Curriculum: A Perspective). *Akademika*, *66*, 115–125.

Warraich, N. F. & Ameen, K. (2011). *'Employability Skills of LIS Graduates in Pakistan'*: needs and expectations. Emerald Library Management, 32(3), 209-224.

Zaidul, A., Suffian, S. A. (2015). Kepentingan Elemen Agama Dalam Kemahiran Employabiliti Di Kalangan Mahasiswa: Kajian Terhadap Graduan Akademi Islam Kolej Universiti Islam Antarabangsa Selangor, 3.

Zakaria, H. Bin, Nasroddin, S. N. B., & Hashim, Z. Bin. (2016). Softskills – Kepentingannya Dalam Memenuhi Kebolehpasaran Pekerjaan Terhadap Graduan Politeknik Johor Bahru (Pjb). *THE Journal: Tourism and Hospitality Essentials Journal*, *5*(2), 921.