Employability of Engineering Graduates from 2013 to 2015 as Basis for a Proposed Student Development Program

Asia Pacific Journal of Multidisciplinary Research
Vol. 5 No.1, 155-166
February 2017 (Part II)
P-ISSN 2350-7756
E-ISSN 2350-8442
www.apjmr.com

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Date Received: January 3, 2017; Date Revised: February 28, 2017

Abstract - *This study aims to determine the employability of Mechanical, Industrial and Electronics Engineering graduates which also explores the relevance of curriculum and work-related behavior to the job placement of the graduate-respondents. Descriptive type of research was utilized in the study. Findings showed that engineering graduates of the academic institution under study are highly employable and gainfully employed locally while enjoying the benefits of regular status and handling professional, technical or supervisory positions where they find their present jobs within 1 to 6 months. Relevance of the engineering program to graduates' present work assignment is one of the common reasons in accepting and staying on the job while communication skill is the most common useful ability of the engineering graduates in their job placement and leadership, hard work and professional integrity are the work – related values identified with very much contribution in meeting the demands of their present employment. Curriculum is also considered relevant for Mechanical and Industrial Engineering graduates but only slightly relevant for Electronics Engineering Graduates.*

Keywords: *employability, engineering, skill, competency, job placement*

INTRODUCTION

Priority of every graduate after having completed a college degree is to look for possible employment. This is their next ultimate goal in life to sustain a living or support the needs of the family as part of Filipino culture. Engineering is one of the most in demand profession due to limited number of students who are taking this as a degree program in college. Science, technology, engineering, agriculture and mathematics (STEAM) are fields of studies where the government encourages the students to pursue in college. High School students tend to enroll in non-steam programs particularly in business related programs. Engineering graduates are expected to possess student outcomes which are necessary to handle responsibilities in manufacturing industries, engineering and construction firms and other related companies. Several employability studies noted that khe knowledge, skills and attitude acquired during college years would serve as strong weapon for their job placement [1]-[15]. Engineers could be able to manage projects with good communication and presentation skills, problem solving skills with technical knowledge in the discipline and high level of IT ability particularly in computer-aided design.

On one hand, employers strongly preferred employees, who are loyal and committed to their works and functions; responsible team members; with strong moral values and high sense of professionalism. Employers preferred graduates who are proactive, trainable, cooperative team players and who can carry all responsibilities with ease and result-oriented individuals with high regards toward the achievement of company's mission [13], [16]. On-the-job training of the students supports the curriculum of every degree program to deepen their understanding and experience of the real work situation towards the holistic development of various employability skills [17], [18]. One of the main strengths of engineering curricula is their perceived effectiveness in conveying Aristotle's epistemological, convergent inquiry process. It promotes the ability to reason about knowledge associated with mathematics and sciences, which is construed as the engineering science or reductionist model [19]. The curriculum aims to develop the ability of the students to communicate the language of mathematics, engineering and sciences

with other fields and be able to work in multidisciplinary team.

Communication is one of the most useful skills during job interviews while logical, analytical and critical thinking skills are useful during employment examinations [9], [11], [6]. Possessing the appropriate attitude during the entire recruitment process also helped them qualify for the vacant position. Adaptability to various culture of the organization has something needed to embrace by the graduates together with discipline and positive behavior.

On the part of the Higher Education Institution (HEI), employability of the graduates is one of the measures of the performance of the institution to deploy its products to various companies and be part of the labor market. The contribution of the graduates to the economic development of the country would serve as significant outcomes of the HEIs [11]. It is the major responsibility of the academic institution to equip the students with necessary technical skills which are supported with co-curricular activities where the HEI can shape the character and values of the youth.

This study explores the employment status of graduates in mechanical, industrial and electronics engineering for three academic years. Determining how they face the challenges of being part of the workforce would serve as substantial input and basis for continuous improvement of the services being offered by the College of Engineering in particular and the entire University. It shows the capacity of the graduates to apply what they have learned in college and how they would keep their skills and knowledge updated with the new trends and innovation of various industries.

The findings of the previous study conducted by Dotong et al [11] from 2009 to 2012 revealed that the engineering graduates are highly employable with 95.54 percent employment rating, with regular status and presently working as associate professionals in the Philippine manufacturing companies related to their college degrees who found their first job as walk-in applicants and stayed on their jobs for more than three (3) years.

The work – related values that contributed to the job placement of the graduates serve as confirmation on how they express their values through demonstrating positive behavior during the recruitment process and interest towards engineering [20]. Maintaining harmonious relationship to establish a long term commitment with the organization and work assignment is another aspect of being an asset for the company. Lifelong learning is necessary to sustain personal and professional development in a dynamic organization.

The engineering students as future leaders and professionals who will be working in multidisciplinary environment are necessary to be equipped with organizational values and employability skills adaptable to different cultures. The student development program may serve as a guide for the engineering department to address the challenges being faced by the engineering graduates who are now part of various industries.

It is in this context that employability particularly the engineering graduates is one of the important aspects of being an academic institution of higher learning where its graduates and educational services are considered the core of its major products. Looking into this element of quality provides substantial insight to the school management on how to deal with the gaps and issues underlying the employability of its graduates. Interventions and other course of actions would be considered to address the growing needs and demands of the industries.

OBJECTIVES OF THE STUDY

This study aims to determine the employability of Mechanical, Industrial and Electronics Engineering graduates for three academic years from 2012-2013, 2013-2014 and 2014-2015. It specifically aims to determine the present employment, employment status, nature of employment, competencies learned in college and work – related values of the respondents; and to propose a student development program.

METHOD

Research Design

This employability study used the descriptive research design wherein according to Shuttleworth [21], it is a scientific method which involves observing and describing the behavior of a subject without influencing it in any way. The subject is being observed in a completely natural and unchanged natural environment. Descriptive research is often used as a pre-cursor to quantitative research designs, the general overview giving some valuable pointers as to what variables are worth testing quantitatively. Quantitative experiments are often expensive and time-consuming so it is often good sense to get an idea of what hypotheses are worth testing.

Participants

Total population of 64Engineering graduates from three Academic Years 2012-2013 (15 graduates), 2013-2014 (24 graduates) and 2014-2015 (22 graduates), Graduates of 2016 and October 2015 were excluded in the study since there are only few months after their graduation and it would not provide precise data of employment and most of them are still devoting their time to review for the board examination.

Table 1. Frequency Distribution of Engineering Graduates

	2013	2014	2015	Total
BSECE	-	5	2	7
BSIE	9	15	16	40
BSME	6	4	4	14
Total	15	24	22	61

Instrument

Survey questionnaire is the main instrument used in this study. The instrument will be crafted from the prescribed instrument for tracer study of the University wherein some variables were omitted just for the purpose of determining some basic data and information from the graduates which include: the present employment, employment status, nature of employment, competencies learned in college and work – related values of the respondents.

Procedure

The respondents were informed on the purpose of the study and were invited to participate in the survey with the assurance that the data provided in the survey will be treated with utmost confidentiality and will solely be used for the purpose of this research. The researchers will administer the questionnaires through online survey. The study achieved 100 percent retrieval rating.

Data Analysis

Frequency count, percentage rank and weighted mean are the statistical tools used to analyze the result of the survey questionnaire. The respondents were given five options to identify the factors that contributed to the placement of the engineering graduates in their present employment and to determine the skills developed by Lyceum of the Philippines University and work related values of the respondents. To arrive at a verbal description of each item, the arbitrary numerical guide was followed: 3.5 – 4.00: Very Much (VM); 2.5 – 3.49: Much (M); 1.5 – 2.49: Little (L); 1.0 – 1.49: Very Little (VL). The given scale was used to interpret the relevance of the Curriculum to the Job Placement of the engineering graduates: : 3.5 – 4.00: Very Relevant (VR); 2.5 – 3.49: Relevant (R); 1.5 – 2.49: Slightly Relevant (SL); 1.0 – 1.49: Not Relevant (NR)

RESULT AND DISCUSSION

Table 2 presents the frequency distribution of the Engineering graduates in terms of present employment data. Mechanical and Electronics Engineering graduates from 2013 to 2015 are 100 percent employed while the employability rating for Industrial Engineering graduates is 95 percent with 2 of the graduates remained unemployed. This implies that the engineering graduates of the University have the capability to obtain jobs in specified period of time within 3 years. The College of Engineering obtained an overall employment rating of 95.54 percent from 2009 – 2012 [11]. This implies that the engineering graduates of LPU – Batangas is highly employable.

Most of the Mechanical Engineering graduates are assigned as Project Engineer, QC Engineer, Design Engineer, Materials and Contract Engineer and Cadet Engineer in various manufacturing companies in Batangas Province and Metro Manila that provide procurement services; design, production and sales of boilers; energy generation; support services to vessels, projects and plants; petrochemical products and solutions.

Table 2. Frequency Distribution of the Engineering Graduates In Terms of Present Employment Data

		2013		2014		2015		Total	
		F	%	F	%	F	%	F	%
Industrial Engineering	Presently Employed	9	100	14	93.3	15	93.75	38	95
	Unemployed	-	-	1	6.67	1	6.25	2	5
Electronics Engineering	Presently Employed	-	-	5	100	2	100	7	100
	Unemployed	-	-					-	-
Mechanical Engineering	Presently Employed	6	100	4	100	4	100	14	100
	Unemployed	-	-	-	-	-	-		

All of them are employed in the companies with job assignments related to mechanical engineering.

Meanwhile Electronics Engineering graduates are handling positions such as QA/QC Officer, Associate Software Engineer, Test Engineer, Field Engineer, Production Engineer and Commissioning Engineer. Furthermore, Industrial Engineering are assigned in various positions such as Material Planner, Staff Engineer, Planning Engineer, Procurement Staff, QC Engineer, Assembly Engineer, Logistic Coordinator, Production Engineer, Process Engineer, Risk Engineer, Operations/Production Supervisor, Purchasing Staff, Assistant Planner and Warehouse coordinator in various companies in CALABARZON and National Capital Region.

Eskandari et al. [22] noted that recent trends in industrial growth are towards nontraditional industries, particularly information technology and service-related industries, it is anticipated that the percentage of industrial engineers working outside of the traditional manufacturing industries will exceed the percentage.

Table 3 presents the distribution of engineering graduates In terms of present employment status, nature and location of employment. More than half of the engineering graduates with 35 or 59.32 percent are already enjoying the benefits of regular status in their respective companies and 17 or 28.81 percent have contractual or casual status including probationary while 7 or 11.86 percent have temporary position.

It is worthy to note that 58 or 98.31 percent of the engineering graduates under study are gainfully employed with related job assignments to their degree programs completed by one (1) or 1.69 percent is self-employed abroad. There are 57 or 96.61 percent employed locally and 2 or 3.39 percent working abroad. They are currently handling professional, technical or supervisory positions (41 or 69.49%) while the remaining 18 or 30.51 percent are handling rank and file or clerical positions.

ECE and ME graduates were not able to find jobs immediately because of the given fact that they need to undergo series of review in preparation for their Licensure Examination. Meanwhile, some of the IE graduates opt to take the certification exam before engaging to fulltime work. Some of them do not attempt to apply for work because they wanted to put in their resume that they are licensed engineer which adds confidence and advantage for job application. It is good to note that 100 percent of the Mechanical engineering graduates from 2013 to 2015 are all passers of licensure examination for mechanical engineers.

While those who failed in IE certification and ECE licensure examination in particular could still manage to find work in similar fields. Maybe they cannot feel at present the difference between with and without licensed or certification, but in later years of their employment, it would serve as a requirement for promotion or other benefits before they could be entitled to obtain from the organization.

Table 4 presents the reasons for accepting and staying on the job of the Engineering Graduates. One of the common reasons of engineering in accepting and staying on the job is that their present job is related to the course or program of study completed in the University followed by career challenge and related to special skill.

Table 3. Distribution of Engineering Graduates In Terms of Present Employment Status, Nature and Location of Employment

		IE (38)	EcE (7)	ME (14)	Total	%
Status	Regular or Permanent	23	5	7	35	59.32
	Contractual/ Casual	11	1	5	17	28.81
	Temporary	4	1	2	7	11.86
Nature of Employment	Gainfully employed	37	7	14	58	98.31
	Self-employed	1	-	-	1	1.69
	Underemployed	-	-	-	-	-
Location	Local	36	7	14	57	96.61
	Abroad	2			2	3.39
Job Level Position	Rank or Clerical	12	2	4	18	30.51
	Professional, Technical or Supervisory	26	5	10	41	69.49
	Managerial or Executive	-	-	-	-	-

Table 4. Reason(s) for accepting and staying on the job of the Engineering Graduates

	IE (38)		EcE (7)		ME (14)		Total			
Indicators	**AC**	**ST**	**AC**	**ST**	**AC**	**ST**	**AC**	**%**	**ST**	**%**
Salaries and benefits	20	6	2	2	9	6	31	52.5	14	23.73
Career challenge	28	26	6	5	12	12	46	78.0	43	72.88
Related to special skill	22	14	3	3	8	6	33	55.9	23	38.98
Related to course or program of study	30	28	6	5	11	9	47	79.7	42	71.19
Proximity to residence	12	8	3	2	6	6	21	35.6	16	27.12
Family influence	-	2	-	-	-	-	-	-	2	3.39
Others	-		-		-	1	-	-	1	1.69

Meanwhile, the least reason of the graduates is proximity to residence and family influence. One ME graduate also answered due to bond contract is one of his reasons for staying in the job. The result of present study confirms the finding of the previous study of Dotong et al. [11] that proximity to residence as well as family influence and peer influence were the least reasons of the engineering graduates for staying on the job. Likewise, Aguila [8] on their study found out that the reason on salaries and benefits is the most common answer of the employed computer engineering graduates on their motive of staying on the job followed by career challenge which confirms the finding of the present study.

The career challenge and salaries and benefits provide motivating factors for any employee to accept and stay on the job especially to entry level positions and new employees. Engineering graduate-respondents are driven by the demand of their degree program in the labor market where they can test and apply what they have learned for five years in college. Meanwhile, the study of Daquis et al. [23] found out that career challenge and relevance of course completed to job assignment are the reasons of the Radiologic Technology graduates for accepting and staying on the job.

Table 5 shows the length of job search of Engineering graduates. Engineering graduates could be able to find a job in 1 to 6 months (27 or 45.76) period while almost one-third of them or 30.51 percent landed a job in less a month wherein most them are Industrial Engineering graduates with no board examination. The board examination for mechanical engineering and electronics engineering graduates hampers them to work immediately after graduation. It takes almost half a year for them to finish and passed the comprehensive examination before they have given the chance to take the actual board examination being facilitated by Professional Regulation Commission (PRC) which almost took another 6 months [5]. Findings of the study of Mason et al. [24] suggest that structured work experience has clear positive effects on the ability of graduates, firstly, to find employment within six months of graduation and, secondly, to secure employment in graduate-level jobs. The latter job quality measure is also positively and significantly associated with employer involvement in degree course design and delivery.

If employability is measured in the simplistic terms of whether or not a graduate has managed to secure a job within six months of graduating, it only provides a very vague and imprecise indication of what the student has gained [25]. Authors wanted to explore deeply the application of knowledge and skills to their work assignment and the stability of job in terms of financial gains to support a living. For first time job applicants, the quality of training they had in school was short of what the industry required thus they supplemented their learning by attending additional training after they graduated in College [26].

Table 5. Length of Job Search of Engineering Graduates

Status	**IE (38)**	**EcE (7)**	**ME (14)**	**Total**	**%**
Less than a month	14	1	3	18	30.51
1 to 6 months	15	5	7	27	45.76
7 to 11 months	5	1	2	8	13.56
1 year to less than 2 years	2	-	2	4	6.78
2 years to less than 3 years	2	-	-	2	3.39

Table 6. Frequency Distribution of Engineering Graduates In Terms of Skills Learned in College They Find Very Useful in Their First Job

Skills Learned in College	IE	ECE	ME	Total	%	Rank
Communication skills	30	5	11	46	77.97	1
Human Relations skills	26	5	6	37	62.71	4
Entrepreneurial skills	10	0	-	10	16.95	6
Information Technology skills	18	4	5	27	45.76	5
Problem-solving skills	28	5	9	42	71.19	3
Critical Thinking skills	24	6	13	43	72.88	2

**Multiple Responses*

Table 6 presents the frequency distribution of Engineering graduates in terms of skills learned in College that graduates find very useful in their first job. Communication skill (46 or 77.97%) is the most common and useful in their job placement followed by critical thinking skill (43 or 72.88) and problem solving skill (42 or 71.19%). Meanwhile, human relation or interpersonal skill is also considered important most common to industrial engineering graduates while information technology (27 or 45.76%) and entrepreneurial skill (10 or 16.95%) are considered useful to only few engineering graduates.

Engineering graduates also find it hard to get a job. Although engineering is very in demand, but competition also exists. Communication skill is of great importance where some of them were not used to talk in front of many people. They can express ideas technically but certain issue on the organization of thoughts and grammar would be encountered. Loquias' [26] study found out that communication skill registered as having the most impact in securing employment for electronics engineering graduates from one local state college in the Philippines.

But they developed how to think critically and analytically through solving mathematics problem using appropriate formula and technique on how to arrive in exact answer which requires a lot of diligence, patience, perseverance and hard work. They are expected to apply their problem solving skill in the situations where they need to decide based on scientific findings and available information. Tryggvason et al. [27] emphasized that undergraduate programs in engineering must first and foremost provide the students with a general education and help them develop analytical and critical thinking skills. In the study of Martin et al. [28], engineering graduates perceived their strengths to be their technical background, problem solving skills, formal communication skills and life-long learning abilities while areas of weakness include work in multi-disciplinary teams, leadership, practical preparation and management skills.

Computer literacy is always been part of every job requirements that graduates should possess in order to be considered in the position aside from other technical skills. Knowledge on basic skills MS Office and other application software brings confidence to the graduates that they could accomplish any assigned task with accuracy and precision using any available electronic equipment and devices in the department. Fundamentals of Database Management and record keeping of data and information using computers are some of the skills considered useful for employment. Experience on the analysis of those data to become substantial information would demonstrate analytical and critical thinking skills of the graduates.

Since graduates are employed in various institutions, entrepreneurship skill has no direct application on their present employment. They don't perceive its usefulness as contributory to their job placement. Interviewers were not able to ask the graduates about their experience of putting-up a business on their own effort and creativity as what entrepreneurship is regarded as basically. Aguila et al [8] on their study found out that entrepreneurial skill is also the least useful in finding their first jobs and the graduates find the communication skill as very essential most especially during the interview process where they need to impress the interviewee regarding their knowledge and skills acquired in college.

On the process, graduates could have some thoughts on the actual operation of how business works and how employees share their expertise to put everything in place. Graduates could still acquire a lot of experiences and business ideas from their employers and the people within the organization to learn about starting a business. They may be lacking for some business ideas but they have the capacity to make things possible through guidance from the experts in the field they want to pursue.

Preparing classroom for generic skills development certainly requires proper planning and preparation and giving a full lecture or demonstrating the skills are not proven methods of developing the

skills among the students [29]. It always requires hands-on experience for the engineering students to experience what they have learned from the demonstration and practice the skill consistently. Chavez et al. [7] noted that LPU-Batangas has a capacity to cultivate the knowledge of their students and put them in a more progressive tract with right interpersonal skills and significant manipulative and technical skills towards the achievement of their future goals in industry.

Table 7 shows the work-related values contributed in meeting the demands of the present employment of the respondents. The value of leadership (3.53) is considered with very much contribution to their job placement followed by hard work (3.51) and professional integrity (3.51) while creativity and innovativeness (3.42) and courage (3.39) are believed that contributed much to their present employment. Leadership skill is very essential for successful management and also beneficial for a person's career in any field of endeavor [30]. Mumford et al. [31] noted that different categories of leadership skill requirements emerge at different organizational levels, and that jobs at higher levels of the organization require higher levels of all leadership skills. In addition, although certain Cognitive skill requirements are important across organizational levels, certain Strategic skill requirements only fully emerge at the highest levels in the organization. Aguila et al [8] also mentioned that inner motivation to give the best of their ability to perform any job assignment brings the character of hard work and perseverance as significant attribute of great employees who are willing to commit themselves and take higher responsibilities in the organization. Meanwhile, Carlson et al (2003) noted that there is no substitute for fabricating working (or not!) prototypes of conceptual designs, and learning first-hand that designing within constraints and through iteration unleashes creativity and motivates deeper understanding.

Being innovative and creative would not be expecting instantly to demonstrate among graduates with less than five years in employment because it requires experience and expertise to execute breakthroughs in the organization. Maybe some opportunities for improvement could be identified by the new employees with certain level of creativity and being resourceful.

Meanwhile, unity (3.39), supportiveness (3.39), obedience to superior (3.37), love for co-workers (3.37) and efficiency (3.35) are also considered important work values that contributed much to the job placement of engineering graduates. Working in a multidisciplinary team requires unity and support from each member towards the achievement of a common goal. Engineering graduate-respondents believed that being a follower at first needs obedience to superior as a sign of a good future leader with considerable respect and love for co-workers through demonstrating competence and efficiency in the work place. However, fairness and justice (3.22), tolerance (3.12) and nationalism (2.87) are considered the least work values that contribute to their present employment.

Work values of graduates are formed from their personal and family background as observed from their behavior and kind of decisions they made in life. They keep on pursuing something notable as part of their dreams and aspirations to have a successful career in engineering and allied discipline in the future to prove their worth and potentials in living their purpose. They see the truth and justice in performing their duties and responsibilities with professional integrity and respect to authorities and superiors in the organization. Graduates believed that those values really contributed to their job placement as instrumental that influence their character and attitude towards work.

Chavez et al. (2016) found out that honesty and truthfulness, commitment and dedication; diligence and hard work; attendance and punctuality and love of work were considered to have very much contribution to the present employment of the employed engineering graduates in LPU-Batangas. According to the respondents, these are the work values they possessed which helped them obtained their first jobs. The value of honesty in all aspects of life really matters a lot, most especially in establishing a good name in the company, dignified profession and ensuring a lifelong treasure.

Table 8 presents the relevance of the curriculum to the job placement of Mechanical Engineering graduates. Mechanical engineering graduates considered the general education courses in mathematics, languages and natural sciences that contributed very much in their job placement followed by the professional courses that include Engineering Management (3.08), Vibration Engineering, Power Plant Engineering and Thermodynamics (3.00) as well as Industrial Plant Engineering (2.85) and Fluid Machinery (2.82).

Table 7. Work – Related Values Contributed in Meeting the Demands of the Present Employment of the Respondents

Work-Related Values	IE	EcE	ME	Total	VI	Rank
Love for God	3.48	2.6	3.31	3.34	M	11
Honesty and love for truth	3.43	3.2	3.08	3.32	M	13
Punctuality	3.29	3	3.54	3.31	M	14
Obedience to superior	3.33	3.6	3.38	3.37	M	8.5
Hard work	3.43	3.6	3.69	3.51	VM	2.5
Creativity and innovativeness	3.48	3.2	3.38	3.42	M	4
Courage	3.33	3.6	3.46	3.39	M	5
Professional Integrity	3.48	3.6	3.54	3.51	VM	2.5
Love for co-workers and others	3.33	3.4	3.46	3.37	M	8.5
Unity	3.33	3.4	3.54	3.39	M	6.5
Fairness and Justice	3.24	3.4	3.08	3.22	M	15
Leadership	3.48	3.8	3.54	3.53	VM	1
Tolerance	3.05	3.4	3.15	3.12	M	16
Efficiency	3.29	3.6	3.38	3.35	M	10
Supportiveness	3.48	3.2	3.23	3.39	M	6.5
Perseverance	3.24	3.2	3.62	3.33	M	12
Nationalism	2.95	2.6	2.77	2.87	M	17
Composite Mean	**3.33**	**3.32**	**3.36**	**3.34**	**M**	

Table 8. Relevance of the Curriculum to the Job Placement of Mechanical Engineering Graduates

Curriculum	WM	VI	Rank
Mathematics	3.15	Relevant	2
Languages	3.23	Relevant	1
Natural Sciences	3.08	Relevant	3.5
Machine Design	2.77	Relevant	10
Refrigeration System	2.31	Slightly Relevant	12
Air-conditioning and Ventilation	2.23	Slightly Relevant	14
Fluid Machinery	2.82	Relevant	9
Vibration Engineering	3.00	Relevant	6
Industrial Plant Engineering	2.85	Relevant	8
Power Plant Engineering	3.00	Relevant	6
Machine Elements	2.69	Relevant	11
Electronics and Electricity	2.25	Slightly Relevant	13
Thermodynamics	3.00	Relevant	6
Engineering Management	3.08	Relevant	3.5
Composite Mean	**2.82**	**Relevant**	

Project management is mostly the nature of job assignments of Mechanical Engineering graduate-respondents which is related to Engineering Management. Project management is the application of knowledge, skills and experience as well as processes and methods towards the achievement of the project objectives where most engineering firms work per project basis that employ various engineering disciplines.

However, Machine Design (2.77) and Machine Elements (2.69) obtained the least scores among the professional courses which are considered relevant to their job placement. Having entry level positions in the engineering industry, designing of machines and other complex job assignments might not be able to discuss during job interviews because it requires experience and expertise in mechanical engineering discipline. Carlson et al. [32] cited that design is an ideal focus for hands-on learning, serving to anchor and provide context for theoretical foundation concepts. It is, by its very nature, open-ended and multidisciplinary, and forces effective teamwork skills, especially if the project is complex enough. Martin et al. [28] noted that given the prevalence of teamwork in industry, an area of concern is work in multi-disciplinary teams, since the nature of industry work frequently results in teams made of individuals with different areas of expertise.

Refrigeration System (2.31), Electronics and Electricity (2.25) and Air-conditioning and Ventilation (2.23) are considered with slight relevance to their job placement because their work assignments were not directly connected to the mentioned areas of mechanical engineering. From the previous study of Chavez et al. [5] found out that Mechanical Engineering graduates believed that Power Plant Engineering contributed the most relevant subject to their present job followed by Machine Elements and Industrial Plant Engineering.

P-ISSN 2350-7756 | E-ISSN 2350-8442 | www.apjmr.com

Table 9. Relevance of the Curriculum to the Job Placement of Industrial Engineering Graduates

Curriculum	WM	VI	Rank
Mathematics	2.91	R	10
Languages	3.45	R	3
Natural Sciences	2.71	R	12
Industrial Materials & Processes	3.41	R	5
Time and Motion Study	3.14	R	9
Facilities Planning and Design	3.38	R	6
Industrial Quality Control	3.52	VR	1
Ergonomics	3.50	VR	2
Operations Research	2.90	R	11
Production Systems	3.19	R	7
Accounting	2.29	SR	13
Systems Engineering	3.19	R	7
Personnel Management	3.43	R	4
Composite Mean	**3.16**	**R**	

Table 9 presents the relevance of the curriculum to the job placement of Industrial Engineering Graduates. Industrial Engineering graduates considered Industrial Quality Control (3.52) and Ergonomics (3.50) as the most useful and very relevant to their current work assignments followed by Languages (3.45) from general education, Personnel Management (3.43) and Industrial Materials & Processes (3.41).The result of this study confirms the finding of Dotong et al. [11] where they studied the IE graduates from 2009-2012 which showed that Industrial Quality Control as the number 1 very relevant to the job placement of the IE graduates while accounting course is also the least relevant.

Pandey et al [33] noted that production scheduling, maintenance scheduling and process quality is some of the key operational policies, affecting the performance of any manufacturing system and Foehr et al [34] cited that product quality is one key performance indicator for manufacturing systems with growing importance. Quality Control is an essential part of the production process in most engineering and manufacturing firms that monitors and measures the conditions and characteristics of the outputs if these adhere to a defined set of requirements. Industrial Engineering graduate-respondents are usually assigned as Parts Quality Control Engineer, Production Engineer, Production Supervisor and Production Planner that require knowledge of documenting and reporting the result of analysis to the management. Likewise, knowledge in ergonomics or human factor also contributes to the job placement of the Industrial Engineering graduates. Ergonomics has great potential to contribute to the design of all kinds of systems with people in work systems and product/service systems [35]. It makes them aware of the consequences on the health conditions and productivity of the workers as well as their performance in relation to the design of the system and the work place.

However, natural sciences (2.71) and operations research (2.90) obtained the least mean scores among the relevant courses while accounting is considered with slight relevance to their current work assignment. Industrial Engineering might believe that natural sciences have indirect application to their present job while utilization of advanced analytical methods in management through operations research could not be exactly addressing the needs of their present job assignments. Operations research is also called as management science which focuses on analyzing and solving management problems with the use of variety of mathematical tools and techniques. This might not be utilized at present but could be beneficial when they go higher in the corporate ladder someday.

Eskandari et al. [22] stressed that while the types of industries are evolving where industrial engineers are working, changes in the types of roles and responsibilities performing by Industrial Engineers within these industries are occurring as well. Given these anticipated changes in industries and consequently in the types of assigned roles, Industrial Engineering (IE) programs need to revise their curriculum to educate and prepare students to meet the future needs of today's rapidly changing industrial workplace.

Table 10 presents the relevance of the curriculum to the job placement of Electronics Engineering graduates. Electronics Engineering graduates considered Languages (2.60) and Principles of Communications (2.60) as relevant to their current job assignment while Microprocessor System (2.25), Mathematics (2.20), Digital Communications (2.20) and Transmission Media and Antenna System (2.20) with slight relevance. However, Logic Circuit & Switching Theory (1.40) and Control Systems (1.40) were considered not relevant to their work assignments.

In the study of Dotong et al. [11] found out that Electronics is considered the foremost relevant to the ECE employed graduates followed by Digital Communications, Logic Circuit and Switching Theory, Control Systems and Engineering Circuits/Energy Conversion which is contrary to the result of present study.

Table 10. Relevance of the Curriculum to the Job Placement of Electronics Engineering Graduates

Curriculum	WM	VI	Rank
Mathematics	2.20	SR	5
Languages	2.60	R	1.5
Natural Sciences	2.00	SR	8
Electronics	1.60	SR	10
Logic Circuit & Switching Theory	1.40	NR	12.5
Microprocessor System	2.25	SR	3
Digital Communications	2.20	SR	5
Control Systems	1.40	NR	12.5
Engineering Circuits/Energy Conversion	1.50	SR	11
Spectra and Signal Processing	2.00	SR	8
Transmission Media and Antenna System	2.20	SR	5
Principles of Communications	2.60	R	1.5
Data Communications	2.00	SR	8
Composite Mean	**1.99**	**SR**	

This signifies that the two groups of ECE graduate-respondents from 2009 to 2012 have different application of professional courses to their job placement compared to the ECE graduate-respondents from 2013 to 2015. There is a diverse application of knowledge learned from electronics which can be employed in job assignments related to computer software and networks, electrical machinery and telecommunications.

Proposed Student Development Plan

The proposed student development plan for engineering students focuses on the graduates' employability, improvement of the engineering curriculum, engineering skills development and work related values. Building long term relationship with the industrial companies where engineering graduates from LPU-B can be considered as priority in hiring employees is one of the given strategies as well as asking the partner – industries for any academic scholarship where students after graduation could be directly employed.

Strengthening the application of design techniques in working with various projects emphasizing the value of creativity and innovativeness and integrating the problem – based learning in performing classroom activities and accomplishing projects alongside with the assessment through outcomes-based education are also some of the proposed strategies for the improvement of engineering curriculum.

It was also noted for engineering skills development to provide opportunities to experience the intellectual discussion for participating in the local or international research conferences and to enhance their presentation skill; allow students to attend training and seminars related to technical skills required by most industries; and Provide strong support to extra-curricular activities to address the gap in working to a multidisciplinary team.

Part of the strategies to demonstrate positively the work-related values is to develop professional integrity through promoting academic honesty in submitting school requirements on time and also to emphasize the essence of time management as well as to conduct activities that they can relate all applications of lessons to actual work environment and how values should manifest in performing their certain duties following ethical standards and code of professional conduct

CONCLUSION AND RECOMMENDATION

Mechanical and Electronics Engineering graduates from 2013 to 2015 are 100 percent employed while the employability rating for Industrial Engineering graduates is 95 percent. Engineering graduates are gainfully employed locally and enjoying the benefits of regular status and handling professional, technical or supervisory positions where they find their present jobs within 1 to 6 months. Relevance of the engineering program to graduates' present work assignment is one of the common reasons in accepting and staying on the job followed by career challenge and related to special skill.

Communication skill is the most common useful ability of the engineering graduates in their job placement followed by critical thinking skill and problem solving skill while Leadership, hard work and professional integrity are the work – Related Values identified with very much contribution in meeting the demands of the present employment of the engineering graduates.

Mechanical and Industrial Engineering graduates considered the general education and selected professional courses as relevant to their job placement while slightly relevant as perceived by Electronics Engineering graduates.

The finding of the study is limited only to the engineering programs and the HEI under study wherein results may not be applicable to other degree programs and academic institution.

It is recommended that the Engineering students may be given curricular activities focusing on the enhancement of oral communication skill and working with multidisciplinary teams. The University may strengthen its linkages with engineering and

P-ISSN 2350-7756 | E-ISSN 2350-8442 | www.apjmr.com

manufacturing firms that will serve as the training ground of students for their internship and as potential future work environment. Ensure that the graduates possessed the student outcomes of the engineering program through appropriate assessment tools in the specific period as deemed necessary.

Seminars may be conducted by the College of Engineering focusing on the total quality management or any quality assurance mechanism as common area of concern for all institutions and industries. Produce research collaboration with the industries through engineering graduates or alumni to strengthen partnership with the employers.

Future researchers may explore on challenges encountered by the graduates on their respective companies and how the University can intervene to provide or offer solutions through conducting collaborative research with the alumni and faculty member.

The proposed student development program may be implemented and evaluated to determine its effectiveness for continuous improvement.

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