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Industries Involvement in the Assessment of Programme Learning Outcomes (PLO)

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Abstract

This paper describes assessment of PLO that is contributed by Learning Outcome of Industrial Training undertaken by Faculty of Electrical and Electronic Engineering (FEEE) students at the UTHM. This is to ensure Continual Quality Improvement (CQI) culture in the spirit of Outcome Based Education (OBE). Evaluation within the industrial training context is to evaluate students' work quality and the development of their soft skills. Among the evaluation method used are: evaluation report from industries and faculty's supervisor, log book and Industrial Training report, observation at the work place and presentations by the students. In order to get Feedback concerning the effectiveness of industrial training, FEEE has organised a symposium called FEEE Industrial Experience Symposium (FIES) since 2008. Every student is required to produce a report and make a presentation in front of representative from faculty and industry at UTHM. The statistics and feedbacks from students and the industry are presented in this paper.

Keywords: Industrial Training; PLO; CQI; CLO;

1. Introduction

Exposure to professional engineering practice is a key element to differentiate an engineering degree from applied science degree. Although the status of Corporate or Professional Engineer requires a substantial period of experiential formation in industry after the completion of an accredited academic programme, it is clearly inadequate, over the first few critical years, for the perception of engineering to develop in complete isolation from the realities practice. Familiarity with all common engineering process is essential and exposure at a practical level to a wide variety of process is required at a level appropriate to the young professional. Industrial training is a key component of learning in an integrated academic curriculum. Due to its importance and based on the requirement of Engineering Accreditation Council (EAC), each student in FEEE, UTHM is required for 2 months of continuous industrial training during their final year and final semester. From 2011 onward, Industrial training will start during the 3rd semester of their 3rd year so that the exposure in the engineering practice can be integrated in the industry based final year project.

The process of CQI is implemented in FEEE, UTHM by reviewing Feedback from industry that receive our student for Industrial training. By doing this, FEEE can keep track the contribution to the programme outcomes.

2. Experimental details

2.1 Theoretical Framework

The assessment of Programme Learning Outcomes has emerged as a main element in the Institution of High Learning in today's competitive scenarios. The input and feedback from multiple stakeholders are becoming a crucial ingredient for effective assessment and followed by continuous quality improvement initiatives. Stakeholders involvement in the assessment process is critical for several reasons. First, it is a direct measurement effort, which may be valued by the IHL's community and its wider community such as the IHLs Management, employers, alumni, Ministry of Higher Education and of course parents.[1][2]
Second, the stakeholder participation strengthens the accountability by creating a shared

understanding of the process of assessment in particular, assessment results, and interpretation of those results[3][4]. The third point is that, it addresses the particular needs of engineering faculty who have been mandated by our accreditation board (EAC) to incorporate industry into their assessment and continuous improvement efforts [5]. This mandate is seen as another task for engineering faculty to address. It comes with few, if any recommendations for how best to integrate industry into the assessment process. This paper attempts to highlight the status of FEEE in developing processes for integrating industry into their assessment programs. Table 1 shows the statistic of Industry involvement in training FEEE students from 2006 until 2009 and projection for year 2011.

Table 1. Number of Industrial Training Student and Industry involved in year 2006- 2011

Year	Number of Students (Diploma and Degree)	Industry Involved (Government and Private)
2006 & 2007 Semester (I,II and III)	179	140
2008 & 2009 Semester (I,II and III)	379	256
2010 & 2011 Semester (I,II and III)	650 (estimated)	560(estimated)

FEEE solicits and integrates industrial input in the assessment process. Evaluation experts recommend integrating stakeholders in all aspects of the process, from its curriculum planning to the evaluation of Programme Learning Outcomes [6] [7]. How then is industry, as one of the most important stakeholders in engineering education, being involved into the assessment process, the answers to these questions are critical.

Table 2. Comments from Industrial Supervisor

Student	Comments from Industrial Supervisor
	Positive Comments
A	"He is diligent, passionate, a fast-learner and able to adapt with working environment."
B	"Good. Ability to grasp new knowledge and skill."
C	"Good attitude, Dedicated towards assignment given. Interested to understand more detail on process related."
D	"Have a good interpersonal skills, verbal and writing"
E	"Competent, capable and passion"
F	"Student shows good commitment to collaborate with our personnel especially the technician to share some ideas in trouble shooting problems or machine upgrading"
	Negative Comments
G	"Need to improve in the initiative & creative way in the working environment, Need to improve communication skills."
H	"Good but need to improve on the syllabus based on current industrial needs"
I	"However, he still lacks of confidence in expressing the idea and this can be developed if he is given more opportunities to gain experience and knowledge."
J	"The format of the book is good but need to improve on the content. Need to improve on the english communication and concentration on the work."
K	"Room for improvement in terms of communication skills. With increase confidence, should explore and widen scope of knowledge in future.Training period should be longer "

2.2. Questionnaire details

Each industrial supervisor is provided with a set of questionnaire that has to be submitted to FEEE Industrial training coordinator after the student has finished their training. The questions provided are divided into 3 categories which are technical knowledge, technical and generic skill. Every question is created so that it reflects the attributes of Course Learning Outcomes (CLO) of FEEE industrial training and Programme Learning Outcomes (PLO) for FEEE.

Table 3 is the Questionnaire that was distributed to the Industrial Supervisor .By the end of the training period, Industrial supervisor will evaluate student by giving marks either 1 (strongly disagree), 2 (disagree), 3 (not sure), 4(agree) or 5 (strongly agree) to the respective items.

Table 3 .Questions that reflects the attributes of CLO and PLO of FEEE

A	***Technical Knowledge***
1.	Student has basic knowledge in electrical/electronic engineering.
2.	Student able to design simple electrical/electronic circuit to solve electrical/electronic engineering problem.
3.	Student able to write computer program or use computer software to solve electrical/electronic engineering problem.
4.	Student able to give constructive ideas to improve current electrical/electronic system.
5.	Student able to solve electrical/electronic engineering problem in a more creative manner.
B	***Technical Skill***
1.	Student able to use electrical/electronic measurement instrumentation and equipment wisely.
2.	Student able to perform basic maintenance on electrical/electronic equipment.
C	***Generic Skill***
1.	Student able to use ICT facilities effectively.
2.	Student able to communicate effectively at all level.
3.	Student able to perform his/her duties professionally and ethically.
4.	Student able to work with minimum supervision.
5.	Student shows enthusiasm to increase his/her knowledge in electrical/electronic engineering.
6.	Student able to lead or participate actively in any project team.
7.	Student has awareness on his/her social responsibilities and evironment.
8.	Student able to plan, manage and shows strong interest in entrepreneurship.
9.	Student able to appreciate and practice aesthetic values (design: ergonomic, safety, portable, practical, durable, etc.).

Table 4 shows the CLO for the Undergraduates Industrial training at FEEE, UTHM. The items cater to the needs of 10 PLO in Table 3.

Table 4.CLO for Industrial Training at FEEE.

	Course Learning Outcomes (CLO)
1	Students able to apply the theory in practical works.
2	Student able to demonstrate the technical skills in the engineering field.
3	Students able to contribute themselves as a disciplined worker.
4	Students able to analyze the knowledge, techniques and skills in using advanced equipment.
5	Students able to manage time efficiently besides adapting with engineering application and current technology and shows interest in entrepreneurship
6	Students able to conduct maintenance work and services periodically.
7	Students able to manage, plan, provide and supervise budgets efficiently.
8	Students able to reinforce the ability to work in a team and communicating efficiently.
9	Students able to enhance understanding towards professional accountabilities, etiquette and social.
10	Students able to work in a challenging environment.

Table 5, is the general PLO for FEEE undergraduates.

Table 5. General PLO for FEEE

1	Acquired and able to apply knowledge of basic science, and electrical engineering fundamental;	KNOWLEDGE
2	In-depth technical competence in a electrical discipline;	PRACTICAL SKILL
3	The ability to communicate effectively/use ICT effectively;	COMMUNICATION
4	The ability to use techniques, skills, modern engineering tools necessary for electrical engineering practice and easily adaptable to industrial needs;	UTHM NICHE
5	The ability to identify problems, create solutions, innovate and improve current designs and practices;	CRITICAL THINKING
6	An understanding of professional and ethical responsibilities and commitment to the community;	ETHICS AND PROFESSIONALISM
7	A recognition of the need for, and an ability to engage in, life-long learning (adaptability to new situations and demands by applying and or updating knowledge and skills);	LIFE LONG LEARNING
8	The ability to function effectively in groups in ways that contribute to effective working relationships and the achievement of goal both as a leader as well as and effective team player;	TEAM WORKING, LEADERSHIP
9	The ability to have an international perspective on social, cultural, global and international responsibilities, including the understanding of entrepreneurship and the process of innovation, of a professional engineer and the need for sustainable development;	SOCIAL RESPONSIBILITY
10	The ability to appreciate aesthetic values through development and applications of personal judgment;	AESTHETIC VALUE

3. Results and discussion

3.1. CLO Assessment

Table 6. Feedback from Industrial Supervisor that Responded Strongly Agree and Agree According to CLO Attributes.

CLO	2nd SEM. 06/70	2nd SEM. 07/08	2nd SEM. 08/09	3rd SEM. 08/09
1	83	83	87	89
2	66	73	79	84
3	69	64	71	85
4	72	68	71	78
5	55	36	66	76
6	92	91	89	98
7	91	91	97	98
8	84	70	88	93
9	66	55	87	85
10	72	79	80	98

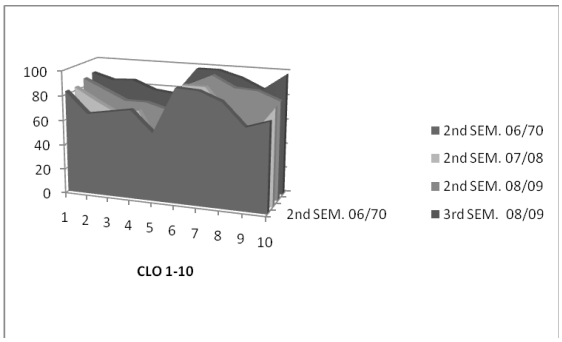

Figure 1. Comparison of Percentage of Positive feedback according to 10 CLO's from year 2006 until 2009.

From the questionnaire we have collected, almost all of the comments from industrial Supervisor stated that the Industrial Traning Student of FEEE fit the industry requirement based on 10 CLO.

Table 6 shows that through the 2nd Semester 06/07 and 2nd Semester 07/08 CLO 5 had obtained marks below 60% because most respondents had answered 3; which is "not sure" for item "ablity to plan,manage and have interest in entreprenuership". However, the percentage for this question has increased in the following year due to the efforts done by the faculty by offering entreprenuership subject together with finishing school programme for the final year students.

In 2nd semester of 06/07 ,for the question "student have strong awareness on social reponsibility towards society and environment "related to CLO 9 had obtained marks less than 60% ,whereby majority of industrial supervisors could not assess

the criteria through the training.The situation is getting better for the next semester.

3.2. PLO Assessment

Table 7. Feedback from Industrial Supervisor that Responded Strongly Agree and Agree According to PLO Attributes.

PLO	2nd SEM. 06/70	2nd SEM. 07/08	2nd SEM. 08/09	3rd SEM. 08/09
1	83	83	87	89
2	72	79	80	83
3	66	73	79	84
4	72	68	71	78
5	69	64	71	85
6	92	91	89	98
7	91	91	97	98
8	83	69	88	91
9	66	55	87	85
10	55	36	66	76

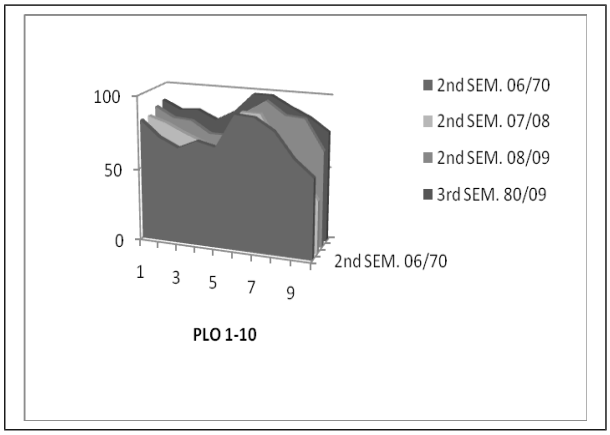

Figure 2. Comparison of Percentage of Positive feedback according to 10 PLO's from year 2006 until 2009.

The majority of Industrial Supervisor had stated that the Industrial Training students of stated that the industrial student of FEEE has met the industrial requirement based on 10 PLO of FEEE.

Table 7 shows that in 2nd semester 07/08, PLO 9 had gained 55% mark but the percentage increased for the following year.This could be due to the fact that finishing school programme organized by the faculty for final year students before they go for industrial training and the implementation of FIES after they comeback from Industry.

4. Conclusion

The study has proved out that to ensure Continual Quality Improvement (CQI) culture in the spirit of Outcome Based Education (OBE) assessment of PLO and CLO from the Industry during Student Industrial training is vital. Furthermore, the measure taken by FEEE in organizing FIES and Finishing School Programme brought more positive comments from both Industry and University.

References

1. Davis, B. G. Demystifying assessment: Learning from the field of evaluation. *New Directions for Higher Education.* No. 67 (1989). pp. 5 – 21.

2. Rao, M. Liberal arts for business: A partnership built by faculty. *AAHE Bulletin.* (1999). pp. 7 – 10.

3. McMartin, F.P., Van Duzer, E. & Agogino, A. Bridging diverse institutions, multiple engineering departments, and industry: A case study in assessment planning. *Journal of Engineering Education.* (1998). pp. 157 – 165.

4. Sheppard, S. D., Reamon, D., Friedlander, L., Kerns, C. Leifer, L, Marincovich, M. & Toye, G. Assessment of technology-assisted learning in higher education: It requires new thinking by universities and colleges. Paper presented at the Frontiers in Engineering Education Conference, Phoenix, AZ. (1998).

5. Engineering Criteria 2007 EAC Manual Published by The Engineering Accreditation Council Malaysia.

6. Nichols, J.O. The Departmental Guide and Record Book for Student Outcomes Assessment and Institutional Effectiveness. New York: Agathon Press. (1991).

7. Gronlund, N.E. *Assessment of Student Achievement Sixth Edition*. Boston: Allyn and Bacon. (1998).

8. D.C. Montgomery, Design and Analysis of Experiments, 4th ed., Wiley, New York, 1997.

9. EAC, Engineering Programme Accreditation Manual, 2007.