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Undergraduate Industrial Training Experience: A Win-win Situation for Students, Industry and Faculty

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Abstract

Undergraduate student industrial training programs in the engineering industry are mutually beneficial relationships that helps nurture student growth, enhance university-industry relationships, and challenge the faculty to include up-to-date information in the teaching curriculums. The engineering discipline in particular requires graduates to be well-prepared with real world experience so they can anticipate the working challenges. The industrial training program is a mandatory graduation requirement for undergraduates of the Faculty of Engineering and Built Environment, UKM. Students have to undergo a ten to twelve-week period of industrial training following their sixth semester of university study. Before the training period, students have to prepare a short resume and then determine their companies of choice. During the internship, students kept a daily log documenting the activities and will be monitored by a visiting faculty academic. Upon returning to the faculty, they have to complete a technical report and deliver a seminar presentation summarising their experience. This paper highlights the program description, defines the industrial training objectives and describes the implementation process and challenges.

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Keyword: Industrial training, Engineering education, University-industry relationship;

1. Introduction

Industrial training or internship programs have been an important part of many engineering programs in the world [1,2]. The link between academia and industry is seen as very necessary for the growth of the students. One

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of the essential missions of universities is to meet the requirements of the stakeholders. For graduates of the Faculty of Engineering and Built Environment, industry employer is one of them. Hiring rates and the satisfaction with graduates' performance in industry indicates the quality of the university's academic programs.

1.1. Positive effects of industrial training as part of engineering education

By combining formal academic education in university with suitable industrial training period, researchers have found that such experience will affect students in their CGPA, duration of time in school, and starting salary [3]. Several other studies also found that there are positive outcomes for students in terms of academic standing and higher cumulative grade point averages than for non-experienced engineering majors [4,5]. In addition, industrial training experiences decrease job search time and increase the probability of promotion and advancement after hire [6].

Other outcomes of a university-industry relationship is that it would enable the faculty to anticipate the shifts in industry trends and can gather industry feedback on student performance and program impact that can be used to adjust the curriculum and study programs accordingly.

1.2. Industrial training as part of accreditation requirements

Starting from the year 2003, the Faculty of Engineering and Built Environment (FKAB) of the National University of Malaysia has implemented Outcome Based Education (OBE) as embedded in the Accreditation Board of Engineering and Technology (ABET) criteria. This is also in line with the engineering program accreditation requirements outlined by the Malaysian Engineering Accreditation Council (EAC). To ensure a successful OBE, the measurement and assessment of each targeted outcome is taken very seriously. By doing so, will enable the faculty to continuously monitor the quality of its engineering education.

The industrial training program in FKAB is implemented as a compulsory course that students should undertake after going through six semesters of university study. Student performance in the course is taken into account as one of the elements towards accreditation of the university engineering program.

2. Description of the industrial training program at FKAB

Although the industrial training program in the faculty is compulsory as a prerequisite to graduation, the course grades is not taken into account in the calculation of a student's Cumulative Grade Point Average (CGPA). However, the grades will give a clear indication to the potential employers on the suitability of the graduates as a potential employee. Thus, undergraduates have to ensure that they perform well during the training period in order to achieve excellent grades.

2.1. Program objectives, structure and management

One of the objectives of the industrial training program is to expose students to the practices in engineering specific to their chosen field of study and industry. Engineering industry often uses the most advanced technology in their operations, and by spending some time in such environment, students will gain some new experience and knowledge that would be unavailable at university.

Based on a survey of undergraduate catalogues of ABET-accredited institutions, Stephan [7] determined that in nearly 70% of the institutions, there is no ethics-related course requirement for all engineering students. In the faculty, engineering ethics is taught in the form of a coursework taken as part of study credit. The industrial

training program enhances this theoretical knowledge by exposing students to the responsibilities and ethics as an engineer and the profession of engineering through actual on-the-job training.

Also, the program is expected to help graduates to develop excellent communication skills in engineering that covers daily interaction within the working environment and technical writing. There has been enough evidence that graduate engineers often lack the required standard of communication skills particularly when compared to the needs of industry internationally [8,9]. Therefore, this program aims to provide the necessary training in such skills for the future graduates of the faculty.

The program has been designed to be implemented during the preceding semester before graduation. The reason why this is done during this time is so that students will have already been equipped with the necessary fundamental engineering knowledge during their first three years at university to be able to comprehend the theoretical knowledge involved in industry operations. Also, it is hoped that by the time these students come back to university for their final year, they would have reached the maturity to tackle the challenges of final year study. This would particularly be useful in their final year project which would sometimes involve projects given by industry.

The management of the industrial training program is being supervised at the faculty level by the Head of the Industry & Community Partnerships. In each department of the faculty, there would be a separate coordinator which oversees the industrial training activities specific to each department. There would be meetings held regularly to ensure smooth organization of the program, and ensures successful placement of each of the students in industry.

The management has devised a timetable for all activities related to the student industrial training to manage the program better. This timetable covers all related activities broken down into different sessions. These sessions are described in Table 1.

Table 1 Breakdown of industrial training activities into different stages

Stage	Activities	Duration (weeks)
1	Resume writing and submission	4
2	First cycle of Application	20
3	Second cycle of Application	9 – 10
4	Actual training period	10 – 12

During stage 1, students are expected to prepare a short 2-3 pages of resume highlighting their personal information, educational achievements, interests, and relevant co-curricular activities. The students would also need to provide the names of two referees of which, one would normally be the departmental industrial training coordinator and the other one is a lecturer from the department.

These resumes will be checked and revised by the respective coordinators and collected as a database at the faculty level. During stage 2, the students choose the companies which they would like to undergo training with. This is done by selecting up to 10 companies from a company database prepared by the university. The respective applications will be sent off by the faculty together with the revised short resume. Then, the students wait for the company reply and training offer. Once a student receives an offer, they will confirm their acceptance and will be recorded in the system.

If by any chance, the student receives no offers, they have to go through to the next cycle of application in stage 3. In this stage, applications are sent off manually by the students to other companies in the database or companies recommended by the faculty. The success of each student's application is being closely monitored by the respective departments and the faculty. Students which have difficulties in securing an offer of placement will be given help by the coordinator.

The final stage in the industrial activity is the actual training period. During this time, students go to their respective companies, and stay there throughout the ten to twelve weeks period.

2.2. Program requirements and assessment methods

The assessment for the industrial training course is completed by the departmental coordinator. Table 2 shows the course requirements.

Table 2 Industrial training requirements for course assessment

Item	Breakdown	Marks (percentage)
Logbook	Submission, attendance and contents	35
Executive summary		15
Employer's survey		30
Communication, ethics and professionalism	Seminar presentation, and general conduct	20

The logbook is a daily record of all the related activities that the students have to perform during their training period. This can include diagrams, and other related information. Once the students have completed their training, the logbook will be submitted and assessed by the department coordinator with the help of other lecturers. Students also have to prepare an executive summary which describes brief technical aspects of their training period. This summary is also assessed by the departmental coordinator. Another aspect of the assessment is a seminar presentation by the students highlighting the interesting elements during their training. The material for this seminar presentation is being kept in a faculty database to be accessed by future students of the faculty.

There is also one aspect of the assessment which requires the employers to fill in a survey form, to directly assess the student performance during their training period. This enables direct assessment of the program outcomes to be made. Through this survey, the faculty also receives feedback from employers on how to improve the faculty engineering programs.

One aspect which is necessary to help improving the program though is not being given any marks is the visit to industry by the lecturers from the department. During their training period, a lecturer is appointed to visit each student in the company. Through this visit, feedback is obtained from the employers regarding the student performance, and on the industrial training program as a whole. This visit also gives the lecturer an opportunity to assess the suitability of the company in providing a useful training program.

3. Implementation and challenges

Through the many years of implementation of the industrial training program, many advantages and challenges have been faced by the students, faculty and industry.

Students participating in the industrial training program can benefit from the pre-internship training on resume writing and general working conduct given by the departmental coordinators. During the seminar presentation students receive constructive feedback from their lecturers on useful communication skills techniques.

The faculty also gains tremendously by the industry feedback which allows improvements to the program to be made. This enables continuous quality improvement to be made, which is an essential element to outcome based education.

By providing the training experience to the students, industry effectively can 'test' the graduates before they are actually employed. This enables the industry to select the best future employees for their company.

One of the challenges faced by the faculty in implementing the program is the constraints of the university academic calendar. In particular for the year 2013, the duration of the industrial training period is only for ten weeks. This is considered too short as industries often require a full 12-week period for their training program. Another challenge is to ensure companies provide a useful and constructive training content. It has been found through previous industry visits that some companies do not conduct a proper training program, and as a result, students were assigned to do tasks not relevant to their engineering career. This can be overcome by conducting discussions and giving briefing to industries on the faculty expectations.

In terms of the students, some students do not take these training seriously and treat it only as a way to spend their semester break. There have been cases where students quit their training without any notifications to the employer and faculty just because they were unsatisfied with the working arrangements. This gives a negative impression to the faculty, and therefore steps were taken by the faculty to prevent this from recurring. One of the steps is through constant communication between the coordinators and the students to monitor their satisfaction.

4. Conclusions

The challenges of globalization require our engineering graduates to be fully equipped with the necessary knowledge and skills before they enter the workforce. One of the ways that can be achieved is through the incorporation of an industrial training program during their study. In this paper the industrial training program has been described, and the benefits gained by the students, faculty and industry have also been highlighted. The implementation of the industrial training program in FKAB has ensured a win-win situation for students, faculty and industry.

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