

Improving Student Achievement Through an Industry Placement

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Abstract - A carefully constructed work integrated learning experience called the Industrial Affiliates Program (IAP) has been a feature of one of the Griffith University undergraduate engineering programs for 18 years. In 2005 the decision was made to extend this program to all disciplines of engineering. 2006 was a transition year and civil engineering students had the option of participating in the Civil IAP or undertaking the Traditional Thesis. Both options run over both semesters of final year and carried the same academic weighting. The Civil IAP involved undertaking a project during a one day per week industry placement with both an industry and a university supervisor. The Thesis was a project or piece of research conducted within the university laboratories with a university supervisor. The Thesis project has often arisen from an industry source. Students were given the option of completing IAP or Thesis, with about one-third choosing the IAP. The final year academic performance of civil engineering students participating in the Industrial Affiliates Program has been compared with the students choosing the Thesis option. Comparatively, IAP participants appear to achieve higher grades.

Index Terms – industrial experience, student performance, work experience, work integrated learning.

I. INTRODUCTION

The accreditation of Australian undergraduate engineering degrees requires the inclusion of a certain amount of industry experience. The accrediting professional body, Engineers Australia, expresses this as an appropriate amount of exposure to professional engineering practice. [1] Griffith University like almost all Australian universities, requires students to gain at least 60 days of suitable industry experience during their engineering studies. This requirement is usually met by the student working for engineering organisations during their university vacations.

The civil engineering section at Griffith University, located on the University's Gold Coast campus, followed this tradition. Again in accordance with tradition the final year of the degree contained a year long Thesis subject which included a dissertation on a piece of project work.

A carefully constructed work integrated learning experience called the Industrial Affiliates Program (IAP) has been a feature of the final year of one of the Griffith University undergraduate engineering programs for 18

years. A number of other university's have since introduced similar programs [2] [3]. In 2005, as part of a review of the Bachelor of Engineering programs, it was decided that the revised program would include IAP for all engineering students. The IAP is a semester long full-time placement in industry with an industry partner. The student carries out a project in the industry setting and reports on it academically to dissertation standard. In effect, the IAP combines professional engineering practice, industry experience, project work and dissertation. Further information about the IAP can be found on the IAP website [4].

When the decision was made to change the degree structure, it was decided to trial the IAP for civil engineering students by allow them the option of taking a "special" version of IAP instead of their Thesis subject. As the existing Thesis subject involved a year-long project, the special version would be a one day per week placement for the whole year, fitting in with the rest of their subjects. From the start it was recognized that this was a less than optimal version of IAP but it was felt important to conduct the trial to demonstrate that the IAP would work for civil engineering.

There had been arguments against extending the IAP experience to the civil engineering students. These arguments centred on:

- Civil engineering is different to other engineering disciplines. Civil engineers do not produce 'widgets' so it would be harder to define a suitable output for a student's project.
- It will be difficult to find industry partners. Almost all civil engineering employment in the Gold Coast region is with consulting companies who are project and deadline driven, and it was argued that these companies would not be able to fit in IAP students.
- IAP is not as suitable as Thesis for high performing students. High performing students will prefer to undertake Thesis as it can be more theoretically orientated. Similarly lower performing students might choose to avoid exposing their performance to potential employers through IAP.

II. THE INDUSTRIAL AFFILIATES PROGRAM COMPARED TO THESIS

The civil engineering IAP involved undertaking a project during a one day per week for a year industry placement with both an industry technical supervisor and a university academic supervisor. The Thesis is a project or piece of

research conducted over the whole year within the university laboratories with a university supervisor. The actual Thesis project has often arisen from an industry source.

The educational outcomes of both course are similar educational outcomes specified. The outcomes for the Thesis course were expressed as “students should have demonstrated the following skills:

- * T o design an investigation, project or task, including the preparation of a brief;
- * T o assess the state of the art in their field of investigation. This process will generally involve a literature search;
- * T o plan and execute an experimental or other investigation;
- * T o work in a sustained and systematic manner on a problem or set of related problems;
- * T o employ social skills needed for working outside of the University or its formal program;
- * T o apply themselves to deadlines under supervision;
- * T o develop research, writing and presentation skills.”

For the IAP course, the learning outcomes have been expressed as “the students should:

- be able to successfully search for and gather information from the Internet and other sources, including library resources and properly cite this material.
- be able to work effectively in a team.
- develop formal presentation skills.
- understand the requirements for liaising with clients.
- develop effective verbal and written communication skills.
- develop analytical and problem-solving skills.”

Although the two courses have similar expressions of learning outcomes, a significant practical difference is that embedded within the IAP is a very strong theme of formal and informal project management coupled with a strong sense of student responsibility for their own success.

Both IAP and Thesis involve carrying out an investigation and reporting on it. The major differences are:

- Thesis topics are set and supervised by university staff while IAP projects are set by the industry and the technical supervision comes from the industry supervisor. Students undertaking IAP are very much embedded in the industry setting while on task. They receive a great deal of informal mentoring from their “work” colleagues in the industry setting.
- The IAP is very strong on managing the project. There has to be a project management plan that is strictly adhered to during the IAP. Thesis is about outcomes and students time management is not so formal.
- As a university subject Thesis students can work on their project at times to suit themselves, whereas IAP

students are “at work” for their project meeting the dress and attendance standards of the industry partner.

If there are differences between the performance of IAP and non-IAP students it would be expected to come from the belief in their own ability that successful completing of an IAP project gives students, especially those who might have been poorer performers prior to the experience.

III. THE CIVIL INDUSTRIAL AFFILIATES PROGRAM

Of the 50 eligible students for the trial, 10 chose to take up the IAP option while 40 undertook the traditional Thesis. Given the quite short notice students had of the IAP option and their lack of knowledge as to what was involved, ten students was considered a reasonable cohort.

One of the characteristics of the IAP program is that projects have to be sought from industry in advance. To avoid disappointing potential industry partners, it is not desirable to accept more projects than there are students to ensure each project will be ‘active’. In the short lead time around 10 projects had been promised by industry.

Despite misgivings about the availability of projects it turned out to be relative easy to get industry to agree to offer projects. Local government engineering departments, the state government main roads department and consulting companies all offered projects.

The trial identified a number of issues that will need addressing in future offerings:

- The approval of IAP project topics needs refining. A good Thesis topic may not be suitable given the project management emphasis.
- The university supervisors need training for their role. They are not the students project supervisor. They have a pastoral care role, and a role in ensuring that academic standards are met.
- Industry needs to more aware of what makes a good IAP project.
- One day a week does not work. It does not allow students to engage intensively with their project and it does not suit industry. When this was realized the last two years of the civil degree were rearranged slightly so the IAP could become the ‘engineering standard’ full semester in final year.

Despite the issues, the students reported that they enjoyed the experience and would recommend it to fellow students.

IV. COMPARATIVE PERFORMANCE OF INDUSTRIAL AFFILIATES PROGRAM STUDENTS

The performance in final year of students who undertook the IAP trial was compared with students who had completed Thesis. Not all IAP and Thesis students have been included in the data. Because participation in an optional overseas experience program has been shown to enhance final year scores, students who had participated were excluded from the study. It transpired that three of the ten IAP students had also undertaken the overseas

experience program, the same proportion as for Thesis students. In addition two of the students undertaking the IAP only needed to complete Thesis, or IAP, to complete their degree, leaving only five students in the study. The basis of comparison was the Grade Point Average for the courses studied.

Griffith University calculates the GPA of its students based on the grades they achieve in each of the courses they study. The weightings attached to the various grades are shown in Table 1

TABLE 1
GRADE POINT AVERAGE WEIGHTINGS

Grade	GPA weighting
High Distinction	7
Distinction	6
Credit	5
Pass	4
Pass conceded	3
Fail	1.5
Fail, no submission	0

In each subject less than 10% of students would be awarded a High Distinction with the most frequently awarded grade being a pass. In the year before commencing the program, students in the program had GPAs for the year ranging from 7 to 3.3.

Table 2 compares the average GPA of IAP and Thesis participants for the year before commencing the program and the year of the program.

TABLE 2
AVERAGE GPA FOR EACH YEAR

Year	IAP participants	Thesis participants
Before the program	5.22	5.32
During the program	5.54	5.43

It is clear from Table 2 that on average students continuing their engineering degree, achieve better GPAs as they proceed through the program. In addition the students who chose to undertake the IAP experience were, at the time of decision, performing close to the same standard as those that did not. It had been expected by some civil engineering staff that the better performers would choose to complete Thesis rather than IAP.

TABLE 3
AVERAGE IMPROVEMENT OF GPA IN FINAL YEAR

Semester	IAP participants	Thesis participants
First semester	11%	2%
Whole year	8%	3%

When the semester by semester relative performance of the Thesis students in their final year is examined, see Table 3, the Thesis students show an increase in performance over the previous year in each semester. However the IAP participating students have a much larger increase in performance in the first semester of their IAP and still have enhanced performance compared to Thesis students in their final semester.

When the individual improvement of student GPAs is investigated it can be seen that the higher performing students had a lower percentage increase in their GPA compared to that for students with lower GPAs.

Figure 1 shows the relative GPA improvement of IAP participants in the first semester of the IAP program compared to their performance over the year before. A ratio greater than 1 indicates an improvement in GPA while participating in the IAP. While the small numbers mean data may not be statistically significant, all students performed at a better or equal level.

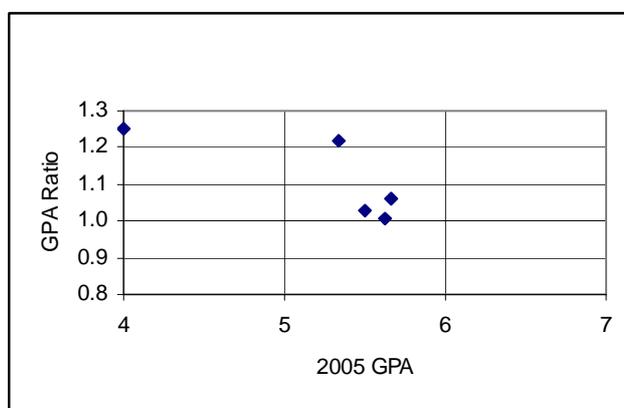


FIGURE 1
RELATIVE GPA IMPROVEMENT OF IAP STUDENTS FOR FIRST SEMESTER

By comparison Figure 2 shows the relative improvement of GPA for first semester of Thesis students. There is a general pattern of improvement with lower performing students showing the most improvement. However there are a number of students with GPAs below 6 whose performance declined in the first semester of their final year.

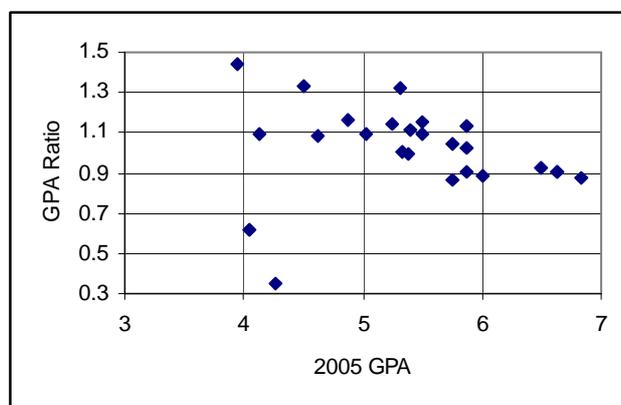


FIGURE 2
RELATIVE GPA IMPROVEMENT OF THESIS STUDENTS FOR FIRST SEMESTER

Figure 3 shows the relative GPA performance of IAP participants over the whole of the year of undertaking their OEP compared to their performance over the previous year. The top two students from the previous year achieved slightly lower grades. The decrease in relative performance also occurs for Thesis students. A reason may be that the Thesis, and IAP, reports fall due in second semester at the same time as their Integrated Design Project.

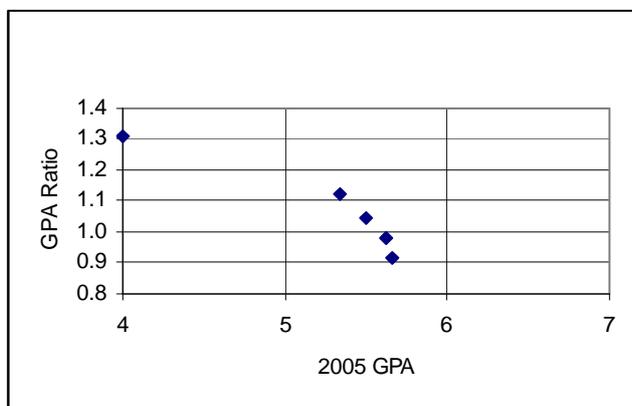


FIGURE 3

RELATIVE GPA IMPROVEMENT OF IAP STUDENTS FOR FINAL YEAR

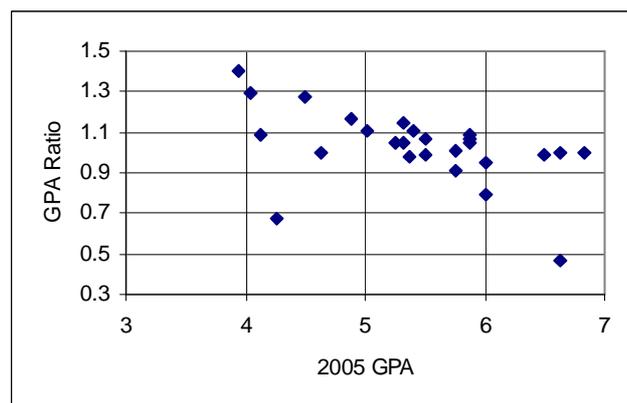


FIGURE 4

RELATIVE GPA IMPROVEMENT OF THESIS STUDENTS FOR FINAL YEAR

V. CONCLUSION

Students undertaking a trial Industrial Affiliates Program show a clear improvement in performance while participating in the program. The performance improvement was most marked in the first semester of their IAP. The grade improvement data is in line with the anecdotal data gathered by observing the students enthusiasm for their experience and their willingness to recommend that earlier year students take the opportunity of IAP.

ACKNOWLEDGMENT

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