

Fostering student reflection during engineering internships

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This paper describes an approach that attempts to enable students to develop and demonstrate appropriate engineering graduate attributes through an industry internship. It also looks at some of the trials and tribulations encountered on the journey. The School of Engineering at the University of Queensland offers a Professional Placement Semester to students in their fourth year, for which students obtain full academic credit. As part of the academic element, students undertake a two unit Professional Development course. The course uses flexible learning methods to encourage students to reflect on their own professional development throughout the placement semester. The cornerstone of the course is the Professional Development log kept by each student in which they record and report work activities whilst at the placement organization. Each week students identify critical learning events in terms of professional development. They must then analyze the most significant of these events using a standard analysis template. For the students, the process aids them in keeping an accurate record of their time on placement as a contribution to future job applications as well as to their assessment. They are also intended to assist in each student's individual growth and learning by providing an avenue for reflexive thought. (*Asia-Pacific Journal of Cooperative Education*, 2009, 10(3), 163-177).

KEYWORDS: Engineering, internship, critical reflection, employability, journals.

Today's engineers are multi-disciplinarians required to work as part of diverse teams of professionals. To become an industry leader in any engineering field, extensive technical knowledge and skills must be teamed with a range of honed professional skills. Thus, the placement program offered by the School of Engineering at the University of Queensland seeks to actively engage students in recognizing the importance of these so-called soft skills.

This paper describes an approach that attempts to enable students to develop and demonstrate appropriate engineering graduate attributes through their industry placement. Students enroll on a Professional Development course that uses flexible learning methods to encourage students to reflect on their own professional development throughout the placement semester. The cornerstone of the course is the Professional Development log kept by each student in which they record and report work activities whilst at the placement organization. Each week students identify critical learning events in terms of professional development. They must then analyze the most significant of these events using a standard analysis template. For the student, the process aids them in keeping an accurate record of their time on placement as a contribution to future job applications as well as to their assessment. They are also intended to assist in each student's individual growth and learning by providing an avenue for reflexive thought. Feedback on the process was gathered from students via written surveys and focus groups. The internship program is small, offering placements to between 10 and 20 engineering students each year. The program is selective and is available to students during the first semester of their final engineering year, usually their fourth year of engineering study.

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The internship is called the Professional Engineering Placement Scholarship (PEPS), and can be described as an approach that enables students to develop and demonstrate engineering graduate attributes whilst on placement. Ideally the placement duration is six months, comprising a summer semester of vacation work and one semester of PEPS. However, in practice the initial vacation work lasts anything from a full semester to a couple of weeks. The value of the vacation work prior to the PEPS semester is that students become fully embedded in the company before embarking on required university tasks.

PEPS placements are sourced both by university staff and students. For university sourced placements, students are selected via university and company interviews, and are chosen by their motivation, enthusiasm and potential to cope with independent learning and external courses, rather than on good academic performance. However, all students are generally averaging a GPA of 4.5 and above (maximum GPA is 7). For student sourced placements, students must still satisfy all university requirements and the school also must approve the placement. The PEPS program is fully accredited as students enroll on two external courses, which are assessed during the PEPS semester; one a Research Project, and one a Professional Development course. Students are classed as external students whilst on the PEPS semester.

RESEARCH PROJECT

The 6-unit research project course accounts for 75% of the semester's marks. The course requires students to use and extend their technical skills. Companies are asked to provide a project that will motivate and stretch the students, and be useful to the company. A strength of the program is the complexity and depth of these projects. Students are often completing projects that are vital to the business of the company, and at a level to be expected of a junior graduate engineer. There is no doubt that students gain specific technical skills and experience beyond that of their peers in the lecture room. Students are allocated an academic supervisor to act as a resource and a mentor for their research project.

Professional Development Course

The second course that students undertake is a 2-unit professional development course, and it is this aspect of the program that creates a unique learning experience for the engineering students. The course seeks to encourage students to recognize the importance of professional skills and check the development of those skills through the placement in preparation for eventual preparation for professional status. The course uses reflective thinking to get students to analyze the learning incidents that have occurred each week. Students are introduced to reflective thinking, which in almost all cases is a new and unfamiliar practice, during a two day preparation workshop. They are taken through the steps required to complete a Professional Development Log, or PDL, which is central to the course. The aim is to encourage students to benefit from more than just the technical skills that they will learn. This is not a new approach and many authors support the need for reflection (Cox, 2005; Dewey, 1933; Kolb, 1984; Schön, 1983). Dewey (1933) puts it very simply, "We do not learn from experience. We learn from reflection on experience" (p. 78). Thus, asking students to carefully consider their actions, they can improve their own performance (Osterman, 1990). The crucial phase, however, is not just to reflect but to take that insight a stage further to increase effectiveness. It is how the experience is de-constructed and turned into future action that is important (Argyris & Schön, 1974). The tool used has been developed from a four step process of information gathering, reflection, linking to theory or knowledge, and future action as described by various authors (Kolb, 1984; Osterman, 1990). Using a selective

tool or model on a regular basis makes the learning from experience an efficient method of gaining benefit from the process (Cox, 2005; Hayward, 2007).

Introducing Students to Reflection

There is no doubt that students will not start to spontaneously reflect without a teaching input. Academics and professionals who voluntarily espouse reflection in their own development will always be able to point to one or more stimulus whether it be a formal teaching input, a chance reading or conversation or mentor. However, there are numerous examples of bad practice in this area. Hobbs (2007) describes being asked to write a series of reflective essays designed to encourage students to examine negative patterns of behavior in their own families. This author can similarly recall being asked as a student to write an essay on gender stereotyping in the workplace. In this case, 'reflection' had yet to become the necessary by-word. In both cases, without adequate preparation students were left to flounder, and probably in both cases the assignments were poor in terms of critical analysis, and therefore rendered meaningless. Fostering reflective practice requires far more than telling people to reflect and then simply hoping for the best (Russell, 2005), it has to be learned and encouraged (Gelter, 2003). Students will not necessarily understand what we mean by reflection, and often they assume reflection is an introspective after-the-fact description of events (Ward & McCotter, 2004).

Through her review of education literature, Van Gyn (1996) finds that reflective practice is regarded as a learned skill and is most effectively introduced in conjunction with an experiential component of a curriculum. As a learned skill, deliberate practice, adequate feedback and the opportunity for the transfer of the skill to a 'real' environment are necessary for its development. Reflection is introduced to PEPS students as a skill they need to foster and develop throughout their professional careers. In order to gain student commitment to the concept, it has to be introduced in terms that they can understand and accept. Therefore, it is referenced to their eventual careers as professional engineers.

The PEPS course handbook reads:

Throughout your career, others will monitor your performance in whatever role you have and reward you accordingly. In order to become a Chartered Professional Engineer, that is an independent professional, you have to demonstrate your competence by critically reflecting on your work, extracting the lessons you have learned and communicating this understanding to senior members of the profession. You will also have to undertake such reflection as a central element of job interviews and annual workplace appraisals.

It is a mark of a successful professional that they know what they are good at doing and where they need to improve their performance. This critical self-knowledge is the foundation for navigating your major career moves.

Your competence in the workplace depends on your technical knowledge and skills (acquired throughout your working life) combined with your ability to work effectively with and influence and lead others. Underpinning all this are your core attitudes to people and the world, your personal attributes and the things that motivate you.

Students are brought together for a two day workshop that constitutes their preparation for the PEPS semester. During the first day, in an active participation session students are taken through the reflective task they will have to complete. They are asked to draw on examples from previous vacation work or university life and analyse them, and also critique de-identified examples from a previous year. At all times, students are reminded that it is the quality of learning that is important not the situational example.

Professional Development Log

Reflective learning journals or logs are widely used to develop critical thinking skills to explore and reflect upon complex concepts and professional knowledge and there are many examples in the literature (Hayward, 2007; Sutton, 2007). The tool developed for students to

use for their reflection in the PEPS semester is called a Professional Development Log. (Appendix A). The Professional Development Log is kept by each student and submitted electronically each week. Students are asked to identify critical learning events that have happened each week in terms of their professional development. They are asked to consider those 'Ah Ha!' moments when things have clicked into place. They then analyze the most significant of these events using a standard analysis template. Osterman (1990) describes it thus:

Prompted by a problem, a discrepancy between the real and the ideal, or between what occurred and what was expected, the practitioners step back and examine their actions and the reasons for their actions. They reflect on the effectiveness or legitimacy of these action choices, and they use this new perception as a means of developing alternate strategies. Through this dialectic process of thought and action, the practitioner takes an active role in shaping his or her own professional growth. (p. 134)

Feedback to the student is critical, and so the logs are assessed by an academic and feedback given to the student within 48 hours. This allows students time to review the comments made by the marker before completing the next log. The value of having one person marking the PDLs is that that person has been carefully briefed on the purpose of the logs, the marker can also provide informed feedback to individuals. Students are asked to analyze their learning incident in a very structured way by working through the incident in four stages on a standard template.

1. **Situation:** What actually happened?
2. **Affect:** What was its impact on you personally?
3. **Interpretation:** What did you learn from the experience?
4. **Decision:** What did you decide to do so as to become a better engineer?

This approach using reflection on practice or incidents has been laid out and discussed by many others including Schön (1983) and Pearson and Smith (1985).

ANALYSIS OF LEARNING INCIDENTS

Situation

In this stage, students are asked to simply state the facts of the incident without interpretation. Students are asked to be concise, but to write as much as they feel they need to. Incidents will vary in complexity and depth. Students are told that while perfect prose is not required, entries written in note form must be well constructed and readable. The following extracts are not put forward as exemplars, but are given to demonstrate how four students approached the task of analyzing a learning incident.

Student A – [I] was supervising a group of 30 operators with one other supervisor. I had a number of groups moving cars from one area to another. Got into a situation where two groups were moving the same cars back and forward for just over an hour until they realized and made myself aware. After investigating I found that the other supervisor organized his group to move cars from the area my group were parking them as he thought they were a part of his area. This was because I did not communicate to him what I was doing.

Student B – I received a task handover for a departing colleague, but didn't look at it. This was because, as per normal, I felt rushed and like I didn't have time. When I finally got around to looking at the task handover plan, I had several questions for the departed colleague. However, I couldn't talk to him as he was on holiday. Hence, the required tasks were much more difficult and time consuming.

Student C – On Wednesday, the supervisor for one of the areas in Body Build was absent. I was asked to fill in the position for the day. Due to my current workload I could not take on the task. I explained this to the manager and told him 'No'. He was able to find someone else and spread the load.

Student D – Part of my job is to calculate the CO₂ emissions of various buildings. This is done via spreadsheets and computer models. As my experience grows, I'm tempted to add complexity to continually improve accuracy and keep things interesting. I've been gradually increasing modeling complexity until last week. I realized such complexity is really not necessary and is really time-consuming. Instead of adding complexity, I quickly completed the model and spent some additional time on communicating the information to the client via a better report.

Affect

In this stage, students have to set out the personal affect the situation had on them. We are fortunate that our students are generally very articulate and used to expressing opinions and arguments, but in this they are advised to initially begin 'I felt ...' as it helps them to focus on recording feelings and not digress into learning or further description of the event. Students initially find this phase difficult in terms of isolating their feelings for this part of the analysis.

Student A – I felt frustrated that for over an hour two groups accomplished no valuable work due to a lack of communication. I was disappointed as I did not pick up on the mistake earlier.

Student B – I felt frustrated because I knew that a few simple answers would clear up my questions. I realized that I should have looked at the task list at the time, and so I was annoyed with myself.

Student C – By saying 'no' I felt like I had let the team down. I was relieved when the manager accepted my comment and agreed.

Student D – I felt this was a small victory against my natural tendency to greatly over-complexity things. This felt good, because previously I have – against my better judgment – continuing to obsess over the detail. It was somewhat empowering to put into action something previously planned via the PDLs.

When students can find or demonstrate a link between successive log entries, as with Student D, it enhances the reflection that is taking place, and reinforces the value of the exercise.

Interpretation

This phase is usually easier for students once they have worked through the first two. Students are asked to explain in what ways the new learning either confirms or contradicts their prior knowledge, theories, or understandings about the practice of engineering, in particular the knowledge they have gained at university. All our actions stem from learnt behavior, so if students can also identify why they acted in a certain way, it will help them interpret their actions and modify them to suit the new environment. Students often find that their workplace is perhaps not so 'student-centered' as the university they left behind.

Student A – I learnt that communication between management and supervision is vital to successfully and efficiently complete a job. I have witnessed through experience the affects of poor communication at work and university. Lessons taught through studies at university have been designed to teach techniques of good communication. I will need to use these techniques and develop them throughout my career.

Student B – I learnt that even if things are hectic, it is necessary to determine if it would be more efficient to have a quick look at certain tasks/documents in order to save time later.

Student C – I often find it hard to say "no" to work takes but have learnt it is sometimes necessarily to do so. Saying "no" is a form of prioritizing work, as learnt from Uni. Good communications skills help make the decision easy.

Student D – I learnt that I can overcome habits and temptations to become more productive. In this situation, this conformed my thinking that often the fine detail is meaningless. Rather, I saw that the communication aspect was equally important. With regards to university, this is usually not the case. That is, at university the detail is – rightly – important. I learnt that this balance, between content and presentation, sways in the direction of presentation in private industry.

Decision

This phase is usually the one that students struggle with the most in terms of arriving at a usable decision. Students are asked to describe how the learning that has taken place will become part of their regular professional arsenal and be routinely applied in a wider range of circumstances, not just those similar to the particular event. In order to be effective, decisions must be specific, realistic, and ideally with some time frame indicated. Decisions such as ‘I will do better next time’ are not helpful to the individual and show that the student has not really thought through how the incident will affect their professional life in the future. Similarly, a decision that would involve their whole time to implement is not workable, so students need to realize that this element of the analysis may only be very small. A small decision acted on is worth much more than an idealistic life-plan than is never used.

Student A – I will be supervising similar jobs throughout next week. I will ensure I communicate with other supervisors and management using techniques I have learnt, for example, regular coordination meetings, phone calls when changes are made, or email if the required people cannot be contacted. I will review the techniques I use at the end of the week and continue to refine and develop my communication skills.

Student B – It’s not practical to look at everything as soon as you receive it. However, I resolved to scan my email every morning, even during busy times. When I see something that is important, I will make a conscious decision to either leave it, or have a quick look and follow it up.

Student C – Being asked to do additional tasks is common in the workplace. I need to continuously prioritize my tasks even if that means saying “no”. However, saying no has to be done appropriately and with good explanation. I will continue to review and reflect on the decisions I make when dealing with tasks. Particularly how to say “no”.

Student D – This was a positive experience. I should, very simply, try to repeat it. Previously I’ve mentioned various task lists, planning methods, etc which have enabled me to determine whether I should delve into the detail of a particular task. In this case, to continue this learning event, I’ll continue to use these methods and follow their advice. This is somewhat hard to enforce because it’s really just my choice at the time. However, one good way is to remember the positive outcome of this event, and to focus on the outcomes, not process.

Assessment

As outlined earlier, each PDL is submitted weekly by the student and they receive feedback from the academic marker before the next log is due. The feedback is qualitative, and will include comments such as advising where students have misunderstood or confused the four steps, slipped into interpretation too early or constructed unworkable decisions.

At the end of the semester, the PDLs are marked on 4 criteria in accordance with their respective weightings, and the best 6 out of 12 are totaled for the mark for that element of the course:

1. Quality of reflection: identification of significant issues and future consequences. Weighting 5;
2. Use of evidence, logical consistency, aptness. Weighting 2;
3. Quality of expression: fluency, clarity, conciseness. Weighting 2; and
4. Quality of insight: honest application of issue to self. Weighting 3.

The criteria, Quality of Reflection and Quality of Insight receive a higher weighting. In line with University procedures, all students are given a copy of the marking criteria at the commencement of the program (Appendix B).

Next Steps

Any assignment must have a clear purpose or rationale within the scheme of a course. Having explained to students in the initial preparation session that they will have to in the future demonstrate their competence by critically reflecting on their work, and also undertake such reflection as a central element of job interviews and annual workplace

appraisals, it becomes necessary to follow that up within the course. The reflective logs are used in two further assignments during the PEPS semester.

Half-way into the PEPS semester, students are asked to prepare an inventory of their professional abilities and skills. The Professional Skills Inventory template is simply a list of 12 different skills, and for each skill students are asked to demonstrate each one by using their placement and PDLs as resources (Appendix C). It is expected that the entries will come primarily from their experiences on PEPS but other experiences such as vacation work or voluntary work are equally acceptable:

1. Problem identification/formulation;
2. Innovative analysis/problem solving;
3. Leadership;
4. Negotiation;
5. Influencing others (written or oral communication);
6. Systems thinking;
7. Effective team work;
8. Time and self-management;
9. Range of interests (balanced lifestyle);
10. Initiative and accountability;
11. Adaptability/resilience; and
12. Lifelong learning.

Against Influencing Others, one student wrote:

I gained experience in influencing others by written communication during PEPS. I was required to determine a method for calculating a flow meter compensation for changes in pressure, temperature and molecular weight. I initially developed the method as a hand calculation, justifying all assumptions in writing, outlining limitations, referencing all equations used and providing a detailed explanation of how the method works. My supervisor reviewed the method and because of the detailed justification was easily convinced that the method would work. I also verbally explained how the method works, why the limitations of the method were not a concern for the application and how the assumptions were justified. By explaining in detail I demonstrated my knowledge and convinced my supervisor that the method was satisfactory.

However, this entry and all the others are still only an academic assignment. In the real world, the one specific use of this type of data collection, is to present themselves through a job application or job appraisal. Thus, the culminating task is for students to apply for a generic graduate engineer position. (Appendix D) They are instructed to use relevant examples from their Professional Abilities Inventory in this task. The aim is twofold, firstly to produce well constructed, targeted applications, but also to link their professional development through the reflective assignment with their future careers. This latter element reinforces to students that their professional development is as important as their technical skills. This assignment was facilitated by an input from the University of Queensland's Graduate Careers Service during the preparation workshop.

Course Evaluation

Over the past two years, the Professional Development course and in particular the PDLs have been reviewed through written response surveys and focus groups. These have taken place at the end of the placement when all assessment has been finalized. Students were given the opportunity to complete anonymously a written survey form and also take part in a focus group. Both activities were completed by all but one or two students each year. The resulting feedback has been used to inform the course delivery for subsequent semesters.

DISCUSSION

“Reflection and reflective practice are crucial features in developing the effectiveness of WIL [work integrated learning]” (Coll & Eames, 2004, p. 273). For a WIL placement to be more than just an experience, a chance to learn or enhance technical skills, students must be able to take something more away with them, something that cannot be developed at university. The best evidence of the power of a reflective activity is when the learning revealed in the PDLs can be seen to be beneficial to the personal growth of the student.

A student described how one day he had been called into a senior manager’s office and asked to look into a bottle neck on a production line. A couple of days later he returned with his report and a costings estimate totaling a few thousand dollars. The manager laughed and told him to come back with a solution that did not cost any money. The student felt humiliated and very small, and was still bristling about it during a routine monitoring visit that week. However, later in his PDL he sat and wrote out the incident, and finally realized that although the manager was perhaps at fault for not giving clear instructions, particularly to a student, the student himself should have made sure he understood the brief and had all pertinent details before leaving the manager’s office. In this instance, had the student not been ‘forced’ to think through his reactions to the manager’s comments, he could easily have left the placement simply dismissing the manager as ‘an idiot’ or otherwise. However, in confronting his actions and feelings, he finally recognized his own responsibility and accountability in the drama. That student will not make that mistake again, and so we have a student soon to seek a graduate position who has already begun to learn to take charge of his own work.

The above, is of course, a staff view. Student comments showed that they found this type of exercise very different from the usual engineering assessments and for some it took a little while to get used to.

Overall, there were a pleasing number of positive comments from students:

At first they were just annoying and time consuming (to a certain extent they still are). However, they made me realize the finer points of my mistakes at work and helped me correct them.

I have developed some good time management and structured problem solving skills

I never really took the time to analyze my work habits while at workplace. Therefore, PDLs gave me time to think back on the week and analyze. Even when I didn’t always do my plans, I found it helpful to just think and analyze them.

It drew meaning out of my experience, if I didn’t spend time reflecting, I would still have been developing, but being conscious of what I was learning helped me be more focused with what I got out of my placement.

PDLs helped me reflect on my mistakes to extract the learning events and reinforce them.

Students agreed that the hardest part was finding or deciding on the incident to reflect on. Students found it easy to fall into the trap of simply looking for mistakes or misunderstandings to report whereas learning can also occur through positive events.

I found some of the time I was looking for bad events to make a good PDL to write about.

However, in a negative event it is usually clear to identify the learning and construct a viable decision, something that ensures the event will not reoccur. Extracting learning out of a positive event can be harder to quantify. Hobbs (2007) questions the value of reflective practice within a course structure, “there is some question as to whether RP [reflective practice] can, in fact, be a required component of a course and still retain validity as genuine

reflection. Can trainee teachers, or individuals for that matter, be forced to be reflective? ... does the practice of RP for assessment purposes limit its effectiveness and/or authenticity?" She would no doubt empathize with the following comment,

It helped me to assess what I was doing and if I was learning anything. After a while it became rather mechanical where I just wrote what I thought was what the marker wanted to hear.

Hobbs is correct in the sense that no university assignment can ever be truly authentic. Surely, that is one of the main arguments for getting students out into the field. PEPS students soon learn that undertaking their research project in the workplace, is very different to completing a university-constructed design assignment. However, one must remember the two-fold reason for including a reflective element as an assignment; to enable students to develop through reflective learning, but firstly to learn to reflect. The approach given to students here may not be perfect, and certainly will not suit each individual, but it is an opportunity for each to explore a reflective technique which may be a precursor to more in-depth reflection in the future. The variety of incidents that students choose to relate will always surprise. Some can occasionally make a course coordinator cringe, such as the student who loaned a company vehicle to an unauthorized worker. The dressing down he received from a manager, cemented his reflective learning. Others are valuable insights into the student's day to day work and development: success in negotiation with a supplier; difficulties in dealings with colleagues; becoming more confident on the telephone; understanding that there are procedures for arranging meetings.

Critics of this type of activity will question the incidents portrayed, and indeed the veracity of incidents will always be hard to establish. Significant or amusing incidents often come up again during monitoring visits to students and placements, and in these cases learning can be reinforced. Focus group feedback showed that doubtful experiences where the student has embroidered or simply made up events do happen, but appear not to be the norm. Fabricated logs can be easy to spot through lack of detail or reference to specific people, events or times, and will usually get marked down because the development of learning through the stages is vague and unhelpful. However, it can be argued that if a student has spent enough time on a non-existent event to make it sound believable and have a good development of learning and subsequent decision, then they must have perfectly understood the process, and probably gained as much from the exercise as if they had used a real event.

Another point for discussion has to be the ethics of asking students to reveal sometimes very personal views about themselves and their actions. Some students, albeit a very small number, found that revealing or expressing feelings was a confronting experience.

Don't feel completely comfortable about revealing emotions to someone I didn't know.

However, for the majority this was not an issue, as shown by many of the entries:

Initially I was somewhat nervous and embarrassed about the situation.

I became angry at myself that I hadn't taken proper risk management protocol.

I was annoyed at myself for doing it.

A couple of days later, once I had 'cooled down', I reviewed some of the comments.

I had begun feeling stressed last week.

The context of the program has a lot to do with allowing the students to feel at ease with expressing their feelings through the PDLs. As explained earlier, this is a small program

which operates within a large, progressive school. The size of the program means that the students are known as individuals to staff working on the program, as are their industry supervisors. The academic marker for the PDLs is introduced to the students at the preparation workshop and students are encouraged to contact the marker if they need to talk through issues relating to writing their entries. It is stressed to students at the preparation workshop that ultimately they have full editorial rights over PDLs, as it their decision what incidents to layout before the marker along with their analysis. The whole process is very formal and structured, and perhaps it should be reiterated here that the system was designed by engineers for engineering students. However, the majority of students found the very structured approach helpful, as it gave them a clear direction in which to order and analyze their thoughts. They felt that without the structure they would not have known where to begin. Although as one of the students above commented, after a while it can become easy to construct the 'right answer' without too much thought. In focus group feedback, some students said that they found the structured format limiting, and would have preferred more scope to develop their own process of reflection. One could argue that the students who were looking for the 'blank page' were the ones that had benefitted most, having taken the skills and were starting to exercise them to their advantage. One wonders whether they would have gained this proficiency if they initially had been presented with a blank page.

CONCLUSION

Students do not necessarily learn from experience, particularly if they do not think about it or do not take responsibility for it. If a placement is only a way to gain experience of industry, and a method of linking technical knowledge with real life application, then it is not being fully utilized (Van Gyn, 1996).

In this program, students are given a tool to record their reflection on a particular incident. It is introduced to them through a preparation workshop before they go out on placement. It is an assessed piece of work within a mandatory Professional Development course. Students are then asked to use the recorded information to complete an inventory of their skills. The final task is to use the inventory to prepare a job application for a given vacancy. Feedback shows that students are generally receptive to the logs and the reflection that they are asked to work through, finding it a useful exercise to enhance their learning. Negative comments from a few students centre on the difficulty in finding incidents to relate, being reluctant to divulge their feelings, and finding the process a mechanical chore after a while.

However, there are numerous examples within the program that students are using reflective thinking to recognize their progress with skills such as communication, negotiation, leadership and networking, and gaining professional maturity before entering the workplace as graduate engineers.

REFERENCES

- Argyris, C., & Schön, D. (1974). *Theory in practice: Increasing professional effectiveness*. London: Jossey-Bass.
- Coll, R.K., & Eames, C. (2004). Current issues in cooperative education. In R.K. Coll & C. Eames (Eds.), *International handbook for cooperative education: An international perspective of the theory, research and practice of work-integrated-learning* (pp. 217-236). Boston, MA: World Association for Cooperative Education.
- Cox, E. (2005). Adult learners learning from experience: Using a reflective practice model to support work-based learning. *Reflective Practice*, 6(4), 459-472.
- Dewey, J. (1933). *How we think*. Chicago: Henry Regnery.
- Gelter, H. (2003). Why is reflective thinking uncommon? *Reflective Practice*, 4(3), 337-344.

- Hayward, L. (2007). Teaching students a process of reflection: A model for increasing practice-based learning outcomes during cooperative education. *Journal of Cooperative Education*, 41(1), 35-47.
- Hobbs, V. (2007). Faking it or hating it: Can reflective practice be forced? *Reflective Practice*, 8(3), 405-417.
- Kolb, D. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice-Hall.
- Osterman, K.F. (1990). Reflective practice: A new agenda for education. *Education and Urban Society*, 22(2), 133-152.
- Pearson, M., & Smith, D. (1985). Debriefing in experience-based learning. In D. Boud, R. Keogh & D. Walker (Eds.), *Reflection: Turning experience into learning* (pp. 18-40). London: Kogan Page.
- Russell, T. (2005). Can reflective practice be taught? *Reflective Practice*, 6(2), 199-204.
- Schön, D.A. (1983). *The reflective practitioner: How professionals think in action*. New York: Basic Books.
- Sutton, L., Townend, M. & Wright, J. (2007). The experiences of reflective learning journals by cognitive behavioural psychotherapy students. *Reflective Practice*, 8(3), 387-404.
- Van Gyn, G. (1996). Reflective practice: The needs of professions and the promise of cooperative education. *Journal of Cooperative Education*, 29(2), 103-131.
- Ward, J.R., & McCotter, S.S. (2004). Reflection as a visible outcome for preservice teachers. *Teaching and Teacher Education*, 20, 243-257.

APPENDIX A
Professional Development Log
Template

Name:	Week Beginning:
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Date	Critical Learning Event	Brief Description

Analysis of this week's **Most Significant Learning Event**

Situation: What actually happened?

Describe the event, the circumstances, and the people involved. Keep it factual.
(Expand as required)

Affect: What was its impact on you personally?

Describe how you reacted to the event (positive or negative), perhaps in terms of how felt about it at the time or subsequently. This description might explain why the event was so significant for you; why it was an "A-ha moment".
(Expand as required)

Interpretation: What did you learn from the experience?

Describe what you learned from the event. Explain in what ways this new learning either confirms or contradicts your prior knowledge, theories, or understandings about the practice of engineering, in particular the knowledge you have gained at university.
(Expand as required)

Decision: What did you decide to do so as to become a better engineer?

If it was a 'positive' (affirming) learning event, describe how you will ensure that the skill / ability you demonstrated will become part of your regular professional arsenal and be routinely applied in a wider range of circumstances, not just those like the particular event. If it was a 'negative' learning event, describe what you will do differently in the future to avoid having to learn the same lesson again the hard way.
(Expand as required)

APPENDIX B
Professional Development Log
Assessment Sheet

Student's name:	Date:
------------------------	--------------

	Quality of reflection: identification of significant issues and future consequences	Use of evidence, logical consistency, aptness.	Quality of expression: fluency, clarity, conciseness.	Quality of insight: honest application of issue to self.	Weighted Mark
	Weighting 5 Mark x 5	Weighting 2 Mark x 2	Weighting 2 Mark x 2	Weighting 3 Mark x 3	Totals
Best 6 Logs					
Log 1	/ 25	/10	/10	/15	
Log 2	/ 25	/10	/10	/15	
Log 3	/ 25	/10	/10	/15	
Log 4	/ 25	/10	/10	/15	
Log 5	/ 25	/10	/10	/15	
Log 6	/ 25	/10	/10	/15	

TOTAL
(out of 360)

Standard	Mark
Excellent - exceptional insight	5
Good – some insights	4
Sound – basic analysis	3
Poor – no real substance	2
Unsatisfactory - inadequate attempt	1
Insufficient to rate	0

Other Comments

APPENDIX C
Professional Abilities Inventory
Template

Name:	Student Number:
(This table is expandable)	
Ability/Skill	Critical Experience Demonstrating the Ability/Skill
Problem identification / formulation	
Innovative Analysis / Problem Solving	
Leadership	
Negotiation	
Influencing Others (Written or Oral Communication)	
Systems Thinking	
Effective Teamwork	
Time and Self-Management	
Range of Interests (Balanced Lifestyle)	
Initiative and Accountability	
Adaptability / Resilience	
Lifelong learning	
Other	

APPENDIX D
ABC Risk Consultants Pty Ltd
Vacancy

Job Description

ABC Risk Consulting are offering an exciting opportunity for a Graduate Engineer to become a Consultant in our team.

ABC Risk Consultants provide structured risk analysis, systematic risk management and loss control services. They specialise in developing business risk profiles and cost effective risk control options to help better incorporate risk issues into business decision making. They evaluate all types of risks and special hazards associated with property, general liability, products liability, business risks, OH&S, business interruption, environmental impacts, professional liability and more.

ABC Risk Consultants advise 40 of the top 50 Australian companies along with public entities. They facilitate a corporate understanding of the costs and benefits of risk to a business and the development and growth of an integrated risk management culture to balance the cost of controls, against the cost of risk. ABC Risk Consultants have a global team of professional consultants with a multi-disciplined group working in the Brisbane Office.

The position offers a great opportunity to break into the highly specialised, rapidly expanding, sought after, challenging and well paid, field of Risk Consulting.

Requirements:

- Graduate Engineer
- Business related studies would be highly regarded
- Desire to work in a team environment
- Excellent verbal and written communication skills
- Advanced Word and Excel skills essential
- A natural curiosity and desire to learn
- Self-motivated goal achiever
- Responsibility – able to work unsupervised to achieve set objectives
- Professional attire.

Applications should be addressed to the Human Resources Manager, ABC Risk Consultants.

ABOUT THE JOURNAL

The Asia-Pacific Journal of Cooperative education (APJCE) arose from a desire to produce an international forum for discussion of cooperative education issues for practitioners in the Asia-Pacific region and is intended to provide a mechanism for the dissemination of research, best practice and innovation in work-integrated learning. The journal maintains close links to the biennial Asia-Pacific regional conferences conducted by the World Association for Cooperative Education. In recognition of international trends in information technology, APJCE is produced solely in electronic form. Published papers are available as PDF files from the website, and manuscript submission, reviewing and publication is electronically based.

Cooperative education in the journal is taken to be work-based learning in which the time spent in the workplace forms an integrated part of an academic program of study. Essentially, cooperative education is a partnership between education and work, in which enhancement of student learning is a key outcome. More specifically, cooperative education can be described as a strategy of applied learning which is a structured program, developed and supervised either by an educational institution in collaboration with an employer or industry grouping, or by an employer or industry grouping in collaboration with an educational institution. An essential feature is that relevant, productive work is conducted as an integral part of a student's regular program, and the final assessment contains a work-based component. Cooperative education programs are commonly highly structured and possess formal (academic and employer) supervision and assessment. The work is productive, in that the student undertakes meaningful work that has economic value or definable benefit to the employer. The work should have clear linkages with, or add to, the knowledge and skill base of the academic program.

INSTRUCTIONS FOR CONTRIBUTORS

The editorial board welcomes contributions from authors with an interest in cooperative education. Manuscripts should comprise reports of relevant research, or essays that discuss innovative programs, reviews of literature, or other matters of interest to researchers or practitioners. Manuscripts should be written in a formal, scholarly manner and avoid the use of sexist or other terminology that reinforces stereotypes. The excessive use of abbreviations and acronyms should be avoided. All manuscripts are reviewed by two members of the editorial board. APJCE is produced in web-only form and published articles are available as PDF files accessible from the website <http://www.apjce.org>.

Research reports should contain; an introduction that describes relevant literature and sets the context of the inquiry, a description and justification for the methodology employed, a description of the research findings-tabulated as appropriate, a discussion of the importance of the findings including their significance for practitioners, and a conclusion preferably incorporating suggestions for further research. Essays should contain a clear statement of the topic or issue under discussion, reference to, and discussion of, relevant literature, and a discussion of the importance of the topic for other researchers and practitioners. The final manuscript for both research reports and essay articles should include an abstract (word limit 300 words), and a list of keywords, one of which should be the national context for the study.

Manuscripts and cover sheets (available from the website) should be forwarded electronically to the Editor-in-Chief directly from the website. In order to ensure integrity of the review process authors' names should not appear on manuscripts. Manuscripts should include pagination, be double-spaced with ample margins in times new-roman 12-point font and follow the style of the Publication Manual of the American Psychological Association in citations, referencing, tables and figures (see also, <http://www.apa.org/journals/faq.html>). The intended location of figures and diagrams, provided separately as high-quality files (e.g., JPG, TIFF or PICT), should be indicated in the manuscript. Figure and table captions, listed on a separate page at the end of the document, should be clear and concise and be understood without reference to the text.

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