

## Tertiary EE Student Projects: What the Academics Learnt

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**Abstract** Problem solving and teamwork abilities are important skills for graduates entering the environment profession. Through a problem based learning approach small groups of students from the environmental courses at RMIT University have been gaining these professional skills by undertaking projects in Vietnam. With three years experience in running the project we have data, through the students' reflections and feedback, to demonstrate the value of the project approach, and to undertake improvements. Drawing on data from the latest project we can identify opportunities for improving the details of the project's organisation, but importantly demonstrate the value of the project in providing a depth of professional experiences for the students. This analysis will be important for other academics needing support in the development of project based activities for those in environmental courses.

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### Introduction

Multi-disciplinary project work is a significant educational approach for the integration of skills that are needed in the professional lives of tertiary graduates. The value of teamwork experiences to which the students are exposed in these situations have been commented on by many; for example Ephross and Vassil (1988); Garner and Orelove (1994); Toseland and Rivas (2005). As Meehan and Thomas (forthcoming) report, educationists, practitioners, and employers also emphasise the importance of project experiences, as does Behrens (1992). Specifically projects provide opportunities for problem based approaches to learning and the development of group work skills.

The context for team projects is typically associated with seeking options, possibly solutions, for problems. So it is not surprising that Problem-Based Learning (PBL) and projects are closely connected. An overview of PBL, provided by Kendler and Grove (2004, p. 348), describes PBL as an approach that "involves presentation of a curriculum-related problem or situation whose solution requires students to practice skills of analysis, integration and application". PBL has found advocates in different disciplinary areas (for example Lev, 2004; Shore, Shore & Boggs, 2004). Importantly the broad applicability of PBL has been emphasised by Verhovsek and Striplin (2003) in their observation that while "there are limits to infusing PBL into a curriculum, the benefits are many, and the approach should be able to be applied to many ... disciplines" (p. 386). In addition to its role in single discipline situations, the importance of PBL

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in interdisciplinary education has been identified. Investigating PBL in the context of health-related disciplines, Eaton, Gangluff & Deere (2004) concluded that the students also developed interdisciplinary learning skills.

There are strong connections between PBL and collaborative learning, where students co-operate and assist one another with their learning. PBL typically involves students in reviews of the group and individual work, where collaborative learning will take place. Atwong et al. (1996) promote collaborative learning, as do Hill and Stewart (1999), who point out that “collaborative learning places significant pedagogical focus on small group learning” (p. 188).

These principles - a project focus, having a group of students working on a problem, where collaboration and reflection are key learning experiences, and where different disciplines mix - have formed the basis of the projects we have organised in Ho Chi Minh City (HCMC), centred on the campus of RMIT International University Vietnam. On the basis of running the project for two years we described its formulation, operation, and indicated some desirable improvements (Meehan & Thomas, 2006). As a consequence of the experience of running the project for the third time, we can reflect on these changes, and the evolution of the project.

The purpose of this paper is two-fold. Firstly, we think it is important to support others in the environmental education community who believe in the value of project work for students, and are looking for models to assist them in the design of suitable projects. Our earlier paper (Meehan & Thomas, 2006) presents our initial experiences, and now we are in a position to provide additional directions for the future. In this context we have engaged in Schön’s (1991) “reflection-in-action” in making sense of the project from our own experiences, and drawing on the specific reflections of the students. Our reflections, using the feed-back of the students, are also the essential element of this paper and our analysis of the need for other modifications. Secondly, we propose to indicate the depth of understanding that senior undergraduate students demonstrate in their reflections about their learning experiences. Again this should provide confidence to educators wanting to use project work.

### **The Vietnam Project**

The broad framework of the project involves:

- being administered as a traditional semester long course (equivalent to a quarter of a full-time load);
- formation of a multi-disciplinary team of final-year students from the environment programs (engineering, science and social science) at RMIT Melbourne;
- the team researching a topic related to environmental issues in HCMC;
- background research in Melbourne followed by the team spending two weeks collecting data and preparing a draft report in HCMC; and
- the team completing the report and students submitting individual reflections after returning to Melbourne.

The assessment for each student is based on the group report where each student is awarded the same score (80% of total score), and the remaining 20% of the final score comes from a brief individual reflective report. The aims of the exercise are to produce a piece of research that provides useful information (for the development of the RMIT campus in HCMC), but more especially to introduce the students to professional experiences – specifically problem solving, teamwork, project management, researching, report writing.

For selection, students are involved in a competitive process comprising written applications, short-listing, and interviews. Once selected, they meet several times to

gain background for the project, and to develop their processes for group interaction. During these meetings the focus and broad directions for the research are decided. Each year the research area has been chosen by the staff in discussion with contacts in HCMC. The 2002, 2003 and 2004 projects have investigated strategies for the management of solid waste-streams and water (waste-water and storm-water) on-site and opportunities for the provision of environmental education programs at the campus.

As part to their meetings before leaving Australia, the 2003 and 2004 students had the opportunity to talk with students from the previous project. In addition the 2004 group were able to read a summary of the (anonymous) reflections of the 2003 students. Otherwise the three projects have followed the same general program. About a month before leaving for Vietnam, the team met for a full day workshop with RMIT supervisors and selected speakers to:

- bring the students up to date with any outstanding issues relating to logistics of travel arrangements and research activities in HCMC;
- discuss the program of preparation prior to leaving Melbourne;
- introduce the issue of thinking ahead about the way in which the student teams would be operating in HCMC regarding the collection of information, the need for a professional approach to interviews, data collation, and writing the reports (both in HCMC and the completion in Melbourne);
- discuss team dynamics and team working processes, to identify issues associated with working in teams and how to manage any issues that may arise; and
- provide more details of cultural and health matters.

Throughout the period of team meetings, especially with the 2003 and 2004 projects, the emphasis was on the students taking responsibility for the development of the project details, and for the management of the project. Our interactions with the students in their discussions and deliberations have been akin to Schön's (1991) "reflective practitioners", where we have taken the role of facilitators. In this role we were keen to develop a reflective dialogue and in the meaning of Brockbank and McGill (1998) to develop a relationship "... where learners and teacher engage and work together so that they jointly construct meaning and knowledge with the material" (p. 5). We also took "... responsibility for creating the conditions conducive to critical reflective dialogue until student learners are familiar with the process" (Brockbank and McGill, 1998, p. 5). As official supervisors we supported the students, especially regarding identification of data sources in Vietnam, and how these should be accessed. However, within the bounds of the broad topic that had been developed, and the available resources, they had responsibility for running the project, data collection, and for their report. To assist them we asked questions to make them think about their decisions, and other options. We also provided our opinions when asked.

The two week research period in HCMC occurs in late June. For both student and staff availability, these are the only two weeks suitable in mid-year; between the examination period and the beginning of the second semester. Together with a female member of staff, we supervised the students, and in HCMC were assisted by staff of RMIT International University Vietnam with logistic support. Students and staff all had individual accommodation in the same hotel. Given the intensity of the projects this ensured that everyone had access to personal space; to moderate any tensions between individuals, and to provide them with some "thinking/reflection" time. Regular team meetings and social gatherings (as over dinner) provided opportunities to discuss issues related to the project, or related to cultural differences.

Before arriving in HCMC, discussion of data needs by the team was used to identify organisations that could be visited to collect documents and meet with staff. These visits were arranged by the supervisors, with meeting schedules organised with the assistance of staff at RMIT International University Vietnam. After two days of acclimatisation in HCMC, six to seven days of meetings were conducted. Usually all the team and supervisors attended, but occasionally the team decided to send a smaller group mainly to follow up meetings. During this period there were spaces in the schedule allocated for the team to discuss what had been found and the next stages. Subsequently three to four days were clear of appointments for the team to collate the data and prepare a draft report. At this point they typically need a month or more to complete the report; although we have told the teams they should aim to submit an “80%” completed draft before returning to Australia. After submission of the report the team presents its results to a public meeting of RMIT (Melbourne) staff and students.

### **Our Data**

From the point of view of looking for potential improvements in the project we are mainly concerned with the students’ reflections about their professional, group and multi-disciplinary experiences, and especially their reflections on the organisation of the project. This formal process of reflection, through reflective dialogues, was seen as one of the mechanisms for developing their experiences of professional reflective practice (Brockbank & McGill, 1998). Additionally, their reflections have provided us with data for our review of the project. The students’ comments about these experiences were very positive in 2002 and 2003, as were their comments about the growth they experienced in their cultural and personal understanding (Meehan & Thomas, 2006).

In this paper we will concentrate on the views of the students involved in the 2004 project. Discussion in our earlier papers (above) has covered the details of the ways we have collected data about the students’ engagement in the projects. The data we present in the following section were obtained from a two hour audio-recorded debriefing session at the end of the students’ time in HCMC. From these data we are concerned with the students’ views of their experiences (professional, group and multi-disciplinary) and the understanding (cultural and personal) they developed. In particular though, we will look closely at their reflections about the organisation of the project, to assess how these relate to the changes we have introduced based on the experience of the previous projects, and whether additional issues are identified regarding the project’s design and operation.

The debriefing session provided a range of comments. Rather than present these as a series of dot points that may be difficult to interpret, we have constructed a fictional meeting between three students. The dialogue we have generated is derived from the actual words of the students; with the exception of introductory and linking sentences or phrases, the words in quotation marks come from the transcript of the session. All the characters are fictional amalgams to represent the comments made by many.

For the following section we have edited the number of comments to reduce the extent of the material, but to demonstrate the range of issues and illustrate the depth of the students’ feelings. This has meant that there is only a limited coverage of some categories of comment (such as cultural experiences). However, there is considerable coverage of issues associated with the organisation and running of the project, as this reflects the emphasis in the debriefing session, and the focus of this paper. The following “conversation” focuses on these issues. In conjunction with them we have provided our discussion of the students’ points, as comments in key parts of the material (these are presented in boxes).

## Reflections on the Project

Scene - The Greenroom, hang out of students from the environment programs.

The characters:

- Joan, student who participated in the project, and returned home two weeks ago;
- *Ng, another participant who returned home yesterday; and*
- **Wendy, student who hopes to participate in next year's project.**

Ng! I thought you weren't getting back until tomorrow. Xin chao! Come and have a coffee.

*Xin chao, Joan. Thanks, a coffee would be good. You have even remembered the accent I see.*

We had a good teacher in you. But, how was your family? You got to Hanoi didn't you?

*Yeh, they were fine. But it was weird. We spent so much time talking about pollution, especially from the motor bikes. I wasn't expecting so much interest in the environmental stuff. It was like I was still doing the project.*

But Ng, remember in Ho Chi Minh. Everyone was concerned about air pollution in Vietnam.

*Mmmm. I guess. But we didn't look much at transport. Maybe that could be a focus for a future year. When things are operational at our site. ... But what has it been like back here?*

You know, same old lectures, and lecturers!!..... That was the thing about the time in Vietnam. It showed the difference between the way that we've been taught at the university where we get things given to us. We get guided in this or that direction. That's the difference between what you learn at uni and the situation in the real world where you are given this problem and you have to deal with it.

*Yeh. ... It's the only self directed project I've done. You know, my favourite thing is probably the format of the project itself, as in collecting information, working solidly. I really enjoyed that even though it was hard work but still good to test yourself and draw information from people.*



What we learnt -

While the responses were not specifically referring to PBL, the points that have been made relate to the aspects raised by Kendler and Grove (2004), and noted above. This indicates that the design and operation of the project have been reasonably effective in assisting students to practice skills of analysis, integration and application. However, in each project the submitted reports have shown a variable standard of analysis and integration of data. This outcome is likely to be closely related to the effectiveness of the team's dynamics, and less influenced by our supervision. Nonetheless, now that this has been identified, we will make a point of more closely reviewing future teams' work processes.

I really enjoyed the cultural aspect ... to be out of Australia. It's such an eye opener going somewhere like that and realising that westerners aren't the only people, and our cultures aren't the only cultures. There are such different things out there it's made me want to travel everywhere.

*Try Hanoi next time Joan! ... I guess the cultural stuff was lost on me a bit. But I've learned not to underestimate people. You kind of put people in a box. So before I went I was a bit worried about how the group would work, and I've seen people totally surprise me and be really graceful. Like they'll change their opinion when they feel like the group needs it - not necessarily change their opinion but accept it.*

The group, yes. I was concerned about how the group might come together and how the project would turn out. From the selection process as well but the way that we've come together both on social levels and professional levels it's been a really good experience. It's been really interesting ...

(From the door) ***"Ng, you're back! Where's that hat you said you'd bring?"***

*The report took up too much room Wendy. You'll have to go yourself next year. Come and join us. ... Joan, Wendy is one of our second years. Wendy, Joan here went with our team.*

Hi Wendy. Ng has been saying there are a couple of keen second years. Do you really think you'll apply?

***I might need some convincing. I hear it's hard work. From what I saw, leading up to the project was quite stressful. You all had exams and Vietnam was really the last thing on your minds, and to not even have a clear idea of what it was all about was stressful.***

Yeh, you're not wrong! ... We were trying to gather information and trying to get our heads around the project and then we were right in the middle of assignments and exams. It would be nice to feel a bit more prepared. I was really excited about going to Vietnam, but I was really concerned about the project. So I needed a bit more reassurance early on. Barry and Ian tried to reassure us but we didn't believe them.

What we learnt -

Undertaking the project just after the examination period is a problem in terms of the energy levels of students (and staff). It means there are only limited opportunities available for the students to prepare for their time in HCMC. On one hand it is unfortunate that there is no time of the year where it will be perfect for everyone. Running the project during the 'long break' of December to February would run into problems of staff availability, and clash with the students' opportunities for paid employment. Also we wonder if more than a handful of students would avail themselves of the opportunity, given the human tendency of 'leaving things to the last minute'. On the other hand the situation faced by the students is a reasonable representation of what they will experience in the workforce, where the pressures of their work and private lives means they will be under similar pressure, and where they will be faced with situations for which they are not well prepared. In future we will not change the project's timing, but we will discuss the issue with the students early in the project, and guide them in more explicit preparation.

The other issue is the clarity of the topic. While in successive years we have given greater emphasis to explaining the process for selecting the topic, it is apparent that we need to involve the students earlier in the process to make it more transparent. We will also consider the possibility of spending more time at the full-day meeting, so that the team can discuss the topic at greater depth.

*I still believe we could have organised roles and the team manager much earlier. The only problem was that we didn't have explanations for what these things were and I think that's something that should be explained better.*

I think we also didn't have the grounds of knowing each other well enough to be able to make a call on those team roles.

***All the group stuff is off-putting.***

Usually I'd agree. I was concerned about how the group might come together and how the project would turn out. But from the selection process as well but the way that we've come together both on social levels and professional levels the project has been a really good experience. ...No one really knew what was happening until we were chucked into the situation and we all swam.

*I think the self-directed nature of the project needed to be spelt out to me a bit more. I didn't quite get the concept and that was the worry. Because we kept waiting to be told what to do. If you told me ten times, I still didn't get it- somehow it needed to be put a different way.*

Organising things like project manager, project coordinator, editors, writers, and to see the researchers and everyone working together, researching in teams. It's been really interesting.

*Project manager and editor and all those sorts of things interested me but I'm really glad I didn't take on any specific roles. I feel like I'm more capable now to sit back and trust that other people can do all of those things, even though we don't know each other that well.*

For so long, Wendy, we thought that the team leader was responsible for everything – we didn't really understand what the team leader was supposed to be doing and if we had actually defined the role and what that person was responsible for, we could start assessing people who had those particular qualities.

***How do you do that? What are you getting at?***

For next year, I'd advise the group to think about their roles well before they are assigned to them. I think that would be useful. I am surprised at how a group this size could work so well together and I think that's largely to do with always thinking about the project manager's role.

*Yeh Joan, what students from the previous project told us about project management was important. It was pretty clear that everyone was getting that straight.... With the number we had it was probably more crucial to deal with project management before the actual writing started, before more in-depth research started. I think that helped the group to work competently and successfully.*

**What we learnt -**

The importance of organising the team roles, especially that of a manager, early in the project has been clearly recognised by the students. We will continue to present students in subsequent years with information and experiences to demonstrate this point. To assist we will use the experiences of past projects more directly to raise awareness of project management: particularly having the past participants present to the new group about how they determined team roles, and any problems encountered. However, the lack of understanding about the range of roles in a team and the specifics of these roles, along with the organisation of the group (such as meeting procedures) may still be unclear. To improve this situation we will seek ways to provide more opportunities for discussion of team roles in general, to provide options for how the team could go about its management.

***There must be more to it than the group stuff. What about some other tips!***

*Hang on! I liked working with people from other disciplines quite a lot. Just seeing how people from different disciplines have a different approach to what everyone else has.... That is a big issue actually, learning that when others take responsibility, you just have to sit back and trust. You just had to let go. Because the idea of taking control of the entire project is completely unrealistic.*

One of the good things I think, professional wise, has been working in the engine room. Basically, you are there in front of a computer but having everyone there, bouncing ideas off, calling on someone to give you a hand, having people working for and with you all at the same time and just coming together like that was a really good experience. ... But it's not a case of being guided as you are at uni. It's a case of being given a situation and having to deal with it and I think that's been one of the more positive experiences.



*I think its hard at the start because you don't really realise how much of it is our project and not input from Ian or Barry. We needed to receive information before we could get started but it was hard to take control and I think that's what a lot of us struggled with in the beginning. ... I don't know how you make that a smooth transition.*

What we learnt -

The students were involved in a situation where they had a degree of responsibility for the outcome. This was unsettling if not frightening, but they managed very well, and being able to cope gave them confidence. Overall the process was found to be difficult but valuable. Most of the students would have liked to have been clearer about this process, and the specifics of the project. However, some recognised that they did not absorb a lot of this understanding during the discussions prior to leaving for HCMC. Rather it made sense during their experiences in HCMC. As a result, we need to explore ways to make the issues clearer early in the project. Nonetheless, having this process understood will continue to be difficult, since it is very different from most of the learning situations they confront in their other university studies (where the activities are arranged for them).

The related point is being clear about when the bulk of control is handed over to the team. Again we will be more precise in the program for the briefing sessions to ensure that the transition from the stage of our initial development, to the stage where the students take control of the project focus, data collection and analysis.

But on Wendy's point, we would have gotten more out of the preliminaries if we had quite thoroughly gone through the last years' reports. You know, picking them apart – which bits were good and why. I would expect to see the reports getting better and I would think that there would be some way to let the students know where the others did so well or didn't do so well so that each year's report would be of a higher standard.

*I think it was good to have insight from previous groups. It was really good to have Amy and Anthony come in to talk to us about their experiences – it would have been nice to have that a bit earlier on because I didn't know what was going on.*

Yeh, the recording of the key team sessions and using it for future years is good. It was really helpful having the two years before us and the feedback that we got from that - things to look out for in terms of working in a group, making sure the group runs smoothly and problems that have occurred in the past don't seem to have happened, and I think that's because we were pre warned about it.

*And also in the descriptions ... with what specific roles were and how we should be informed. That has greatly enhanced this experience. But some basic project management, minute taking etcetera. would be useful. I think that most students don't know how meetings function. I think that the meetings next year, the preamble meetings, should be run as strict, professional meetings.*

What we learnt -

The importance of the experiences and feed-back from the students of previous projects is clearly valued. Drawing on these students and the wealth of reflective material we have collected, we will ensure that in future projects there are opportunities for students to learn from this experience. It is apparent that the students take notice of the previous experiences, and this could be used to explore meeting procedures. In addition, it is apparent that there would be benefits in providing a session on options for meeting procedures to give a broader range of ideas.

***Did they talk about the project for next year - the topic, or anything?***

*No Wendy, but I think it would be a good opportunity for students in following years to be on site and to be able to be even more hands on than what we have.*

You know, when I met the architect, it was the first indication of we're going to do something that could make a difference. I got excited because there was a sense of you're coming over and we need you and we want you. We want your ideas. ... So long as that is there maybe the actual topic is not so important.

*Yeh. It was really exciting to meet the people that are really high up and for them to give us the time of day and to be really interested in us because sometimes you think, I don't really know much, I haven't got much to offer. But they were so enthusiastic about our coming to see them.*

Maybe. Understanding where people are coming from is important. Everyone has their own agenda and sometimes you just take what they say as the truth or their real motive. I think we've seen that a lot of people with different motives and they'll go about giving you a certain impression. It been interesting to see that even though they say things in a certain way, they could be thinking something totally different. Not that it's a bad thing. We all do it - we all make things mean different things but it's been interesting to see it.

*You need to understand what it is you want to know. Dividing up questions was really helpful. Working out what we wanted to ask particular people doing particular jobs. I've learnt about getting the same information or trying to get the same information from several different sources. Not taking someone's word as fact. ... Not taking the first option as fact and making sure you've got your information correct.*

What we learnt -

These general points indicate that the students' were developing some of the interdisciplinary learning skills that Eaton et al. (2004) associated with PBL approaches. They also indicate understanding of the practice of researching, and of the respect shown when professionals are serious about their task. In these respects we feel that the project has helped to validate some of the many aspirations of PBL.

***On that note I'll head off and talk to some of the others about their ideas! I guess I'll get to see you at the presentation of the report. Nice to meet you Joan.***

Same here Wendy. Don't be put off by what we've said about the work. I think it's been an amazing experience.

*I'll go with you Wendy. You're headed for the student meeting aren't you? See you at the team meeting on Thursday Joan. Will you bring your photos?*

Sure thing Ng. See you.

## Overview

We acknowledge that the project is not perfect, but it produces valuable outcomes for the recipients of the reports, and especially for the students. We do not believe it is possible to have a perfect project, given the range of agendas that operate, and the range of situations in which we operate (the individual students, data availability, logistic issues in Vietnam, and many more). More importantly, we believe that we all learn lasting lessons by reflection on our practice and experiences (Schön, 1991). In the words of one of the students, who specifically recognised the advantages of reflective practice:

It's probably most often or not the negative things that help you to learn and grow the most as well; the real challenges and painful experiences we've had. Not that it's been that painful, but those challenging times when we really learn and really grow.

So it is to the benefit of the students if there are situations where they have to engage in reflective dialogue; as promoted by Brockbank and McGill (1998). This is not to say that we will deliberately create 'learning situations' where the students have to struggle unnecessarily. However, while we have indicated above some of the improvements that we will be trying, we will be wary of bending to pressure to remove all the challenges.

For those interested in the use of project work our experiences should provide encouragement. Specifically, a project that involves students in multi-disciplinary team-work experiences, which adopts a problem-based focus, and which enables the students to take responsibility for aspects of the direction and management of the work can assist the development of skills that have professional importance. However, students cannot be left unaided. Considerable academic input is needed to provide the context and background resources, to prepare students for team-work, and to mentor the students when the project is under way. As demonstrated by the reflections of our students, with these principles in place, they can gain handsomely from their experiences. What we have presented is not a model to be followed in every detail. However, we feel the key elements, and our learning, will assist those who want to pursue this effective learning mode.

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