

Letter from the oasis - helping engineering students to become sustainability professionals

Abstract

*Sustainability scientists call for education that produces "sustainability professionals", who understand the need for sustainability and can work towards it. However students often have very different ideas, usually based on an expectation of continued unlimited growth. This paper, based on research with large, diverse, first year engineering cohorts, argues that a reflective process and on-line support can contribute to a learning oasis - an environment that encourages students to leave their cultural and intellectual comfort zones. In these circumstances, most students will engage with the personal and professional challenges of what it means to be *Globo sapiens*, a global sustainability professional for an increasingly complex century.*

Patricia Kelly

Adjunct Lecturer University of the Sunshine Coast, Queensland, Australia
PhD candidate, Queensland University of Technology, Brisbane, Qld., Australia

Introduction

This paper documents some of my work with first year engineers, trying to meet the challenge posed by sustainability scientists "to develop appropriate methodologies, train a new cadre of sustainability professionals and build institutional capacity" (Raskin et al, 2002, pp. 56-7), as part of a transition to a preferred future. I welcome dialogue with those on similar paths; those who may regard such work as just another burden on an already pressured curriculum and those who think it has no place in an engineering curriculum. This is not a value free zone. I want to "contribute ... to the betterment, well-being, protection and further positive development of humankind within its environment, present and future" (Slaughter, 2004, p.45). My work also fits an Action Learning (AL) paradigm, expressed as the "basic belief that we can transform our lives, our workplaces and society if we act with integrity in concert with others and nature" (Passfield, 1996, p.14). The clearly stated values and respect for nature in this discourse¹ place my teaching within a wider struggle - towards a "partnership" future based on an understanding and appreciation of the interconnectedness of all life (Eisler, 2001, p.50)². At the deepest level, I am motivated by the urgent need to contribute to the change from the un-limited, growth-driven, anthropocentric view of the world, which has created the risks now facing this fragile planet and its increasingly damaged ecosystems (Steffen *et al*, 2004; UNEP, 2000; Lowe, 2003; Raskin *et al*, 2001). After setting the context, this

¹ Ehrenfeld (1993) in Passfield, *op.cit.*, pp.15-16) expands this to a call for "social transformation through integrity, honesty and recognition of our "evolutionary interdependence".

² The terms "partnership" and its opposite, "dominator" "...describe systems of belief and social structures that either nurture and support – or inhibit and undermine – equitable, democratic, non-violent, and caring relations" (Eisler, 2001, *op.cit.* p 144).

paper summarises some of my learnings under the headings Sustainability Professionals, Reflective Process and Developing *Globo sapiens*. I conclude with some reasons why this kind of work is not “airy-fairy”, the most common criticism, but contributes to a transdisciplinary education based in foresight and long-term thinking.

Context

In practice, I have found that, as suggested,

“serious attempts to integrate sustainability into higher education brings academics into whole new pedagogical worlds - experiential, epistemic, and systemic - which in turn brings them into whole new worlds of learning and, indeed, researching”
(Bawden & Wals, 2000, in Arjen and Jickling 2002).

This work began with an invitation (in 1997) to provide academic support for staff wanting to improve communication skills in a small Engineering elective. This led to being part of the development of a compulsory first year unit (BNB007), for a large (400+), diverse student cohort. Here the broader issue was how to help students to integrate their learning into their lives as developing, globally competent citizens and professionals, willing to think critically and assume responsibility for their impact on communities and the planet. Other Engineering educators had similar concerns. “A radical reshaping of engineering education is necessary to green prospective engineering graduates”(Beder, 1996; Johnston, 2001). Experience and reading led to increasing dissatisfaction with terms such as ‘global portability’ and ‘global competence’. These seemed inadequate to describe the qualities engineering (or any) graduates need in order to contribute to a new values-based vision of humane, sustainable and desirable futures that sees “rights assured, nature treasured, culture rich and the human spirit animate” (Raskin *et al. op cit*, p.70).

Sustainability professionals

The more apt term “sustainability professionals” comes from a group of leading natural scientists, social scientists and policy analysts who met to deal with growing concerns, “that meeting fundamental human needs while preserving the life systems of planet Earth will require world-wide acceleration of today’s halting progress in a transition toward sustainability” (Kates *et al*, 2001, p.1). They described efforts to promote this transition as a new field, Sustainability Science. Among other pathways, they called for research “on the character of nature-society interactions, on improving our ability to guide those interactions along sustainable trajectories, and on ways of promoting the social learning that will be necessary to navigate the transition to sustainability” (Kates *et al, op cit*, p.4). I realise that sustainability is a contested, ‘messy’ and ‘ill-defined’ term. Arjen and Jickling’s work (2002) is very helpful in outlining the many possible uses and misuses of this term and their consequences for higher education. BNB007 was one attempt to meet calls for a different approaches and methodologies. In practice it isn’t easy to change either the content or practice of curricula. A lot of work goes into designing and teaching any unit of work and there are vested interests in preserving and protecting the status quo. I see my work as part of a humbled, on-going process of “seeking, rather than setting, standards for

education for sustainability” (Arjen and Jickling, 2002). Having established the need for sustainability professionals, the next section briefly describes the reflective process I have used to support their development.

Reflective Process

Using Reflective Journals with first year engineering students has benefits including improved writing skills, increased self-confidence and better interpersonal and intercultural communication in the linked teamwork activities. At a meta-level, there is evidence of growing awareness of their personal and professional responsibilities on a local and global scale (Walker & Finney, 1999, Scoggins & Winter 1999; Kelly 2002; Kelly, 2004). As stated in the unit outline, the aim of the Professional Practice module is "to help you identify and develop the skills necessary to be effective responsible and ethical professionals in a rapidly changing world." Two linked assignments, Reflective Journals (RJs) and a team-based project³ are the way we developed assessment as a "tool for learning and growth" (Heath 2000, p.46). In 2003, students wrote eleven (x 300 word) reflective journals, related to the lecture topics⁴ and at least one set reading in the "Professional Practice section of the unit. In Week Five, two markers give formative feedback, using the same assessment criteria that are used in the Week Twelve summative assessment.

Journals are written and sent in electronic form. The "Track Changes" facility enables fast and legible feedback as well as providing an opportunity for the journal markers to develop a personal and trusting relationship with students. Our experience confirms other research showing that the flexibility of word processing and ease of correcting have positive effects on students' academic abilities and self-esteem (Palmer 1999). Word Processing is one of the skills taught in BNB007, and students take pride in integrating their growing expertise into journal presentation. 2003 was the first year that I was directly responsible for marking journals rather than being a slightly external adviser/researcher. I made a commitment in the first lecture to students, that "no-one would fail RJ's because of me". This led to a huge commitment of time as a (casual) on-line administrator trying to establish a safe environment with a "human face". I wrote over 8000 words in notices during the semester. Here is a truncated excerpt to give the flavour of what I was trying to achieve.

Dear BNB007 students, This is a note to let you know that the READINGS for Week One are available in PDF format from the Home Page of this unit. They are both very readable

³ The teams must negotiate, create and complete a project related to the United Nations focus in each particular year. In 2002, projects had to respond to the International Year of the Volunteer. These were presented and assessed at a public EXPO. 2003 was the International Year of Freshwater and students presented to peers. Three winning groups presented at Parliament House, Brisbane.

⁴ In 2003, the Professional Practice topics that formed the basis for the RJs were 1. Personal Perspective on Learning 2. Problem Formulation and Critical Thinking 3. Intercultural Skills 4. **Peer Interview** 5. Environmental Principles / Sustainable Engineering 6. Socially Responsible Technology 7. Professional Engineering Ethics 8. Project Progress and Planning 9. Entrepreneurship, Innovation and Creativity 10. Globalisation and Professionalism 11. **Self-Interview on Learning**

and practical. If you think that you aren't very good at planning or time management there is a good goal setting exercise in the second article that you might find useful. ...The first week of a new unit is always a bit overwhelming. Think of it like eating an elephant, just take small bites:) .. I would also be grateful for feedback about the notices, whether they are helpful and if not, what would be most useful for you right now. I hope you have a good weekend. Pat

It is essential to show "a human face", to make constructive comments and to respond to personal input. Previous research, (Krol, 1996) notes that the response itself encourages dialogue and categorises teacher comments as affirming, nudging, "giving information and personal connection comments" (in Maloney, 2002, p.40). I received some heart-warming emails from both domestic and international students thanking me for "words of encouragement and advice in your emails..." ; "Thought you should know your work is helping" and "I was so worried. Your words are so encouraging. I will be doubling the effort for the rest of the journals". These are from male students.

Reflective Journals and reflective processes are not to be taken on without thought and planning and staff need appropriate maturity and communication skills. Boud and Walker (1998) highlight the power of this strategy and its potential for harm, despite good intentions, particularly in regard to issues of power and trust. I continued to assure students that there was no "party-line" that they had to toe and that no-one would fail for disagreeing with any reading or topic.

The best of what I have learned about the RJ process includes⁵:

- Early scaffolding of writing through providing an open-ended template for writing the first few journals. This is particularly useful for students who are unconfident of their writing skills for whatever reason
- Incorporating a Personal Learning Agreement based on a Code of Conduct and a tutorial on Thinking about Learning.
- Introducing a Peer Interview in which students share their journals and learning experiences. I moved this from Week 5 in 2002 to Week 3 in 2003 so that students got feedback early in the semester. This has proved extremely popular as a way of relieving anxiety about the journals, and meeting other students, particularly across perceived age, gender and cultural differences.
- The formative assessment in Week 5 provides non-threatening feedback early in the semester and can identify students with difficulties.
- Include one or two set readings each week. These are important and are a good opportunity to introduce writers from different backgrounds and perspectives. Articles have included those from Professor Sharon Beder, *New Internationalist* magazine, Management magazines, Personal Development articles, a personal choice from websites about cultural issues and so on. Students tend to say they have discovered things they never would have read otherwise. A short article on the extent of the freshwater crisis proved cathartic for many students in 2003. At first year level, short, well written articles are ideal and focussing questions can help

⁵ I have not addressed the issues of resistance to the reflective process in this paper although it is a key aspect of my research.

- to direct reading – for those who need it.
- Metaphor plays an important role in establishing the vision and atmosphere of such a program. So many of the metaphors used in problem-based learning are military or machine-based (Bowers & Flinders 1991), Burrowes, 2001). ‘Oasis’ (Boud, 1999) seemed an ideal metaphor for the learning environment that I was trying to establish in BNB007. Our metaphors should be carefully chosen, able to be explained and justified and open to contest. There are no “innocent” choices. As a teacher, I have to make the effort to be conscious of my assumptions and to make these as transparent as I can. The oasis may remain, but as *my* metaphor. Having explained my choice, I now invite students to choose their own metaphors for their learning.

Developing *Globo sapiens*

While the notion of ‘sustainability professionals’ is a useful one, the idea of a wise global citizen *Globo sapiens* (Malaska, 1997), offers a more explicitly values-based concept and vision that integrates the personal and the professional with a base in global responsibility. Literature, the reflective journals of the last five cohorts and over twenty personal interviews provide the basis for identifying and unpacking the qualities, skills and attributes of *Globo sapiens*⁶. This is work in progress and characterising qualities, as outlined below, continue to emerge. These qualities are evident across cultural, gender and age groups and extend the “dynamic qualities” that allowed students “to critique, construct and act with a high degree of autonomy and self-determination, if not in their personal lives then at least in their professional lives” (Posch, 1991).

Quality 1: *S/he will be sensitive to the different ways we learn from each other and know the world.*

I borrowed this quality from a longer quote, “engaging in futures-oriented pedagogy requires sensitivity to the different ways women and men, civilisations, classes, people with disabilities and those without ... know the world” (Inayatullah 2002, p.121). This quality seems to shine through these comments from students in the 2001 cohort as they struggled to understand the 11 September attack on New York’s Twin Towers:

I don’t think BNB007 could have come into my life at a more appropriate time, as it has helped me to understand the World trade centre incident. After deeply reflecting on cultural and religious differences in the journals, I know why it happened, I am able to understand and respect the anger of the Muslims, but because America believes they [the USA] are innocent, I also understand their retaliation. (Female, NESB, 2001)

The tragedy in the United States was terrible, 4000 lost souls, but just think ten times that amount of people die everyday from AIDS in Africa, and it never makes the news and no one really cares. (Female, NESB, 2001)

What I find striking are their heartfelt efforts to understand why this had happened, *despite* so much media actively discouraging such thoughtful responses. The Peer Interview is a particularly effective strategy in making apparent barriers transparent as the following example shows.

⁶ Malaska’s original and more grammatical *Globo Persona Sapiens* divided into human and non-human branches that eventually coalesced into a hybrid Internet “global mind with superior intelligence and wisdom”.

...it seemed like we knew each other for years. Even though we are of the opposite sex; I am of Pakistani culture and he is Anglo-Saxon; we have never met before and would ideally probably have gone through the whole degree not realizing that we could be such good friends; all this seemed irrelevant, and in the space of a few minutes, we found ourselves agreeing on several different issues that we have come across during our course. (Female, NESB, 2003)

Quality 2: *S/he will show evidence of global consciousness.*

Many of the students' journals show evidence that they are on the way to showing a degree of "global consciousness" that Markley defines as having two elements, an "expansion of consciousness beyond the confines of an egocentric sense of self ..." and a functionally adequate awareness of ecology as a whole system of physical and non-physical interactions across time" (1996, in Dator 2002, p. 340).

After writing about various issues in my journals, I became more aware of situations in the "real world" that are affecting people all around the world. (Female, ESB, 2001)

The environment is a sensitive ecosystem and with one small change it can cause detrimental effects to the environment. Thus the future generations cannot enjoy what is alive today. (Male, ESB, 2001)

Quality 3: *S/he will be able to contemplate changes to their current way of life, rather than taking its continuation for granted.*

Changing our thought processes and values to develop an ecologically sustainable culture represents "the abandonment of the middle-class vision of unlimited economic prosperity and technological progress" (Bowers 1991, p.230). This may be the most difficult change for privileged young people to contemplate. And why not: they are bombarded by images and messages telling them that escalating consumption is their right. This consumer 'hyper-culture' has been cleverly described as the domestication of the 'seven deadly sins'⁷ into the 'seven marketing imperatives" (Slaughter, 2004 p.11). Despite the temptations, many students demonstrate such virtues:

The responsibility of fixing some of the problems created by previous generations undoubtedly rests on the shoulders of the new generation of engineers. However, our decisions may, in turn, become the basis of unseen problems in the future. We must then, do our best to predict and consider all possible repercussions of our actions and decisions prior to their implementation in order to protect further generations and the lives of others throughout the world before. (Male, ESB, 2001)

... one of my career goals is ease the burden that the human race is currently putting on our planet. At the moment, I picture the human race as a colony of fleas, unwelcome in their feeding off their host, our planet. I would like to see the human race lose their flea-like nature and begin to nurture and care for the host on which their survival depends. What I really hope for is the same attitude to be present in my fellow engineers. Sure, one person can make a difference, but hundreds, even thousands of people can make a huge difference. If this difference does not take place soon, then the area of sustainable development won't even be an option for our future generations. (Male, ESB, 2001).

Quality 4: *S/he will be capable of trans-generational thinking.*

⁷ (pride, envy, greed, anger, gluttony, laziness and lust).

As well as engaging/re-engaging with their own cultural background/s and histories, many students recognise and understand the concept of Future Generations. 'All other species' feature less often:

As future engineers, we must respect our natural environment so future generations can also enjoy it. Having become aware that our environment should be treated with respect the concept of sustainability has emerged. (Male, NESB, 2001)

I believe we should all look into the future and think of our children's children, and visualize what the earth will be like for them, and their lifestyles. They have just as much right to have just a lifestyle as most of us have now in the 21st century. If sustainability of the environment isn't implemented properly then these generations will be effected in a big way, both in the environmental aspects, and an overall lifestyle of living. I believe it is everyone's job to do this, but engineers have their jobs to do, that other citizens with lack of knowledge can not. I would like to be a part of this, and do what I can, but I know it has to be a worldwide effort and not one single person could do it on their own. (Male ESB 2001)

... engineering with a purpose and looking to the future really appeals to me. I know I'd like to think that at the end of the day, as an engineer, I wasn't just going about destroying things and taking away more from the environment than I am putting back. I'd like to think that I am investing in the future and ensuring that there will be a future for my children. (Female, NESB, 2002)

A sustainable environment is a happy environment, and a happy environment increases the social capital of humans and animals alike. (Male, ESB, 2001)

Quality 5: S/he will be able to contribute to a 'learning society' through growing "dispositions of generosity, of openness and of serious engagement".ⁱ

Students need these dispositions in order to support a society based on 'social wisdom'. I saw these qualities emerge in 2003 cohort and in their responses to each other. For example, a student from a previous cohort entered the on-line discussion forum under his own name with advice to the year's cohort to take it seriously and learn from his mistakes and offering help should anyone need it. Another student offered to do a second interview if anyone could not find a partner. Most of those now in higher years have done the unit in one of its forms and they are now the majority in the Faculty environment. There may be small but significant signs of healthy life at the oasis.

As a result of the topics we've been looking at in class, I've found myself thinking more and more about the cost to the environment our everyday activities result in. I'm becoming more aware that as an engineer I cannot simply carry on in an ignorant manner, but it is up to me to find means to reduce the impact humans have on the environment. (Female, NESB, 2002)

Quality 6: S/he will be a person of courage

Courage has emerged as a desirable and possibly the most demanding quality for *Globo Sapiens* - and their teachers, in the 21st century.

"Engineering graduates will need to come to terms with the causes of environmental degradation as well as the social and political factors which shape and direct technological change. They will need an education that gives them this understanding as well as the courage and professional integrity to independently pursue sustainability" (Beder 1996).

Barnett acknowledges that “Finding one’s own voice and expressing it — in thought and in action — requires the moral virtues of courage, independence and persistence” (1997, *op.cit.*, p.173). Sidhu (2004) amplifies this by applying Foucault’s notion of *parrhesia* “fearless speech”, with its moral and critical qualities, to higher education. “The hallmark of a university education should be training professionals to be *parrhesiastes*.” Students will feel more confident to develop this quality if we model it through the environments we create and through our own behaviours as globally competent practitioners (Badley, 1999).

One important aspect which I have come to value and appreciate, as a result of reflective journals and the module bnb007, is that my own view of engineering has changed. Before this subject I was really questioning the role of engineers in the global community and their relevance to society in general. I wondered whether this was the course I should be taking as all first semester subjects were maths and science subjects. The subjects weren’t difficult, only a little uninspiring and theoretical. This subject has helped me to further understand what an engineer is and who an engineer is. (Female, NESB, 2002)

Engineers hold great responsibility in the development and implementation of new products and technologies thus the need to put the livelihood of people and the environment first is important. We need not only to ask, as an anonymous person said, “Can we do it” but also, “Should we do it?”. (Male, MA, NESB, 2002)

Conclusion

This work is not ‘airy-fairy’, the most common criticism, but entirely compatible with the faculty’s need to earn money, from international students in particular. In terms of this discourse, students in such units are getting value for the large amounts of money they are paying for a professional education, because:

- all experience a curriculum that overtly welcomes and builds on what they bring with them in terms of work, culture and gender experiences
- for first year students, Reflective Journals or a reflective process, if well supported, allows each student, even in such large cohorts, to feel that someone recognises them as an individual and is listening to what they say
- for international students, learning has a global dimension relevant to issues affecting their home societies rather than being solely based on Anglophone societies or First World examples
- their experience as international students is more positive because they learn in environments where they feel supported, valued and respected
- they will take this good-will with them to their home countries as a long term investment in our role as desirable education destination nation/s
- Above all, both domestic and international students are developing the skills and attributes desperately needed by a world in transition.

All societies are confronting, or about to confront, the consequences of unsustainable practices and will need to bring about dramatic changes in technical and professional education in order to respond effectively. This was a small and imperfect intervention, but most changes in the real world begin this way. The initiative has suffered from lack of sustained high level interest, support and encouragement and 2004 is the last year that the unit will run in this format, or include Reflective Journals. Initiatives for change need a “champion” at the

highest faculty level, and recognition and encouragement from the professional body for work towards the profession's stated goals. The support of colleagues, through participation, constructive criticism, or even expressing interest, is also critical to developing, maintaining and improving innovative programs. One response typifies common and unhelpful responses. A colleague I was talking to about another matter dismissed the RJs, saying everyone thought they were a joke and just wrote what they thought we (the markers) wanted to hear. I have now read over 2000 Reflective Journals and this could be true of occasional journals only. When I offered to send the colleague some journals (for which I have students' permission to use for research purposes), the reply was, "Oh, I don't have time for that". I find it disappointing that colleagues who put such store in evidence aren't interested in this case. This work involves my own learning as much as any student's (Arjen & Jickling 2002); (Brookfield, 1995). I am not an engineer but come from a humanities background and working closely with engineering students has been challenging. Research in the form of the Reflective Journals and personal interviews has given me respect for these students' willingness to engage and for their capacities for growth and transformation. I am more convinced of how important it is to expand the few spaces we make in universities "for allowing the life world of the learner to enter the educational process" (Arjen & Jickling 2002).

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