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Preparing Action Competent Environmental Educators: How Hard Could It Be?

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Abstract This article describes an interpretive study that evaluated a new subject in teacher education called 'Education for Sustainable Development'. The study evaluated the subject for its ability to prepare pre-service teachers for their roles as environmental educators. We used perspectives in place-based pedagogy and critical thinking to underpin the subject design and our analysis. Data sources include instructor journals, planning documents, interviews with students and student thinking books. Interpretive analysis of the data corpus was a collaborative process that involved both subject instructors and students who took the subject. Themes that emerged from the research were centred around: (1) how the students built connections between primary school education and environmental education; (2) how students developed action competence through the activities in the subject; (3) how students were challenged to think differently about themselves as educators; and, (4) how the subject design presented its own challenges for both instructors and students.

The purpose of this article is to explore the design of a new subject in the Bachelor of Primary Education at the University of Wollongong (UOW) through the experiences of the designers (the subject instructors) and students who participated in the subject in its first year. Further, we conducted the evaluation of the subject as a collaborative research project with four pre-service teachers who had been students in the subject. The new subject is called 'Education for Sustainable Development' (ESD) and is a core subject in the autumn term of the fourth and final year of the degree program. The subject was designed to incorporate collaborative, experiential and place-based learning as a focal point for the aims of the subject. Through the subject, we aimed to help our students develop action competence (Jensen & Schnack, 2006) to prepare them with skills and knowledge about sustainability and environmental education that can be put into action in primary schools. Our students are nearing the completion of their degree programs and preparing for work as classroom teachers. As such, their work with future generations of children will demand thinking differently about teaching and learning as children can reasonably expect their teachers to contribute to a shared vision for a sustainable future. Significantly, we invited students from the subject to critically analyse the subject and how well it has prepared them for the complex task of teaching children in a fast changing world. In doing so, we asked them to collaborate in the decision-making processes that shape the future direction of the subject, thus offering them a taste of leadership in the area of environmental education.

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Perspectives

We draw from perspectives in pre-service teacher education, constructivist views on learning, experiential and critical place-based notions of curriculum and pedagogy and student voice as vital in evaluating both our intentions and the effectiveness of the subject organisation and pedagogy. From our place-based perspectives, we view environmental education as intertwined with education for sustainability, where pre-service teachers can move in and out of concepts, issues, personal action and critical engagement on multiple levels.

As teacher educators, our focus is on preparing pre-service teachers with knowledge, skills and attitudes appropriate for their vital role as primary school teachers. Teacher education programs are often subject based, so that within the program pre-service teachers take New South Wales (NSW) curriculum subjects in Creative Arts, Science & Technology, Mathematics, Human Society and Its Environment (HSIE), Personal Development, Health and Physical Education, Music, Language Arts and more. As environmental educators, we see our responsibility as preparing teachers to teach across all these subjects, and view environmental education as a suitable focus for interdisciplinary curricula. Further, we want our teachers to be competent, self-confident and skilled teachers *about* environmental issues and *for* the environment. Our challenge is to find ways to engage our pre-service teachers in learning experiences that meet these goals.

Education for sustainable development is a state, national and international goal, mandated in educational policy over the past several years (Australian Government Department of the Environment, 2005; NSW Department of Education and Training [DET],[1] 2008; NSW Government, n.d.; UNESCO, 2009). Schools are key sites where education for sustainable development can be taught and put into action (Gough, 2006). Further, schools are required to develop a School Environment Management Plan (SEMP) as part of their operational response to Department of Education mandates (e.g., Sustainable Schools NSW). School-based teams are responsible for developing and implementing a SEMP, support for which has been provided by various NSW governmental agencies (e.g., DET, Department of Environment and Climate Change, Sustainable Schools), but teacher education at the UOW has to this point only addressed sustainable development within elective subjects in single discipline areas, and most often, from a largely theoretical framing.

ESD is a new foundation subject for all fourth year students in the BEd program at UOW. The subject is offered jointly as a collaboration between educators in HSIE and Science & Technology. ESD is multidisciplinary and seeks to prepare a new generation of teachers who are both theoretically and practically ready for empowering their students to become critical change agents in their own schools, families and communities.

The Need for Environmental Education in Pre-Service Education

In the 1960s, scientists began calling for recognition of the looming environmental crisis around growing world population and depletion of the earth's resources. Education was seen as the means to providing students with a scientific understanding of the issues involved (Gough, 2006). As a result, at the Stockholm Conference of the United Nations Environmental Programme in 1975, a major recommendation was that environmental education be a critical element of a comprehensive attack on the world's environmental crisis (Gough, 2006). Despite the rhetoric, Gough describes the history of environmental education in Australia as 'long, winding and rocky', where, like a game of Snakes and Ladders, positive initiatives encounter problems that soon return them to their beginnings (Greenhall, 1987). Nonetheless, there have been many environmental education

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programs introduced in Australian schools, and Armstrong, Sharpley, and Malcolm (2004) argue that there is strong evidence that these programs have created changes in both attitudes of students and general wellbeing of schools.

With contemporary interest in wider issues of sustainability and the expectation that teachers will develop and implement programs in schools, it naturally follows that teachers ought to be suitably prepared in their teacher education programs to bring about these important changes. Consistent with earlier UNESCO recommendations, the Australian Research Institute for Environment and Sustainability (ARIES) Graduate School of the Environment at Macquarie University states that it is the 'priority of priorities' to educate pre-service teachers to be educators for sustainability in schools (ARIES, 2009). Further, 'within Australian school education systems there is increasing recognition of the importance of EfS' (ARIES, 2010, p. 7).

Given the many years of attention to issues of sustainability education, one would assume that universities in Australia all have vibrant programs and models in place for education for sustainability, meeting the needs of the schools for which they are preparing their students. Unfortunately, this is not the case. Miles, Harrison, and Cutter-Mackenzie (2006) argue that it is the lack of pre-service and in-service teacher training in environmental education that poses a major barrier that prevents or limits the effective implementation of environmental education in primary schools, and that there are inadequate levels of environmental education provided at the teacher education level. ARIES (2010) advises that

> *changes in pre-service teacher education will need to keep pace with changes in policy and action in schools. Students now leaving university to teach in these school environments will need to be aware of policy, and be able to initiate and participate in whole-school sustainability activities. (p. 8)*

Miles et al. (2006) identify two key areas that need to be taken into consideration by lecturers and tutors when preparing pre-service teachers to teach education for sustainability: first, dispositions, beliefs and attitudes of pre-service teachers need to be challenged; second, the knowledge and preparedness that they have for teaching sustainability education needs to be developed. Gould (cited in Gaylie, 2009) questions how children will have the desire to save nature if they do not love nature. A similar question could be asked of pre-service teachers: how can pre-service teachers empower children to become environmental custodians when they may not themselves possess this desire? In other words, we would like our pre-service teachers to model care for the environment in their pedagogy. Therefore, we argue that lecturers and tutors should model suitable pedagogy for pre-service teachers, and provide opportunities to help pre-service teachers develop a desire to care for the environment alongside knowledge and skills to do this. Cutter-Mackenzie and Edwards (2006) claim that one way to develop this knowledge is to provide experiential learning opportunities for pre-service teachers that combine content knowledge and everyday experiences grounded in appropriate pedagogy.

As teachers, our students will be expected to create environmental education programs within their schools, involving 'hands-on' activities such as growing vegetable gardens, while linking these to the syllabi and the world around them. University programs need to allow their students — in the words of Lewis, Mansfield, and Baudains (2008) — to get 'down and dirty' in vegetable gardens while they are still undergraduates, and at the same time providing opportunities that facilitate deep links between values and the real world. ESD is our response to this array of needs and goals for pre-service teacher education.

Context

At the centre of the development of the subject that is the focus of this study is collaboration between colleagues from HSIE and Science & Technology, two Key Learning Areas (KLAs) in the New South Wales school curriculum. With a recent reconfiguration of the Bachelor of Primary Education at UOW, what were separate fourth year elective subjects have been combined into a jointly offered, semester-long, new subject co-instructed by subject specialists from the two disciplines. As the introduction of the subject coincided with the study leaves or retirement of senior personnel, two junior faculty members took the draft subject outline and developed and implemented the new subject, Education for Sustainable Development.

The hand-off to junior faculty was fortuitous, as one (the first author) was in her first year as a new lecturer in the Faculty of Education and the other (the second author) was her first doctoral student and a regular member of the adjunct faculty in the teacher education program. As junior members of the faculty, the co-instructors of the new subject were free to imagine and implement what others had initially drafted for the subject. Given the diversity of perspectives in HSIE and Science & Technology alongside prior classroom teaching experience, both instructors felt strongly about developing a subject that would break the mold into which our teacher education core subjects typically fall: a 2-hour lecture with the whole group of up to 200 students and then break-outs with tutorial groups of 24 or so students. This is the institutional model at the university for management of lecture hall space and lecturer remuneration. In the humble opinion of the junior faculty members here involved, the institutional model for traditional subject delivery did not suit the objectives of the subject.

We based the development of the new subject on experiential and place-based pedagogical approaches. While not uncommon in teacher education, particularly in elective subjects (that typically have 25 or so students), 'place-based' perspectives incorporate activities that critically engage individuals: 'place-based pedagogies are needed so that the education of citizens might have some direct bearing on the well-being of the social and ecological places people actually inhabit' (Gruenewald, 2003, p. 4). As core subject teachers, we took on this challenge. As one of the instructors noted in her reflective journal (W. Nielsen, March 1, 2010):

> *Part of the larger project for the new subject ESD is to give our students a chance to establish and understand their own situatedness in place. This is place on many levels, including personal or home, where the family lives or grew up, institutional spaces such as the uni or a school, the community or town in which you live or work, the region and geography of the state, the nation, and of course international 'space' too.*

We had limited flexibility in how we might structure the subject according to the timetabling and work-loading authorities at the university. For example, we were expected to share 50% of the subject workload each: 2-hour lecture blocks and six sections of 1-hour tutorials over the 12-week term. Lecture and tutorials were all programmed on the same day of the week. All enrolled students did meet as a whole group each week, but rarely for the 2-hour block. Rather, we used the lecture time as preparation for breakout activities. During two of these whole-group occasions, we had guest speakers. We 'workshopped' in smaller groupings of 3–20 students depending on the activities. We were fortunate that all students were programmed for one of the six tutorial sections on the same day, so for several of our meetings, a 3-hour block was treated as a workshop. Additionally, in some weeks, we met in the traditional model of a 2-hour lecture block and then students attended their 1-hour tutorial sections later that same

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TABLE 1: Twelve-Week Term Schedule

Week	Activity/focus	Format
1	Acknowledgement of Country	Whole group, 2 hours
	Introduction to EDSD401	
	Introduce Family Protocol	1-hour tutorials
2	Environmental Audit of FOE	3-hour workshop
3	Guest lecture: UOW Environment	3-hour workshop
	Initiatives Manager	
	Environmental audit of FOE	
4	Guest lecture: Local primary students and teacher	2-hour lecture
	K-6 Syllabus overview	1-hour tutorials
5	FOE audit synthesis	Whole group, 1 hour
	Workshops at Botanic Garden	2-hour workshops
6	EAT Team presentation to Dean	Whole group, ½ hour
	Garden planning fieldwork	2.5 hour workshop
7	Garden planning fieldwork	3-hour workshop
8	Garden planning	Small groups, 1.5-hours
	EnviroFair planning	Whole group, 1 hour
9	Garden planning synthesis	Whole group, 1-hour
	EnviroFair Planning	Small groups, 1.5-hour
10	EnviroFair Planning	Whole group, 2 hours
	Test run EnviroFair activities	1-hour tutorials
11	EnviroFair at Botanic Garden	3-hour workshop
12	Semester wrap-up	Whole group, 2 hours
		1-hour tutorials

Note: FOE = Faculty of Education; EAT = Environmental Action Team

day. Table 1 shows an overview of our plans for the semester, with the weekly focus and related larger scale projects and activities. The Table also describes the format for that week's class time.

We started with a 'Big Idea' and imagined what our students should know and be able to do at the completion of the subject. We were also mindful of NSW Sustainable Schools initiatives where each school is expected to develop and implement a School Environment Management Plan (SEMP; NSW Department of Education and Training, 2006). Anecdotally, despite being mandated in NSW DET policy, schools in the public system in the catchment area of the University of Wollongong are in every possible stage of progress in either developing or implementing the SEMP. This is the case for a myriad of reasons, discussion of which is beyond the scope of this article.

Sustainable Schools NSW offers guidance for how to develop the SEMP collaboratively within the school community and then guides action to make the school and its

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community more environmentally friendly and sustainable (NSW Government, n.d.). There are exemplar schools in our area where pro-active teachers and administrative staff have developed elaborate SEMP documents and have implemented the plan on the school grounds. And, as with key educational initiatives or reform movements, teacher perceptions of their own efficacy alongside personal capability to effect the change (Evans, 1996; Fullan & Miles, 1992) drive implementation of the SEMP. This is the context in which we have interpreted what 'action competence' (Jensen & Schnack, 2006) might look like for our students. Clearly, within the context of NSW DET schools, teachers need to be agents for both developing and implementing a SEMP plan and managing its flow-on effects of school gardens, habitat ponds, waste management mechanisms, resource use/minimisation plans and more. With the new subject in the fourth year of the BEd degree program, we were in a position to develop our students' action competence to develop and implement a school SEMP. Key to our imagining experiences for our students in the new subject, and foundational to our place-based perspectives, was our desire to enable our students to draw connections between activities within the subject and their lives outside of school, their developing teacher identities and the local (and wider) environments we inhabit and in which we work.

Methods

The research reported in this article is an interpretive study that reflects the process and outcomes of developing and implementing EDS as a culminating experience for fourth year students in the Bachelor of Primary Education (Primary) program at UOW. The research protocols were approved by the university's Human Research Ethics Board. As subject instructors, we were mindful that those students who volunteered to offer feedback on the subject would do so freely. They needed to feel safe that their comments would not jeopardise their standing. To protect their privacy, we employed a research assistant who gathered the names of the volunteers, conducted the interviews and transcribed the students' data.

Both of the instructors kept reflective journals through the early stages of subject development and throughout the term. As one of the assessment tasks for the subject, we asked our students to write a one-page response to weekly prompts. The resulting 'Thinking Books' (Malone, 2005) were a means for students to process their experiences as we introduced activities throughout the semester to explore, connect, elaborate, disrupt, and unsettle prior ways of thinking and being. The prompts for the thinking books are included here as Table 2.

Our constructivist perspectives as teachers led us to encourage this reflective writing by our students as a way to consolidate and reinforce lessons we were aiming to teach. Students who volunteered to be part of the research project ($n = 25$) allowed us to make copies of their thinking books and these became part of the data set. Some of the students ($n = 7$) also volunteered to participate in individual interviews conducted by a research assistant (who was not associated with the subject in any other way). Interviews were conducted near the end of the semester and were audio recorded. The interviews followed a semi-structured format, lasted about 30 minutes each, and were transcribed verbatim.

As instructors, the research protocols ensured that participating students' identities were protected until after all final marks were submitted. In this way, we aimed to minimise any possible bias from their responses on their assignments or their participation in the study. Data records for the study include student thinking books, interview recordings and transcripts, instructor planning documents, field notes and instructor reflective journals.

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TABLE 2: Weekly Thinking Book Prompts

Week	Thinking Book Prompt
1	Find a quiet place to sit in the BG. Sit, put your feet on the ground, listen, feel and smell the place. Consider how the place feeds your experience of it and reflect on this in your TB.
2	Considering your own ecological footprint, if there one thing you could change, what would it be? Think outside the box.
3	Pick one issue that Lisa raised and draw connections to your experience of doing the environmental audit.
4	What is different about the experience of these kids in Year 4 compared to your own experience in Year 4?
5	Look ahead to our learning garden: Create your own vision of a learning garden that is sustainable as a learning space.
6	Having listened to other tutorial groups' ideas, fears and suggestions, please talk about how you are feeling with the process (of the garden) so far.
7	How does making a garden, such as the one we are planning, link, for you, to a global environmental issue?
8	Are you feeling more comfortable about creating education for sustainability programs in your future school? Explain.
9	As you look forward to the EnviroFair, what big ideas do you want the kids to take away from your presentation?
10	Given that individual awareness of human environmental impact (e.g., personal, workplace, collectively as a society) is growing all the time, how do we as a society and individuals move toward ethical action?
11	Critics have argued that EnviroFairs are tokenistic. What is your reaction to this in relation to your presentation?

Note: BG = Wollongong Botanic Garden; TB = Thinking book

Analysis

We wanted to be open to our students' perspectives and experience of the new subject and we used a constant comparative method (Strauss & Corbin, 1998) as we combed through the data sets, first individually, then together. Scanning and rescanning the audio records from the interviews, written thinking book responses and our own reflective journal entries and planning documents, we sought themes that represented students' perspectives on their own learning, their experiences through the subject and how the subject design and implementation may have influenced these perspectives. Further, we sought to understand if the participating pre-service teachers had developed a sense of action competence (Jensen & Schnack, 2006) and if they felt more confident to begin their teaching careers as environmental educators.

Once all of the marks for the subject had been finalised, we listened to CD recordings of the interviews as we read through the thinking book responses. Most students wrote one or so pages on the weekly prompts. We scanned and rescanned the data sets to search for emerging themes (Erickson, 1986), and as a result, developed four themes through our analysis of the data corpus.

Results Discussion

This article presents four key themes that emerged from the data from this study. First, our students built connections between primary school education and issues in environmental education and sustainability. Second, activities designed for the subject enabled our students to embrace the concept of action competence (Jensen & Schnack, 2006). Third, individual thinking was challenged. Lastly, we describe some of our challenges in designing and implementing the subject.

Sustainability and Teaching in Primary Schools

Over the course of the subject, conversations between students and instructors provoked consideration of the position of university students as future teachers of primary students: 'My thoughts, before starting this course were that it wouldn't really be my responsibility to plan programs like this when I started teaching in schools' (Student 15, Week 8 Thinking Book). As reflected by this comment, students struggled with both the idea of sustainability education and its implementation in primary classrooms. Student 15 highlights a key topic of many conversations held by students in the subject as they rationalised the objectives and reasoning behind ESD. Most students found it hard to conceive not only why sustainability education should be a part of primary schools, but also how such a program could be implemented; in particular, considering the young ages of children in primary classrooms. This could reflect the KLA-heavy programming present in the tertiary sector, where the focus is on literacy and numeracy, and where the age of the children in the primary classrooms does not present itself as a barrier for the pre-service teachers, as they are expected to be able to teach children in years K-6, and have experienced this in their Professional Experience placements throughout the degree.

However, a shift in sceptical thinking became apparent after a visit from primary students and their teacher from a local primary school, as described by one pre-service teacher: 'Having the students come and explain their experience of building a garden was a great opportunity for me to understand how creating a garden with students can open many avenues for teaching about sustainability' (Student 21, Week 8 Thinking Book). This 'Guest Lecture' appeared to be a turning point for many students in the subject, as was evident in the positive conversations that followed the visit. Much of the talk surrounded the idea that after watching and listening as the children described their experiences, the pre-service teachers now had a positive, first-hand model to refer to when conceiving a similar project in their own classrooms.

In combination with the primary students' visit, there were many other opportunities to personally experience how to make links between issues of sustainability and teaching in primary schools. For many pre-service teachers in the cohort, it appeared that participating in practical and concrete learning experiences that could be used in the classroom helped to confirm that such teaching is plausible and enjoyable whilst being informative and valuable:

> *Through activities like the garden, the ecological footprint protocol and the university audits, I have been able to experience on a personal level the value for authentic hands-on learning experiences which provide a multitude of learning opportunities outside of the 'normal' classroom setting. (Student 20, Week 8 Thinking Book)*

Other students noted the importance of connecting theory and practice through first-hand experiences, such as developing a learning garden at the university: 'So we were doing the research for it and we were reading about it, and then we were actually being

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able to go out and do it' (Student 1, Interview). While the plans that were developed for the university learning garden were not actualised this term, they are being carried forward, where future pre-service teachers will work to enact the plans made by students in the first cohort. Direct experiences enabled the pre-service teachers to consider links between primary school teaching and sustainability education.

This was not without its challenges, as pre-service teachers are developing their identities as teachers while still located in the university as 'students'. As articulated by one of the subject instructors: 'Where is the line between thinking as a student and thinking as a teacher?' (W. Nielsen, Reflective Journal, March 12, 2010). This is an essential tension for pre-service teachers who move between personal locations as university students and a developing professional teacher as a teacher (Feiman-Nemser, 1990; Rodgers & Scott, 2008). We also want our pre-service teachers to contemplate from a school student's perspective how an activity may be perceived and what a student may believe to be interesting or beneficial. Activities such as the cohort's visit to the local Botanical Gardens for environmental education workshops was not only an enjoyable experience, but provided the opportunity to assess the lesson from the viewpoint of a school student. Transferring this knowledge to the EnviroFair, where pre-service teachers planned and delivered workshops for varying ages of primary school students, allowed the teacher education students to experience the content from a teacher's perspective. Through these experiences, consideration opened as to how other ESD activities, such as environmental audits, sustainable gardens and ecological footprints, could be activities for primary students in future classrooms.

Pre-service teachers in ESD believe that the ability to work in sustainability education, witness sustainable education in schools, participate in workshops and activities at a student level, and plan, implement and reflect through the eyes of a teacher made the innovative subject such an enjoyable, valuable and worthwhile part of the BEd program. Ultimately, the subject was able to identify the importance of sustainability and also convey how to teach it in the context of primary schools.

Developing Action Competence

One of the main goals that we shared as we embarked on this subject was to enable the students to appreciate and experience the concept of action competence. Linked to democratic, political education, 'action competence' is bound in critical theory (Morgensen & Schnack, 2009), which views environmental problems as societal issues involving conflicting interests. Through such a theoretical perspective, engaging with problems that are both environmental and societal during schooling aims to develop capacities and powers to 'question preconceived opinions, prejudices, and "given facts", [in order to] to participate in the shaping of one's own and joint living conditions' (Morgensen & Schnack, 2009, p. 60). Jensen (2002) argues that the key to action competence is the desire to find solutions to the problems at the personal and social levels. This means that the aim of environmental education at school is to facilitate the process, helping students to identify environmental and social problems, develop a vision for a better future, and generate the skills to bring the vision to fruition.

Despite the successes in developing methods to teach sustainability in primary school classrooms, by the end of the ESD subject students had mixed feelings about the subject overall. Feedback indicates that the course left some students feeling confused and without expert guidance, while others felt that they had flexibility and freedom to explore action competence (Jensen & Schnack, 2006). From the first week of the semester, students were engaged in a diverse range of activities aimed at developing their action competence in environmental education. Familiar with lecture-style and content-based subjects, some students struggled with the alternate structure for this

subject. They expressed feelings of confusion and a need for more theory or instructional support. Student 22 lamented: 'I think that maybe a few steps have been skipped and in the eagerness to get us doing practical tasks everything is being rushed and not thought out or explained properly'(Week 6, Thinking Book).

Rather than developing action competence through participating in problem-solving, some students seem to have expected that the lecturers would resolve all problems for them. Herein lies an essential tension between direct experience as a teaching and learning technique in university-based courses and its transferability to pedagogical approaches for teaching primary children. Pre-service teachers who expected or desired more certainty in terms of being told what to do were disappointed when the experiences offered were open-ended and student-directed.

By the end of the course other students reported feeling confident to take action in their future schools. They valued the opportunity to participate in practical activities and move beyond learning about environmental education theory, 'to go out and do our own things' (Student 9, Interview). Students who reported positive learning outcomes tended to link specific activities in the subject to implementation in a school; for example, a classroom waste management program, a vegetable garden, or man-made habitat. Considering the varied contexts of schools where these pre-service teachers will work, they need to move beyond the specific knowledge, skills and experiences to more general critical thinking required of an environmental educator.

An activity that offered a good balance of specific knowledge, skills and experiences with the chance for critical thinking was the environmental audit of the Faculty of Education. Groups of three pre-service teachers used workshop time to visit each room in the faculty to gather information for the audit, including how the occupant travelled to and from the university, managed climate control, electrical devices, waste and recycling, among others. Whole-group and tutorial group discussions synthesised this information to a 'State of the Faculty' report. Further, a group of about 10 pre-service teachers in the subject volunteered to prepare and synthesise this information for a report to the faculty that was delivered both to the whole group and the Dean of the Faculty, who had been invited to the presentation. A second version of the report was presented at the May 2010 Faculty Meeting. This group of 10 students became known as the 'Environmental Action Team' (EAT), which was an extra-curricular voluntary committee connected to the subject. A member of the EAT group, Student 4, talked about this experience during the interview:

> *I probably got the most out of the action team that came out of this subject, rather than the actual subject. And so, from that there were things like the organising committee … getting something off the ground to do with an environmental project.*

What became apparent was that part of the reason for the success of EAT was that the students involved were provided with the chance to share meetings with the lecturers and other equally motivated students. During these times they co-designed the strategies of the group, while getting immediate and relevant feedback from the lecturers. This is unlike the group work set during the lecture and tutorial time in the subject. During lecture or tutorial times, the students were left more to their own devices — in accordance with the paradigm framing the subject — but lacked the instant feedback from the lecturers.

Another key difference was that the members of the EAT shared a common vision, based on bringing about change at a faculty level. Further, they were provided a platform to share their vision with the gatekeepers of power within the faculty — members of the senior management team. By taking their findings to the members of the senior

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management team in the faculty, they were able to convert their ideas to action. We interpret this as an example of developed action competence, which was a highly empowering experience, not encountered by the rest of the cohort. For the majority of the cohort (those not in EAT), the planning books that they created for the learning garden were just that, planning books. At no stage did they see any of their ideas converted into action. This had a disempowering effect on some of the students.

Given the diversity of students, activities and organisational structures for the subject, it is perhaps not surprising that results in terms of developing action competence are mixed. While some students may not have fully engaged with the range of opportunities that were components of the subject design, clearly, others exceeded our most hopeful expectations.

Shifts or Challenges to Personal Thinking

Throughout the subject, there were a number of opportunities for student thinking to be challenged. Thinking books were used as an assessment task and a key opportunity for the students to document personal reflections in response to a topic question or prompt set each week. Further, in this introspective private forum, students could consolidate personal emotions and feelings towards stimuli raised throughout the seminars and class meetings. Some students within the cohort struggled with this style of assessment task: 'We didn't really feel like we were learning much of the topics as our Thinking Book seemed rather vague: We didn't really have much to put in them' (Student 8, Interview).

Individual authors did have freedom to respond to prompts in their own way. Students who saw the prompts as vague may have been challenged to think in abstract ways, ways with which they were uncomfortable. However, students who engaged with the prompts may have deepened their thinking, as exemplified by Student 10 during the interview: 'The Thinking Book caused me to constantly move beyond what I would just normally be thinking. It actually caused me to go to that next level and really analyse why I believe what I believe.' The method of engaging deeply and reflectively each week with the thinking book prompt and the surrounding, broader concepts of the subject was an important means for pre-service teachers to recognise and explore their own positions with regard to issues of environmental significance and environmental education.

Although divided on the format of assessment tasks (i.e., the highly personal and reflective format), the cohort as a whole was united in their views of this approach being effective in assisting individual articulation of personal teaching philosophies with particular regard to environmental education. The thinking books provided a chance to document the personal learning process while raising issues or responding to questions, concerns, aspirations and inspirations concerning environmental education. We imagine flow-on effects and positive implications for work with future primary students. Just as was the case for the pre-service teachers' use of thinking books, primary students can also use thinking books to document their developing knowledge of, and attitudes towards, environmental education and matters of global significance within the curriculum areas of Human Society and Its Environment and Science & Technology.

Challenges With the Subject Design

There were a number of challenges to the subject design and we describe some of them here, not so much to warn against pitfalls or to suggest what ought not be done; rather, we offer consideration of our local context that was under constant negotiation. This will also be the case for others who may seek such a complex undertaking, and we encourage the attempt. We focus discussion here on garden planning as this was a key component to the subject that presented a range of challenges.

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Planning a learning garden (Gaylie, 2009) on the grounds of the university was an ambitious project. Over the semester, we had developed a number of skills in planting techniques, habitat gardens and composting. Even though discussion with the university authorities began many months before the subject started, it was not until after the subject had finished that a space was designated for the learning garden. Even with the uncertainty of having an actual space for a learning garden, we engaged the pre-service teachers in a planning exercise around the idea of a learning garden. This was a new concept for many, and some students felt challenged by the limited time available: 'I feel one semester is not long enough to enable pre-service teachers to acquire the knowledge to be able to plan such a garden, let alone establish and maintain it' (Student 11, Week 6 Thinking Book). While as instructors we wanted open engagement and learning-through-doing, some of our pre-service teachers were focused on their role as university students, rather than imagining the potential of a learning garden:

> *It takes a lot of time, and that is where people didn't want to put that extra time in because it didn't count for anything.... I think the garden could be made to count for something, but I think it's kind of nicer that it's just kind of a free thing that they can think about. (Student 6, Interview)*

It is fair to say that, as with many of the other activities in the subject, those who most fully engaged with the activities learned the most and began to see the potential for their own classrooms: 'I'm going to be a role model in my class. I've got to make the effort to do that, to make changes myself if I'm going to expect my students to contemplate those sorts of things' (Student 9, Interview).

For the garden planning exercise, we broke the larger group into smaller theme-based groups of 8–12 people, so that the pre-service teachers could focus on an area of interest to them, which also gave us an opportunity to break our large group into more manageable-sized groupings. But, by doing this, we were opening up the possibility of our students feeling a lack of guidance for their group's activity. This was compounded by the lack of a confirmed space for the garden. We had expected that, given open-ended time to explore the area of interest, our students would take the opportunity to direct the learning in their planning groups and consider their future positions as teachers in classrooms who may very well be tasked to develop a learning garden. As with other activities in the subject, we saw the learning garden exercise as a chance to cross several borders in the teacher education program: move the students out of a traditional teaching/lecture model, experience learning activity directly, enable some choice over how the learning would proceed, engage groups of students in collective learning activity, and develop plans for a learning garden that could be implemented by the next cohort of students in the subject.

As with most teaching and learning encounters, good intentions and careful plans by the instructors are taken up in a myriad of ways by the learners. In this case, the learners were fourth year pre-service teacher education students, who were asked to think differently about themselves as students and teachers. This is a challenge that is well documented in teacher education research (Feiman-Nemser & Buchmann, 1986; Leggo, 1997; MacGillivray, 2002; Wideen, Mayer-Smith & Moon, 1998).

Conclusion and Future Directions

The course offered students a real opportunity to develop critical problem-solving and project management skills through engagement and self-reflection on the varied activities throughout the semester. The different format of this course posed significant challenges for students unprepared for the openness of the learning environment. Given

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that students were in their fourth year of study it may be appropriate to scaffold similar but more structured opportunities earlier in the degree program so as to more positively foster the learning potential of this fourth year BEd subject. We are hopeful in speculating about the level of expertise in sustainability education that the members of the EAT and other like-minded students could have reached by the end of their four-year degree if offered further opportunities to develop their skills through other subjects.

In this article, we have shared our experiences and perspectives on the design and implementation of a new subject in the teacher education program at the University of Wollongong. As instructors, we intended the subject to be engaging, thought-provoking and relevant for our teachers, who would soon teach children in their own classrooms. We designed hands-on, place-based experiences for our students to design a learning garden, conduct an environmental audit of the faculty, develop a family environmental protocol, run an Environmental Fair for 650 local primary students, and reflect weekly on their own learning as part of these experiences over the semester. While the experiences of the pre-service teachers presented here offer a glimpse of their ability to link environmental education and primary school classrooms and the possibility they developed action competence or experienced shifts in their thinking, the real result of our efforts will be when these students move out into their own classrooms where they will be free to put these new perspectives and knowledge into practice. On an even more abstract level, with knowledge and skills in hand, these teachers will now influence experiences and perspectives of their own students (and the students' families) each year.

As with any new subject, future iterations will undergo shifts as resource availability, faculty commitment and new initiatives come into focus. Discussions are currently underway to increase the time the pre-service teachers spend with primary children as part of their work in the subject. Further, we want to develop the Family Protocol as a means for individuals to continue to monitor their own (and their families') environmental impact. Key outcomes from the first year included greater awareness of wasted water and electricity, but also modes of transport and food choices. Continuing to raise awareness of personal impacts will likely be considered alongside a wider perspective of global issues of sustainability and social justice in future iterations of the subject. As our Western, resource-based economy continues to struggle with its legacy of overuse, exploitation and waste, our responsibilities as educators become clear, and developing our personal consciousness through subjects in a teacher education program is a key component to future sustainability.

The Final Word

> *Through programs such as this one, we are learning the skills we will need to take into schools to make this possibility a reality. Through education and real experiences, the children we are teaching will grow to become conscientious users of resources and environmentally aware. (Student 15, Week 7 Thinking Book)*

We are encouraged as instructors when our students voice such thoughtful comments. Our aim as instructors in this subject persists: to prepare the next generation of teachers to teach environmental education and sustainability at the interdisciplinary core of all other school subjects from a base in critical, place-based pedagogy. The challenge remains to foster in our students the ability to view the world through critical lenses — the hallmark of action competence — so that they too will be able to assist their own future students. We feel that by approaching *Education for Sustainable Development* with our experiential, place-based focus, we have opened a space where our students can consider themselves as part of the bigger picture — 'cosmopolitical citizens'

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(Larsson, Andersson, & Osbeck, 2010), colleagues and educators concerned about and for quality environmental education.

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Note

[1] In 2011, the NSW Department of Education and Training [DET] was renamed the Department of Education and Communities [DEC]. While some websites and documents have been renamed to reflect this change, ones referred to in this article have not, so the 'old' name remains in our references to the documents.

Keywords: pre-service teacher education, environmental education, action competence

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Peter Andersen is a lecturer in Sustainability Education at the University of Wollongong. His major research interests lie in how to empower children to become intergenerational environmental change agents in their schools, communities and family homes, and how to prepare pre-service primary teachers for sustainability education leadership roles in their future classrooms.

Amy Hurley, Vanessa Sabljak, Amy-Lee Petereit and Vanessa Hoskin were fourth year students in the Bachelor of Primary Education degree at the University of Wollongong. They were members of the Faculty of Education's Environmental Action Team, and were particularly interested in developing their skills as leaders of sustainability education, empowering their students to take action on important global environmental issues.

Garry Hoban is the Science Education Coordinator in the Faculty of Education at the University of Wollongong. He has a strong interest in technology-enhanced learning focusing on student-created digital media. He is the creator of 'Slowmation' (abbreviated from 'Slow Animation'), which is a simplified way for school and university students to create a narrated stop-motion animation to explain a concept or tell a story and can be used in environmental education. His website www.slowmation.com has had over 12 million hits from users in over 100 countries in the last 2 years.

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