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# Telling Reflections: Teaching Sustainably in a Complex Learning Environment

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**Abstract** This article examines learning design in a postgraduate preservice teacher setting. The overarching aim was to embed environmentally responsive approaches throughout two companion units for diverse student cohorts. This article reports on a teacher educator self-study in a regional university with extensive online delivery for large units (300–800 students) in a 1-year course. The author examines how assessment tasks in literacy- and numeracy-oriented units are designed to meaningfully integrate environmental sustainability using contextual cues, collaborative learning, complex tasks, and reflexivity. The author argues for the use of these four key guidelines of environmentally responsive pedagogies alongside environmental education programs to emphasise messages of sustainability even in units that are not traditionally environmentally oriented. Challenges include problematising the nature of effective teaching and dealing with the complexities of purposeful learning. Innovative unit learning design alone, however, is inadequate if the surrounding systems are fragmented and seen as separate to learning about sustainability.

The purpose of this article is to argue that effective learning design — in any context — attends integrally to four key guidelines: contextual development, purposeful collaboration, foregrounding complexity, and reflexive practice. These guidelines should underpin *all* learning and teaching in order that environmental sustainability messages are conveyed through the learning processes and experiences of students as well as the content.

Community-based, 'grass-roots' environmental education (EE) programs exhibit these four characteristics, but I argue in this self-study that EE should not be the only programs where contextualisation, collaboration, complexity, and reflexivity are applied.

If teacher educators widely account for these four characteristics of effective learning design, there is a greater likelihood that deep learning — even in areas not traditionally associated with EE — will be underpinned by messages of environmental stewardship. Further, if preservice teachers apply these four guidelines to learning design for *their*

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students, they are likely to be better equipped citizens of the 21st century and its largely unanticipated challenges.

## Methodology

The self-study methodology (LaBoskey, 2004) was invoked for this research because both self-study and the approach to learning in this paper are self-initiated, improvement-aimed, interactive, and qualitative. Self-initiation in this study was prompted by the desire to improve learning for preservice teachers within large units. However, with limited teaching resources, making improvements required reframed thinking. The collaborative and interaction component of self-study was integral in reframing our thinking.

Collaboration and interaction were most pronounced within literature from EE, teacher education, these two areas combined, and, above all, between lecturers within the units. The validity of self-study is its coherence between examples in teacher education and EE, sharing within professional fields, and testing and retesting (LaBoskey, 2014) the ideas among teachers and teacher educators (as reported in this article).

## The Complex Learning Environment

The Graduate Diploma in Teaching and Learning (GDTL) is a mature, 1-year, full-time course in the School of Education at the end of its life cycle. The highly diverse cohort comprises students who: bring the full range of previous degrees; live mostly in Australia; are about 85% external enrollees; fulfill professional placements in the entire range of schooling levels and environments; and juggle home, family, work, leisure, work-integrated learning, and study.

This is the seventh year my colleague and I have taught in two large, companion units entitled 'Teaching the Curriculum/Integrating Literacy' and 'Teaching the Curriculum/Integrating Numeracy'. These units carry a wide-ranging brief that normally would be spread across various disciplines and topics, such as sociology, educational policy, social inequalities, and history of education. These units also address reflective practice, information and communication technologies (ICT) in education, philosophy of education, professional literacies, and problem-based learning.

Two to four staff assigned to these complex, multidimensional units are interacting with each other daily about learning approaches, responding consistently to student needs, unit and assessment redesign, and ongoing moderation. I found this collaborative learning one of the most satisfying aspects of working on these units.

Marker resilience in these large, under-resourced units is aided by the varied responses to the assignments, enabled by a problem-based task — foregrounding context — with the result that collaboration among students is widespread but plagiarism is difficult to execute. Importantly, students 'exit the unit with a reasonable understanding of relevant curriculum and applicable literacy [and numeracy] teaching principles as these relate to their own particularised teaching contexts' (McDowell, 2013, p. 236).

These achievements, given the challenging context, can be attributed to applying the same guidelines of effective learning and teaching as we are espousing for our students: contextualise learning; collaborate purposefully; embrace complexity; and, engage in a continuous reflexive process.

## Assessment and Learning Design for Environmentally Responsive Pedagogies

The design of assessment tasks and learning activities used in our teacher education units not only underpins good learning practice, but it also underpins the concept of

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environmental sustainability. The familiar term 'environmental education' (EE) is used throughout the article to refer to programs and projects that seek to increase awareness about and change behaviours toward the environment. EE generally is community-informed and action-oriented (Ferreira, Ryan, Davis, Cavanagh, & Thomas, 2009).

Davis, Sumara, and Luce-Kapler (2015) use Systemic Sustainability Education (SSE) to denote the very recent shift informing education discourse about the interrelationships between all 'levels of the subpersonal through the supercultural' and reminding humans that they are embodied beings (pp. 172–173). SSE highlights the systems emphases of current research (Buchanan, 2012; Ferreira et al., 2009; Ferreira, Ryan & Tilbury, 2014; Sterling, 2012) and my own. SSE refers to the current move away in formal education from the mechanical worldview to one that draws on more 'holistic, contingent, and exploratory ways of thinking' (Davis et al., 2015, p. 173). Unlike a mechanical worldview, SSE foregrounds complexity and the health of surrounding systems. It is through this multifocal lens that educators must perceive learning and teaching in order to bring about more environmentally responsive pedagogies.

This article illustrates how four areas — context, collaboration, complexity, and reflexivity — are pedagogically congruent with the broad characteristics of EE programs. Context must be accounted for in learning and teaching; collaboration (e.g., interaction, collegiality) is the dynamic of 'learning is becoming' (Davis et al., 2015, p. 207); complexity and transdisciplinarity are essential for dealing with uncertainty and change (Morin, 1999); and reflexivity is more about the learning process than content — all strongly applicable to successful EE programs as well as learning design in our units.

It became apparent during my reflexive self-study that good pedagogical practice in all learning and teaching attends to context, first and foremost. Context (e.g., location and place) is the starting point for all EE projects: awareness of the importance of context is developed throughout these GDTL units. Collaboration is central in these GDTL units because students have a compelling reason to communicate with each other around completion of the problem-based assessment tasks.

Complexity, fluidity and uncertainty are central in EE programs (Sterling, 2012, p. 36); we have made them central in our units by focusing on complex and dynamic assessment tasks and learning activities where disruptions to thinking are likely to surface. Reflexivity is built into assessment and learning design in our units because process is emphasised over product. The reflective process is also highly valued in EE programs through critical enquiry, action learning cycles, and evaluation (Ferreira et al., 2009).

These four guidelines are essential elements of environmentally responsive pedagogies. I argue that they must be integral to all learning and teaching design so that messages for environmental sustainability are more likely to be underpinned by notions of democracy, humanism, responsible citizenship, and collective action, rather than notions of a mechanistic world view dominating educational systems, such as competition, compartmentalisation, control, and measurement (Bamford, 1999). 'The changes in attitudes, values and behaviour inherent in environmental programs are difficult to reconcile with traditional assessment methods' (Hunt, as cited in Bamford, 1999, p. 164).

## Making Context Central in Learning

A specific location and place are prerequisites for any EE learning experience. EE programs are characterised by holistic thinking about how the localised environment is affected by the surrounding environments; 'Contextual issues are the key driver for

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Education for Sustainable Development' (Sterling, 2012, p. 14). In addition to location and place, other contextual aspects can be students' preoccupations, community needs and events, school leadership, and curriculum priorities.

Contextualisation is one of the key alignments between effective learning and teaching and EE. In the units I am involved in, context is foregrounded in the learning process. For example, students are asked to 'design a numerate learning experience for a class of students (real or hypothetical) in a familiar educational jurisdiction' (assignment task). Student discussion is stimulated about what aspects of context 'count' in their particularised teaching situations. The extent to which students develop their specific context deeply influences the effectiveness of the learning experience they design for their students. In discussions, the centrality of context, community and place highlights grass-roots learning activities either in the environmental area or in equally important areas that demand change in the community — local or global.

The audience for the assignment tasks in our units is not assumed to be just the university marker. Students work within expansive problem parameters to target a defined (but potentially broad) audience (e.g., professional colleagues). The prerogative to contextualise the audience adds dimensions and purpose to the assignment responses immediately applicable to students' current professional experience context. Students' choices of audience and purpose also have a significant bearing on what genre (e.g., narrative, functional text) they choose to present, rather than defaulting to the standard essay.

In general, curriculum (both preservice teacher and school education) is not contextualised. We emphasise contextualising learning and recontextualising the curriculum. Recontextualisation of the curriculum requires knowing the students, the school, the community (local and global), and the self in order to design effective learning experiences — possibly in response to environmental needs, possibly in response to another compelling need. Students' work with the curriculum takes into account 'community diversity', 'how literacies/numeracies play out in the local context', and 'the diversity, complexity, and contestation that's present' (excerpts from assignment tasks).

Often our students encounter perspectives that can be challenging and they begin to understand that *their* students' perspectives give insight into shared contexts and learning experiences. This is when preservice teachers' effective learning design takes a leap forward and they feel the burden of responsibility to recontextualise their curriculum — from their students' perspectives.

Language used in assignment tasks is deliberately open to interpretation in order to cater to the wide variety of contexts of our students. In addition, language 'frames current possibilities' and gives 'insights into why certain practices and beliefs are so resistant to change' (Davis et al., 2015, p. 5). Language use is foregrounded to *our* students by foregrounding the language use of *their* students. (The assignment task demands attending to 'student-student interaction'.)

In some of our assignment tasks, explicit environmental contexts have been suggested, such as the theme of 'Water!' from the Commonwealth's National Literacy and Numeracy Week. One year we developed the scenario, '… your principal has asked you — a preservice teacher with fresh ideas — to design a learning experience to use allocated funding before the end of the UN Decade of Education for Sustainable Development …'. These broader, global contexts lead to discussions about other more localised environmental contexts that students can draw upon for their learning experience designs.

Local and national policy is an important contextual aspect. In their assignments, students 'consult, incorporate, and reference relevant policy and curriculum' in a 'school setting chosen by [the student]'. In our learning activities and assessment tasks, we

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invite critique of current systemic policy frameworks that influence educational practice in schools and encourage critical analysis of the Australian Curriculum documents, for instance. Policy is essential in community-based EE as well to determine what changes for sustainability are necessary, possible, or prohibited at a local site.

In spite of a strong imperative to contextualise learning in teacher education, it is much more common in my experience to see assessment tasks and learning activities that are not premised on strong contextual development. Tuning students in to their context through their assignment tasks results in more effective learning design. It presents the very real possibility of creating learning experiences where students are more likely to act on environmental needs and other social and political needs in their communities.

## Making Collaboration Central in Learning

Other learning design features — closely tied to context — that mirror characteristics of EE programs are collegial interaction and collaboration (Sterling, 2012).

In EE programs there is a strong emphasis on participatory grass-roots action and collective ownership of a problem (Ferreira et al., 2009). It is usually the community members who see an environmental need and form a plan of action. The 'buy-in' by individuals into a collective allows a big job to be accomplished and many more ideas to be generated. Henderson and Tilbury (2004) state that, 'Partnerships can assist in maintaining momentum, sharing responsibilities and spreading achievements and knowledge. They are also congruent with the concept of [education for sustainability] .... Many consider partnership building as a critical success component of whole-school sustainability approaches' (p. 22).

From the context of embedding environmental sustainability in teacher education, Ferreira et al. (2014) support this systems view. The principles of education for environmental sustainability call for collaboration — as well as other key elements — in order to redefine relationships among various stakeholders.

However, we work in a global educational environment that is experiencing major political shifts — for example, in literacy and numeracy testing for preservice teachers. Political and social responses to the dilemmas of schooling are not necessarily based on solid academic studies, deep reflexive practices, or genuine transdisciplinary collaboration. We allow other institutions to dictate the approach we take when research shows it is not how students best learn. We allow ourselves to work in isolation when collaboration is more productive, satisfying, and reflects a more accurate world view and a more accurate view of what learning is.

Learning design in these higher education GDTL units emphasises collegial interaction: learning activities state explicitly that 'working with other people is a way to manage the task'. Students are positioned as experts in their context through wording such as, 'imagine you are writing for your professional colleagues', 'online peers and critical friends', 'collegial learning is encouraged in line with professional practice', and 'student-to-student communication predominates' (excerpts from unit documents). Collegiality is demonstrated by some students sharing their assignments (whole or in part) for peer comment and reflection.

Discussions within complex learning environments, such as the one in which I work, are illustrative of a '... smart collective ... a decentralised structure in which individual participants could represent their own interpretations and concerns ... [which] bump into the articulations of others, [and] points of convergence and divergence begin to be revealed' (Davis, Sumara, & Luce-Kapler, 2008, p. 199). Jardine (2012) writes that you 'cannot practice this knowledge by yourself and alone and only within the confines

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of the devices you have already mastered because this is not how this knowledge is held in the world' (p. 126). These authors are all researching the importance of genuine collaboration and collective action within education for environmental sustainability in combination with teacher education.

The language we use in designing assessment tasks and learning activities invites discussion, helping participants articulate meaningful interpretations within a professional context. Deliberate word choice in assignment tasks helps expand opportunities for connections between the readings, students' contexts, professional literacies, and learning complexities.

The type of talk that allows this complexity to emerge is described by Mercer (1995) and Barnes (1971) as exploratory talk. Exploratory talk allows students to:

> *explore meaning and try out new ways of understanding and to modify existing ideas. . . . It is hesitant and incomplete because it involves experimentation with new ideas. . . . Talk play[s] a central role in learning by enabling students to . . . [talk] their way into meaning. (Edwards-Groves, Anstey, & Bull, 2014, p. 5)*

In these GDTL units, most 'talk' occurs in an online, asynchronous environment, but the Learning Management System is linear and hierarchical — not conducive to complex trains of thought in environmental sustainability. These are formidable barriers to learning collaboratively and learning to embrace complexity. Possible solutions are contextual and emergent.

## Making Complexity and Transdisciplinarity Central in Learning

EE programs are transdisciplinary (Henderson & Tilbury, 2004; Sterling, 2012). For example, they must draw on: biology and ecology for the flora and fauna interrelationships they affect; historical, sociological and political aspects relating to land use and community needs; mathematics in the logistics employed; and literacy and language for communicating. Environmental sustainability 'should be central to all of the doings of a school' (Buchanan, 2012, p. 110).

Morin (1999), however, says that teacher education neglects teaching the complexity of the human condition, including its relationship to the earth: 'Humans are physical, biological, psychological, cultural, social, historical beings. This complex unity of human nature has been so thoroughly disintegrated by education divided into disciplines, that we can no longer learn what human being means' (p. 2).

Bamford (1999) is also explicit regarding the relationship between humans and the physical environment. He asserts that this relationship should be the basis for holistic curriculum in order to examine complex differences (such as power relationships) to improve the ways all creatures live in the world. As soon as teachers focus on the processes of learning, resist the simplistic, mechanical world view predominating in education, and draw heavily on the transdisciplinary and diverse community contexts, teachers 'move into realms that are counter to existing dominant values' (p. 170). EE programs work within these realms constantly: I argue that educators must move in these realms as well to bring about change in environmentally sustainable behaviours through environmentally responsive pedagogies such as I illustrate in this article.

In our units, students who hold a degree in Visual Arts, for example, might not see the importance of literacy and numeracy in their discipline. Part of the students' contexts they develop in their assignments is their previous expertise: once they recognise that literacy and numeracy are embedded within their learning area, a more complex picture emerges of context, transdisciplinarity, the need for collaboration, and reflection on professional literacies and numeracies.

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Despite the welcome inclusion of Sustainability as a cross-curriculum priority in the Australian Curriculum since its 2014 national implementation, the content and skills that *could* be part of environmental sustainability are 'unconvincingly represented', 'oblique' and 'fall short of the promise' of policy documents that do indeed represent the desirability of the pervasiveness of Sustainability in the curriculum (Kennelly, Taylor, & Serow, 2011, p. 211). Neither does the Australian Curriculum use language foregrounding responsiveness or proactivity to community needs.

The disciplinary structure (and the increasing emphasis on content) of school and teacher education curriculum is problematic when trying to progress a more environmentally sustainable world view that is more process-oriented. *The Review of the Australian Curriculum — Final Report* (Donnelly & Wiltshire, 2014) provides further cause for concern as it questions the viability of even the current, embedded and superficial treatment of environmental sustainability.

In our units, we recognise diversity and complexity of context through problem-based dilemmas. For example, students are invited to 'document, analyse, consolidate and redirect the learning' (assignment task excerpt) they are acquiring while working through the learning materials, emphasising the iterative process-orientation of learning. Complexity is further encountered in the assignment request for 'a surprising idea or unanswered question' that is likely to highlight tensions or inconsistencies in the preservice teacher's context. Focusing specifically on 'disequilibrium' prompts reflection and is more likely to 'interrupt entrenched patterns' (Davis et al., 2008, pp. 108–109) and promote 'effortful study' and learning (Davis & Sumara, 2012, p. 33). Schultz et al. (2013) also state that '… uncertainty, surprise, and change' (p. 14) are critical in dealing with global change. Teachers '… legitimate dominant cultural values' and 'need to escape their own enculturation' if they are to genuinely address environmental concerns (Bamford, 1999, p. 171).

Systemic thinking, one of the characteristics for EE programs to be successful in teacher education courses (Ferreira et al., 2009), is necessarily transdisciplinary: literacy and numeracy learning in our units is also transdisciplinary. Buchanan (2012) notes that the inclusion of sustainability education in curriculum learning areas tended to be 'incidental, sporadic and tangential' (p. 114); 'Some subjects … are relatively artificial sites for inclusion of Sustainability Education' (p. 111).

This is all the more reason to promote environmentally responsive pedagogies so the 'non-verbal' language of higher education courses is emphasising the contextualised, the complex, the collaborative, and the reflexive.

## Making Reflexivity Central in Learning

We have incorporated many reflexive characteristics into our assessment and learning design. First, assignments are linked explicitly in order to emphasise the reflective process. As mentioned, the first assignment requests a 'surprising idea or unanswered question' to pursue in Assignment 2: the second assignment asks preservice teachers to reflect on the learning activity developed in Assignment 1 and to improve the experience for their school students.

Second, the assignments invite students to reflect on their own professional literacies and numeracies. Preservice teachers in this intensive 1-year course have come from a variety of backgrounds and they find it a sobering thought that all teachers need to understand the developmental continuum in numeracy, for instance, or have a working knowledge of the English parts of speech. They may have some gaps in their knowing of these General Capabilities and reflect on the need for some professional development in these areas. In addition, it is cause for reflection for teachers and teacher educators

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when Goodrum, Hackling, and Rennie state that 'significant numbers of K-6 teachers are science-phobic' (as cited in Buchanan, 2012, p. 111) because most of the curriculum elaborations for Sustainability are found in the Science Learning Area.

The third reflexive characteristic of our units is the emphasis on the dynamic process of learning over time — not just for preservice teachers but for their students as well. Some of our assignments have invited narratives of how the preservice teacher has come to new realisations over the semester. Narrative allows the writer to explore aspects of their learning while they move forward or back in time and back and forth in space or place. Focus shifts inward (e.g., feelings) and outward (context) to narrate reflections on professional learning (Clandinin & Connelly, 2000). All of our assignments emphasise the problematic, iterative, and dynamic aspects of learning, as does EE.

We explicitly emphasise the learning process over content knowledge. 'Learning and teaching are recursively elaborative processes of opening up new spaces of possibility by exploring current spaces' (Davis et al., 2008, p. 225). We have made space for creativity by resisting requests for an exemplar of a 'good' assignment. Jardine (2012) says that the demand to be told is how truths remain hidden. Over time, students become more experienced in the process of learning and more comfortable being 'left in peace' (Jardine, 2012) to let this process unfold again and again. This space, however, is anything but peaceful, especially when the learner is grappling with contested views in their context and complex ideas such as what learning and teaching is and what environmental sustainability means in their contexts.

A critical component of the assignment task design is to include 'student-student interactions'. This has been difficult for students to conceive, not least because the IRE (teacher *i*nitiation-student *r*esponse-teacher *e*valuation) sequencing is still the status quo in most classrooms (Edwards-Groves et al., 2014). Many students interpreted 'student-student' as simply IRE. Those who responded to the assignment task with actual student-student talk realised that these interactions (real or imagined) were powerful reflective stimuli and compelling evidence of learning in context.

Self-reflection, reflexivity, and critical evaluation are listed as dispositions of the 'sustainability literate graduate' because of the contentious and complex nature of sustainability issues (Sterling, 2012, p. 21).

## Linking All Learning to Environmentally Responsive Teaching

Over time, I saw parallels between the learning approach my colleague and I are implementing in our units and similar approaches in EE programs and policies. Innovative unit learning design alone, however, is inadequate if the surrounding systems are fragmented and seen as separate to learning about environmental sustainability.

Our pedagogical approach closely aligns with characteristics of approaches to EE programs. By applying learning and teaching approaches such as ours, we are enabling deep learning in all Learning Areas of the curriculum, including environmental sustainability. Through contextualised and complex assessment problems, disruptions to thinking are likely to surface and injustices are likely to be confronted. Theory and practice converge in our units through requesting learning design in context: theory and practice converge necessarily in EE projects (Sterling, 2012, p. 31).

In general, 'sustainability education prepares people to cope with, manage and shape social, economic and ecological conditions characterised by change, uncertainty, risk and complexity' (Sterling, 2012, p. 9). Unfortunately, modern curricula and teaching practices seem to be aiming in another direction (Davis et al., 2008, p. 224).

Moekle (2012) writes in the context of teaching composition to undergraduates 'to explore matters of sustainability using the lens of rhetoric' (p. 77). This is particularly

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relevant to this article and the literacy (and numeracy) learning emphases of our units. Moekle explicitly connects the importance of genuine communication through literacy and the guidelines for environmentally responsive pedagogies as explored in this article. She states that:

> *… rhetoric and composition [are] valuable precisely because the many challenges of sustainability will be solved not only through science and policy, but through writing studies that focus on communicative acts among various audiences.… and to navigate the complexities of a planet on edge. (Moekle, 2012, p. 83)*

## Conclusion

We have designed our assessment tasks and learning activities to afford deep and critical learning processes in literacy, numeracy, and curriculum implementation for preservice teachers. The pedagogical approaches used in designing these units reflect characteristics of environmentally responsive approaches used in EE programs. That is, purposeful learning is context-dependent; fragmentary disciplines are incapable of helping us towards deep and interrelated knowing about the biosphere; complexity and uncertainty must be accounted for in all learning and teaching (Jardine, 2012; Morin, 1999). 'Compartmentalisation of subjects and students is accepted as the norm … but is the antithesis of an environmentally responsive pedagogy' (Bowers and Flinders, as cited in Bamford, 1999, p. 162).

The nonverbal language of learning design in these literacy and numeracy units is congruent with the messages of environmentally responsible behaviour and situating humans in the world — their common context — not apart from it. Overall, learning about sustainability is 'about the kinds of education, teaching and learning that appear to be required if we are concerned about ensuring social, economic and ecological well-being, now and into the future' (Sterling, 2012, p. 8). Morin (1999) puts this another way:

> *The difficulty of knowing our World is aggravated by our mode of thought which has atrophied instead of developing the aptitude to contextualize and globalize, whereas in this planetary era we must conceive its globality, the whole-part relation, the multidimensionality, the complexity. (p. 31)*

The 'verbal' content of environmentally sustainable knowledge (e.g., spatial scales, probability) must be congruent with the nonverbal aspects of learning and teaching (such as genuine collaboration, iterative approaches). In the context that I am reporting on, the parallel could be that the verbal content of literacy (e.g., spelling) and numeracy (e.g., patterns) must be pedagogically congruent with purposeful collaboration and reflective cycles, for example, in order for processes underpinning environmental sustainability to be applied effectively.

While the content that is included in EE for sustainability is clearly important, so too is the process by which that content is conveyed to learners. 'A most important component of the pedagogy associated with Education for Sustainability/Education for Sustainable Development is the process by which learners experience the material and values' (Thomas, 2014, p. 1705) of EE.

In order for behavioural changes enabling environmental stewardship to take hold for the long term, all teachers need to apply environmentally responsive pedagogical approaches akin to the approaches we have applied. All learning must be designed so that contextual elements are foregrounded, collaboration is purposeful, complexity is embraced and reflexivity is integral to learning experiences.

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Debbie Prescott teaches literacy and numeracy curriculum, communication, and research units for pre-service teachers. Throughout her life she has participated in environmental activism, travelled throughout South Pacific and Asian nations, taught English as an Additional Language and Dialect and received science and teaching degrees. These experiences combined to reinforce thinking towards embedding environmentally responsive pedagogies across the curriculum.

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