Intergenerational Education for Adolescents towards Liveable Futures

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By

Kathryn Paige, David Lloyd
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ACKNOWLEDGEMENTS

The initial suggestion that David, Richard and Kathy had a book to write about their eco-justice passion was raised by Professor Robert Hattam over five years ago. To get it to fruition has been an amazing journey of tenacity, collegiality, friendship, and intellectual rigor over a long period of time.

Whilst it was a joint project for the three of us we also had invaluable support from colleagues, family and friends.

We gratefully acknowledge the following:

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All our co-learners who taught us over many years much of what we know, including what we know about what we believe and want to do;

Our other fellow Earth-citizens, that is, "other" species - and Earth structures - which succour us all in body, mind and spirit.

NOTE ON BOOK COVER AND CHAPTER PRIMARY IMAGES

We have chosen to use images that relate to a reader's journey through the book. Sometimes an image makes direct reference to a chapter's contents; at other times images highlight one or more of our shared values, ones which readers will encounter as they make the journey.

Our book references the notion of 'place'. It discusses educators' places as guides for their co-learners and themselves as they embark on the many exciting experiences that education for sustainability —what we have called 'liveable futures'—makes available. It also encourages all the co-learners—students, teachers and the local community—towards getting to know the nature of their places, and acting to enhance eco-social equity for all the Earth-citizens there, and beyond.

Several images on the dust-jacket and within the book, are emblematic of our place, and some of the values we hold and support in what we have written.

Dust-jacket: the illustration is of a real-life pink gum, one of the several hundred eucalypt species endemic to Australia. Growing in a mutualistic relationship with the tree, on its extensive root system, is a fungal mycelium; together they constitute a cooperative system that can extend much beyond the tree and, in fact, forms communicative relationships with other trees. In nature, the mycelium can extend over areas of square kilometres, including many trees in its network.

We hope that readers and their co-learners can extend their connections with each other, and many other Earth-citizens, in reflecting on and following the suggestions we make about improving educational and action experience towards more liveable futures. The illustration reminds us of: Interconnecting and Mutual Support.

In opening our book, the reader enters the pink gum canopy as they begin their journey, we hope one of interest and professional enhancement.

Chapter 1: Gum trees offer several possible homes for a variety of animals. The infrastructure they provide is well used by many different bird species. Some take much time and show incredible no-hands construction skills. Their nests, the site of some equally intricate rearing techniques, we see as highlighting sustainability values of: Nurturing and Appropriate Technology.

Chapter 2: Little Corellas utilise the relatively-safe-from-predators space in a eucalypt canopy to groom each other and consolidate bonds of connection and protection, seen especially when they mass into flocks of hundreds. In this they seem, to us, to speak of: Co-operation, Communal Care and Behavioural Adaptation.

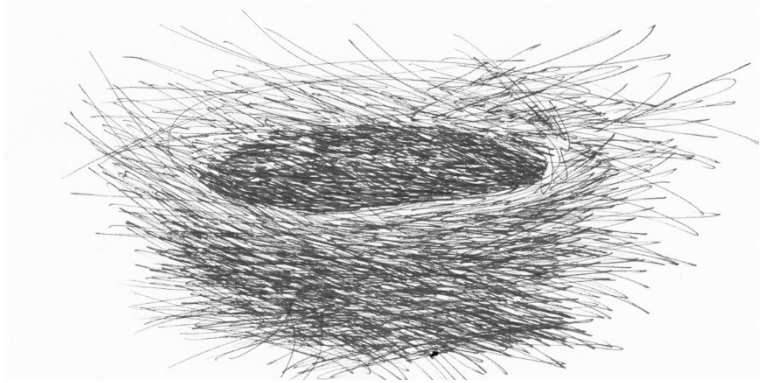
Chapter 3: Feathers are an astounding structural adaptation. At a macro-scale, they assist birds in their "colonizing" the air to an extent no other vertebrates have attained; at smaller scales of observation, feathers contribute to the colouration and courtship that ensures their successful pairing and reproduction, and to the visual jewels that humans delight in. At smaller scales, the architecture and structural strength of bird feathers assist the animals in flight and temperature regulation. This array of attributes leads us to think about the importance of: Structural Adaptation and Appropriate Design.

Chapter 4: The image is of a very successful community garden, one which promotes practical social intercourse between people of several generations, in the promotion of self-care through physical activity and food growing. It is a cultural/behavioural adaptation that one might hopefully expect would emerge in a well-researched futures scenario, an on-ground example of: Future-proofing Recreation and, in the human-sphere, all the Co-operative and Nurturing Behavioural Adaptation mentioned above, and Inter-generational and Intra-generational Eco-social Equity.

Chapter 5: The butterfly in this image utilises the flower as one source of its food, and lays its egg on the plant's leaves, ensuring that hatchling caterpillars will also have an appropriate food source. It can be seen dancing around the canopy of the Iga, or Native Orange, one of many arid zone plants of cultural significance to the Adnyamathanha people in the northern Flinders Ranges. Adnyamathanha people proudly continue to celebrate their connection to country, their place in their place, one of many indigenous Australian groups who trace their ancestry into the deep time of up to 60,000-120,000 years. We are reminded, in thinking about these connections, of: Interconnections, Cultural Adaptation and Resilience.

Chapter 6: Flowering plants produce not just fruit such as the native orange. In fact, the fruit are only there to provide a means to assist dispersal of a plant's seeds. The woody fruit in the illustration are just as effective in this as the softer, luscious fruit humans might enjoy. Each seed contains an embryo, a tiny pre-cursor to the sometimes gigantic plant that might grow in good conditions and over many years. In relatively nutrient-deficient soils one might produce the never-gigantic, generally twisted and gnarly pink gum with which we began the journey through our book. The seeds, these repositories of wisdom, of genetic information that will direct the growth and function of prostrate floor-dwellers and forest giants, are examples of: Inter-Generational Wisdom and Sustainable Design.

Chapter 7: The building of bee hotels is an increasingly popular school and local community activity that supports biodiversity enhancement, particularly in Australia; most people think that the introduced honey bees are the only bees we have. Only recently, has the fact that there are more than 1700 species of, mostly solitary but still active pollinator, native bees been popularised. A variety of "publicity" and nature-meeting experiences, generally acts of activism by native bee fanciers and biodiversity enhancers, has meant that native bees are headlines, and fun. This image illustrates sustainability values of: Individual and Community Activism and Biodiversity Enhancement.



CHAPTER ONE

INTRODUCTION

Introduction: Why this book?

The issues that humans face today in the era of the Anthropocene such as climate change, species loss, overpopulation, material and social inequality, and mental health issues—that is, issues which are physical, psychological and spiritual—seem to be beyond the individual or collective competence of our present cultural traditions.

Wilber (1995, 4) argues that: "Present environmental crisis is due primarily to a fractured world view, a world view that drastically separates mind and body… values and facts, spirit and matter, human and non-human". This is a world view that erroneously separates humans from, and often unnecessarily elevates humans above, natural ecosystems and the species that depend upon them—the same precious biosphere that sustains human life! The apparently increasing human amnesia about our non-negotiable Earth dependence, our great forgetting that we are Earth-sustained, contributes to a series of human world views better described as world-blindedness (Hayward and Page 1996). It's an affliction that makes it difficult to see the need for action.

George Monbiot (2018) writes:

> One planet living means not only seeking to reduce our own consumption, but also mobilising against the system that promotes the great tide of junk. This means fighting corporate power, changing political outcomes, and challenging the growth based, world-consuming system we call capitalism.

Similarly, Suzuki and Hanington (2017, 114) state that: "If we want to heal this world we have so badly damaged we must do all we can." Although many necessary and profound changes must come from governments, industry and other institutions, all humans can make a substantial contribution, conserve energy, eat less meat, drive less, improve energy efficiency in their homes and businesses, and continue to stand up and speak out. Nelson and Cassell (2016, 43) add to this: "We are living beyond the planetary carrying capacity and efforts to seriously address sustainable practices remain remote at best, and clearly lacking in political leadership." They go on to say that educators must work towards being in the business of helping learners to understand, critique, construct and enact alternatives to degrading and endangering the natural environment (46). In this book we invoke a critical praxis pedagogy [1] and transdisciplinary approach to education as a way to assist teachers and students to build sustainable communities.

Humans need to erect and operate new world views in education. Our challenge as educators is to assist students—our co-learners—to invent and activate preferable futures through transdisciplinary place-based learning experiences in their communities. This involves employing a range of educational practices that enable students to successfully tackle local and global issues of concern to them. It's eco-social justice we seek; all Earth species, not only *Homo sapiens,* deserve our compassionate support.

We are environmental science educators who have been trying personally and professionally to "walk the talk" for decades. Passion and appreciation for connecting to people and place, and taking an activist role in all that we do, led us to set about writing a book that contains hope, possibility and a way forward. This book is about education that contributes to knowing, feeling and doing in turbulent times, caring for others and other-than-humans and the places we live in. There are multiple issues in need of our

[1] The critical praxis curriculum model, developed by Moore and Reid (1992), built on Habermas' (1971, 1973) critical theory. It has the aim of enabling effective shared decision making and collective action which is oriented towards achieving a liberated future.

attention and resolution. Finding some of the answers might well require entrepreneurs, activists and even artificial intelligence. However, this book is about helping educators/teachers/higher degree students/ academics to be brave, stand up, stand out and make a difference. We focus on areas of critical concern in educational settings, particularly environmental education—from both social justice and eco-justice perspectives. Student emancipation and empowerment are central, as is a curriculum that intersects with, and overlaps, the various disciplines. We use a no-boundaries approach. We intend this book to be a guide to some of the aspects of, and approaches to, education we consider important.

Aim of the book

The aim of this book is to provide science and environmental educators with a conceptual framework and a diverse set of examples of how science/environmental learning for students and their co-learner teachers can be enacted in order to contribute to their understanding of, commitment to, and capabilities towards, living for a more eco-socially just and sustainable world. The challenge is to see science and environmental learning within a critical transdisciplinary learning and acting framework; such an approach values human and other-than-human beings who live on an amazing planet with rich but finite resources. A set of eco-justice principles that we have developed over a long period of time is the focus of this book. These principles underpin each chapter and provide the reader with a sound basis for planning. We also provide examples of a transdisciplinary approach to teaching and learning that connects students to place and addresses student concerns through a critical praxis approach.

An example of a transdisciplinary approach to planning and learning is described in Chapter 2. In a unit of work on local wetlands, teachers adopted a transdisciplinary approach to pedagogical practice. The unit is student centred, it uses an open-ended critical inquiry into a relevant life-centred issue that links to the lived experiences of students and their community and, in particular, involves shared decision making and action. It provides an example of eco-social justice in action, and makes a contribution towards a curriculum for the Anthropocene[2] with an extended science, technology, engineering and mathematics (STEM) focus.

[2] Costanza et al. (2012) describe this moment in history we live in as the "Anthropocene", an era in which humans are dramatically altering our ecological life support system.

In an era of rapid change, we need to rethink education, and we hope the reader will find in this book:

- examples of "education for sustainability" that encourage learners towards identity and adulthood
- a discussion of research/teaching praxis that values connecting knowing, feeling and doing
- ways to improve student physical and mental health through making connections within communities of humans and humans learning to live responsibly within nature
- strategies for being brave, going out and doing it
- examples of where the eco-justice principles are evident
- approaches to addressing hard questions, transdisciplinary and futures orientations, and STEM with a critical lens.

STEM and a transdisciplinary approach

The agenda we have identified needs to be centre-stage if education and, in particular, STEM education is to provide the required knowledge background and, we argue, also promote the development of affective and behavioural dispositions of students to act. STEM often prioritises the cognitive (knowing), with limited emphasis on the affective (feeling) and the action (doing), and hence leaves out much of what education should be about: growing up to be a happy, useful and respected citizen in a world where ecological and social justice are of equal value. We argue that a broad interpretation of STEM should be prioritised. STEM should be seen as a link between the sciences and society (social sciences, humanity) and ensure that both human and other-than-human species are valued. The lack of a common definition of STEM that is applied universally in Australia and internationally in government policy, reports and research is problematic (Panizzon, Corrigan, Forgasz and Hopkins 2015). It is of significant importance that we arrive at common understandings of STEM. The integration of understandings and skills generated in this space will be needed to help address global challenges (e.g., agricultural production, biodiversity, "clean" energy) now and into the future (Kelley and Knowles 2016). But other subjects and approaches are also important to ensure that our students receive a broad and liberal education. As educators, developing critical thinking that transcends immediate instrumental goals, focusing on real-world problems, assisting children to think for themselves, and placing ecological concern at the forefront of pedagogical endeavours are pivotal to our work (Kopnina 2014)

For science and environmental education to possess practical meaning for learners and their teachers, and hence be of significant value to the communities in which they live, it must: relate to the interests and concerns of learners; develop over time in order to become an integral part of learners' world views; and be critiqued against cultural values that promote eco-justice, that is, the wellbeing of humans and other-than-humans.

Eco-social justice and education

We suggest that what we—the whole Earth community—in fact need is to develop from ego-activism, not just to healthy social activism, but to an insistent, informed, capable, compassionate and effective eco-social activism. It was many years ago that Ian Lowe (2009, 2016) (and equally many other people) indicated that "you can't have one without the other"—at least in terms of two of the most significant outcomes of activism: ecological justice and social justice. They argued, as we and a host of commentators continue to maintain (Kopnina 2018), that humans are doomed to failure if they persist in seeking social justice (that is, social equity, an end to social inequity and the presently widening gap between "rich" and "poor") without spending as much effort seeking ecological justice: that is, seeking the right to a decent life that is ideally available to all Earth-citizens, and seeking the maintenance of biospheric integrity. Pursuing justice for other-than-humans to the exclusion of just ends for humans is similarly futile.

Skidelsky and Skidelsky (2012) argue that humans have to live more simply but not less happily. For this reason, the authors challenge the current corporate push of having more "stuff" and the resultant environmental degradation and inequitable distribution of resources. Although the citizens of the overdeveloped world are increasingly "wealthy", because of population growth and increased consumption, the future is in peril. In meeting these challenges humans must transition from nation-states towards *One World* (Singer 2002), a world which must be always "becoming" to be an equitable world, not just for today's humans, but across species and generations. It an exciting time to live because of the challenges to be solved as we transition to this new, one world, age. We shall be arguing that the transitioning requires that education be transdisciplinary and places the challenges and opportunities of this new era centre-stage.

In this era of the Anthropocene, all sectors of education require an activist approach to pedagogy that values both knowledge production and its application in our everyday lives. We all need to be informed by current

initiatives in science so that we can challenge "fake news" and be able to undertake inquiries in local places to generate emergent new knowledge. Students need to understand and internalise that humans are not separate from their environments, but integral parts of them, and that any implied separation gets in the way of a whole-Earth focus. Germaine Greer writes about not being an Australian, and not being British, but rather being earthlings and responsible for Earth. Being earthlings is a path that can cross international borders as global problems are tackled with no time to lose. Greer notes that often humans arrogantly think and act as if they are above nature and can somehow control it and use it for their benefit—but they/we *are* nature. And she argues that when people damage nature they are, in fact, damaging themselves. "Soon we may have damaged it beyond repair" (Greer, unpublished lecture, April 15, 2015). Professor Greer encourages us to think about ways we can help rebuild habitat. "The fact we are earthlings means we care about the death of the planet", she said. "The hardest thing to do on Earth is to do good … Like all the other earthlings we need to work out a way to stay here" (Broadstock 2015).

In summary, eco-justice ideas that underpin our work include:

- extending notions of social justice to include ecological wellbeing, environmental issues, and a recognition of the significance of preserving the cultural and environmental commons and the role that they play in maintaining the integrity of the Earth
- bringing into the foreground the moral consideration of species other-than-humans; that is, understanding that all species, not just humans, require "moral consideration" or have "rights" (Nussbaum 2006; Singer 2010), and "standing" (Stone 2010)
- seeking to preserve and, where appropriate, *enhance* ecological wellbeing and the integrity of the ecological commons—the "properties" of the Earth that sustain all life, including human life; properties called "ecosystem services" (Costanza et al. 1997; Costanza 2012b) or "the larger systems of life that we depend upon" (Martusewicz, Lupinacci and Schnakenberg 2010, 11).
- having the same "view-of-care" for human systems, especially the cultural commons acknowledging indigenous perspectives (Bowers 2009).

Eco-justice principles: A framework to implement a cohesive approach to teaching and learning

We believe that an appropriate world view for all humans is one that values 1) the understanding of the natural world (of which humans are a part) through science/ecology, 2) collective (cultural) values that place humans within ecosystems, and 3) the needs of humans to value the cognitive, affective and intentional (Martusewicz, Edmundson and Lupinacci 2015). What does this mean for teachers, experienced practitioners and their early-career and pre-service colleagues? Teacher education programs can contribute to eco-social justice learning by introducing and making explicit the ethical and sustainability necessity of valuing all aspects of Earth systems, and of behaving accordingly, through science courses that provide conceptual frameworks and mobilise student participation (Ferreira, Ryan and Davies 2015). That is, such courses should structure and enable the direct action that is essential for healthy, resilient communities and ecosystems (a critical praxis approach). As science educators, we have focused primarily, but not exclusively, on the natural world aspects of eco-justice and its application to the places in which we live—that is, our local situations. We understand that our own journeys to eco-justice have been influenced by the places in which we have lived, and the people we have come in contact with directly or through the literature, and we wish to provide our students/readers with their own opportunities to see the world as a whole and each of us as part of the world ecology (Paige, Lloyd and Smith 2016).

The set of principles we have developed, and which can be identified as contributing to eco-justice, have provided a coherent approach to teaching and research in university-based teacher education. They have helped us make decisions about both what to teach and how to teach. Using these principles has helped make the unobvious obvious. The students know our stance, and our aim is for them as early career teachers to “carry it forward”.

The principles that underlie our work have been informed by the work of Kopnina, Lazlo and Wilber contrasting outdated and futures world views (as set out in Table 1-1). The latter provides some detail of the world view towards which humans must move if humanity is to obtain more sustainable human living and value the welfare of all species.

Outdated world view	**Futures world view**
1. The natural world is a resource for human use (human-centred).	1. The natural world is valued for its own sake (eco-centred).
2. We are all separate individuals.	2. We are active participants in a range of communities.
3. I only owe allegiance to one country and one people (ethnocentric).	3. All of us belong to whole Earth communities (Earth-centric).
4. The competitive free market is supreme.	4. A combination of mutually supporting, resilient local and global trade is sustainable.
5. Masculine characteristics predominate: "A woman's place is in the home."	5. Masculinity and femininity are equally valued: "Everyone's place is everywhere."
6. The value of everything, including humans, can be calculated monetarily (material wealth only valued).	6. Both the non-material and the material are valued: wellbeing is measured by inner happiness and adequacy of material goods.
7. Newer is always better.	7. Novelty for its own sake leads to a wasteful use of resources and privileges humans over other members of the Earth community.
8. The future is none of my business (only short-term thinking valued).	8. Foresight is valued, developed and acted on.
9. Crisis in the world is temporary and reversible (the Holocene continues to develop).	9. The world is undergoing rapid and fundamental transformation (moving further into the Anthropocene).

Table 1-1. An outdated world view and a futures world view

The eco-justice principles we have developed and use for planning our teacher education programs are listed here and explored in further depth in the following section.

1. *Identify and challenge* current world views and behaviours.
2. Develop a *community of learners* with a disposition to knowing and valuing with compassion natural and human systems (the cultural commons) in the geosphere and biosphere, and elements of the noosphere supportive of natural systems.
3. Invite students to *engage collaboratively* in working towards creating socially and ecologically just and sustainable communities.
4. Assist students in their development as *role models* who value the commons, partnerships, quality of life and material adequacy.
5. Promote students' acquisition of *eco-social wisdom*—ways of thinking, feeling and acting within places which they inhabit.
6. Help students to develop a respect for long-term rather than short-term thinking through historical and *futures* studies.
7. Provide opportunities for students to *reflect critically* on what they have learnt.
8. Prioritise *culturally responsive* pedagogy and indigenous perspectives.

The first of our eight eco-justice principles is to identify and challenge the world view assumptions that direct our thoughts and behaviours. This includes challenging the deep-seated ideologies of consumerism, individualism, growth, development and progress, and relearning the values central to living well with sufficient resources, in humility and with respect, within a whole-Earth community. The second principle is to encourage the development of a community of learners with a shared disposition to value with compassion natural systems and human systems (the cultural commons), in the geosphere and biosphere, and also elements of the noosphere (the sphere of human thought) supportive of natural systems. This means promoting "knowing our place"—where we "fit" as Earth-citizens into the structure of things. According to our third eco-justice principle, we invite participants to engage collaboratively in enhancing socially and ecologically just and sustainable communities of people and other living things, and the physical systems on which they depend. Our fourth principle is that we intend that our graduating educators act as eco-justice role models in their personal lives and in educational communities. Our fifth principle is that we aim for the development of ways of thinking, feeling and acting with eco-social wisdom in places that we inhabit, recognise and relate to; such a wisdom necessarily includes ecological systems thinking, scientific knowledge, skills and practices and creative experience/the arts—the core of science

curriculum and science general studies courses. Our sixth principle is that we seek to develop a respect for long-term rather than short-term thinking, through historical and futures studies that introduce students to the traditions of past and future communities that have or will have world views and values that respect all aspects of Earth systems. Our seventh principle is that we provide opportunities for students to reflect critically on what they have learnt, the impact their learning has had on their perspectives, and how this could influence their future behaviour.

These principles have continued to evolve over time, and in this book we have added an eighth eco-justice principle which focuses on culturally responsive pedagogies and indigenous perspectives, a surprising oversight/omission from our previous work in 2016 (O'Keeffe, Paige and Osborne 2018). These eight principles, and examples based on lived practices of doing, acting, feeling and knowing as a way of improving people's ability to imagine other futures, underpin each chapter in this book. Using these eco-justice principles can provide a vigorous and informed basis of an activist approach to education that focuses where possible on contemporary issues.

As we have explained, the evolution of our work as teacher educators has brought about our eco-justice pedagogical practices, and led to the development of a set of guiding principles. They are tentative and evolving and provide opportunity for reflection on current and future practices that are sensitive to eco- and social justice concepts and practices. We see these principles as an essential aspect of all learning, that is, as cross-curricular themes addressed across the traditional learning areas within teacher education programs, in middle schooling, and as an ongoing agenda item with community groups and local governments. We are optimistic that our contribution has made a difference and that the students we have worked with will continue to promote eco-justice. Our transdisciplinary approach is an inclusive pedagogy which involves at least: being "in and among" nature; slow pedagogy[3]; eco-social activism; exploring and attempting to effect improvements in a healthy planet index; citizen science; and visionary sustainable futures.

Education in its broader sense will disappear into schooling that can be regulated and tested if an alternative is not offered. Our alternative—a

[3] Slow pedagogy "allows us to pause or dwell in spaces for more than fleeting moments and therefore encourages us to attach to and receive meaning from that place" (Payne and Wattchow 2009, 16).

transdisciplinary approach that builds knowledge through action with community—is helpful for students and teachers. For us, an eco-justice orientation is a necessary one for educators who intend to assist their students towards the kinds of "whole-Earth" knowing, wanting and acting that just might enable them to work towards an increasingly whole—and just—Earth community. This Earth would be one within which there would be "equitable sharing between all human beings, the natural world, and future generations" (Jucker 2004, 10), and also many opportunities for each human to become an increasingly embedded participant in that community. Jucker's (2004, 23) conclusion is that we need:

> to delearn ourselves, and enable our students to delearn, the deep-seated ideologies of consumerism, individualism, growth, development, and progress, and relearn the central values of many vernacular societies: to live well with little, in humility and with respect, within a community of human and nonhuman relations.

And this provides a summary of what is required that presents no small challenge!

Why us? Why these authors?

We have all been environmental science educators and between us we have worked in the primary, secondary, tertiary and community sectors. Taken together, we have over 145 years of experience in eco-justice educational activism. We have been together for the last 15 years as teacher educators and also active in our respective communities for many years. Our work is primarily situated in the Adelaide region of South Australia.

David Lloyd writes about being influenced by the educational literature, our histories, and our colleagues. But initially he was influenced by his adventures in the natural world as a boy growing up in a number of suburbs on the outskirts of the city of Adelaide. These provided natural places to explore within walking or cycling distance of home including the beaches/wetlands/sandhills of West Beach, bushlands of the Mt Lofty Ranges, and the well-known glacial geology of Hallett Cove. These experiences provide a base against which we can debate with ourselves and others issues of social and ecological justice. Lloyd's own realisation of the need to be intimately connected to the natural world has influenced his journey as an educator and had a significant impact on the way he has directed his classroom practice and, now, his citizen duties with a community garden, the Transition Town Movement and local government

(Lloyd 2013, 2014, 2015; Lloyd and Deans 2017).

Eco-justice brings together ideas of social and ecological justice and provides a space for debate about, and decision making and planning for, normative futures. Lloyd sees eco-justice education as an idea that needs integral consideration, an approach we detail in later chapters (Esbjörn-Hargens and Zimmerman 2009; Lloyd 2007b; Wilber 1998b, 2000). It is about social and ecological justice, and sustainable living and intimate connection with the geosphere, biosphere and noosphere. It relies for effect on the development of our inner personal and cultural lives and our personal and social behaviours.

Richard Smith, from his early adulthood onwards, spent much time and energy sharing motivations, passions and actions with environmental educators and eco-social activist groups. On reflection, these experiences contributed to his structuring of self in a series of circles of solidarity by allowing him to discover in deeply personal ways, and by having "deep" discovery learning about several "fact(ors) of life". He experienced roles that included inventor, discoverer, taxonomist and etymologist, naturalist and "maker of friends". His work has enabled him to develop a feeling for "teachership", in becoming an inventor of rewarding, exciting, awareness-raising, educational activities that had or have an impact on students, many of whom have reported that the activities changed their views of themselves and of the other citizens of Earth. He has worked with: motivated and active learners in outdoor education; teacher education students in natural history courses; teacher education students in classroom and field-based courses in science; and students in science and social science curriculum courses. An ongoing interest in "problem-based", situation-improvement learning has often contributed to his learning and teaching.

As a beginning teacher, Kathy Paige understood the importance of connecting children to wild places in the natural world by taking them on annual camps to local spaces, walks and picnics in the bush, and cooking lunch between high and low tide (Littledyke, Taylor and Eames 2009; Wilson 2012). Students were engaged, cooperative, excited and challenged by these experiences. She always noticed how much less stressed the children were when they returned from three days outside engaging with nature, having regular meals and good nights' sleep (Sobel 2008). The focus on learning in "place" with a transdisciplinary mindset, that is thinking and working scientifically, mathematically, creatively and environmentally to make sense of the world around them, ensured that the learning experiences had an eco-justice frame.

Reflecting on her experiences as an environmental science educator, Paige sees nothing more important than connecting people/children to the natural world. It is these experiences that are recalled and not their test scores. She often starts the year with a new cohort of eager pre-service teachers with some stories. Mainly she congratulates them on enrolling in such an ethical and worthwhile profession as teaching. She reflects that it's not how much one earns, but the amount of difference one makes for those children most in need. She recalls one particular personal story. She was heading up a side street in the dodgy side of the city very late on a Friday night to her car. It was very dark, with minimal street lighting, and she was feeling nervous when she noticed four young men sitting in an old Holden Torana car. As she passed, the front door opened and out jumped a six-foot-tall dreadlocked Rastafarian. Just as she thought her days were numbered, he said: "Hey Ms Paige. Remember me? I was in your Year 5 class in 1986. You took us on a great week-long camp to Aldinga Beach. Best days at school." She felt relief at seeing a friendly face, but also for knowing that she had had a positive impact on a student. The experience confirmed that educational experiences in the outdoors are memorable and that teaching is a critical profession. In her early days of teaching she maximised the time spent outside. Living near the river at Murray Bridge, being in the intertidal zone at Port Broughton or the local wetland at Ridley Grove, she knew intuitively the importance of learning outside the classroom. She now has the language to describe her approach; it was transdisciplinary, action-orientated, place-based futures thinking enacted beyond the school fence.

During the last 22 years Paige has worked as a teacher educator in an interdisciplinary team which embraced educating for sustainability (EfS) as a way to reconnect pre-service educators to science and mathematics (Lloyd 2011; Paige, Lloyd and Smith 2016; Paige, Lloyd and Chartres 2008). She ensures graduating teachers are equipped with a knowledge and understanding of EfS and, in particular, an action-orientated curriculum perspective. There is nothing more important than treading lightly (for example, taking reusable coffee cups and water bottles to meetings), asking the hard questions in the classroom, and exposing pre-service teachers to eco- and social justice practices so that they "get it", both personally and professionally. That is, she tries to ensure that students understand the importance of connecting to place, using "slow pedagogy" and incorporating a transdisciplinary approach to teaching science (Payne 2015; Payne and Wattchow 2009).

The number of years we the authors have worked together has resulted in us continuing to push boundaries ecologically and pedagogically. Education

systems have put "knowing" on a pedestal. This is not a problem per se, but there also needs to be equal attention to connectivity, feeling and doing. This book is an attempt at weaving together several educational strands: being, thinking, believing, feeling and doing, the affective as well as the cognitive. The purpose of this book is to consolidate our combined experience in ways which might be useful for others. We focus on material we think is suitable for students in the middle years, that is, for the education of adolescents, but we hope it might be helpful for all in the community. Whilst it is a collegial effort with a shared world view, different chapters have been written by different authors and some variations in writing style will be clear. We have spent much time discussing the order of the chapters and how to explicitly make links between them. This is not a linear journey but a network of ideas. We hope that as you dip in and out of the book you will find:

- examples of educational practices that astound you because they are intelligent and compassionately written, and that most readers think that they could do similarly magical things
- stories of the lives of other students, teachers and community members that are inspirational
- images and words that bring joyfulness to your reading, your professional life, and your personal life.

An overview of the book chapters

In Chapter 1 we have made an argument for an eco-justice transdisciplinary approach to education, outlined our aims and backgrounds and described our eco-justice principles which underpin each of the chapters.

Chapter 2 focuses on a year-long project in which researchers worked with middle primary teachers from schools along Australia's River Murray to develop a transdisciplinary curriculum for the Anthropocene around the topic of freshwater systems. Ways of doing and knowing from disciplines including science, mathematics, English and Indigenous perspectives were central. This chapter uses our eco-justice principles to frame and reflect on deep learning experiences in which students become activists in their community and it includes practical examples that can be implemented in many classrooms.

Most occasions and issues we face in life are not bounded by a single curriculum area such as mathematics, science or history, but rather draw upon a combination of many traditional school subject areas and community