

Early Preservice Teachers' Experiences of the Environment: A Case Study of Participation in a Community Outdoor Event

Wilhelmina van Rooy

Faculty of Education and Arts, Australian Catholic University, Sydney, New South Wales, Australia

Abstract

Clean Up Australia Day is the country's largest community-based environmental annual event when participants work in teams to remove rubbish from their local environment. This article describes an interpretive study in which a sample of preservice primary teachers' ($n = 30$) responses to questions about their involvement in the event were evaluated to determine their developing knowledge and understanding about environmental and sustainability issues. The study evaluated a university assessment task for its ability to identify and challenge preservice primary teachers' views as consumers of manufactured products, environmental citizens, and future teachers. The data were drawn from students' written work that formed part of the assessment task. Results indicate that students found participation in this community event to be a significant, valuable part of their learning about the environment that contributed to their understanding about sustainability and highlighted the power of positive community participation as a force for good.

Significance and Focus of the Study

Few days pass without the Australian media making mention of environmental and sustainability issues such as climate change, food security, decreasing biodiversity, water availability, energy consumption, and waste (Inouse, O'Gorman, & Davis, 2016). Community interest, awareness, and understanding about these issues are increasingly evident with the growing number of volunteer organisations whose mission or brief is to leave planet Earth in the same or in a better condition for future generations than at present (Kempton & Holland, 2003, as cited in Blatt, 2014). O'Gorman and Davis (2013) refer to this growing interest, awareness, and understanding as 'intergenerational equity, that is, that future generations have access to at least an equivalent quality of life as today's generations' (p. 780). Within Australia, a wide variety of organisations provide

Address for correspondence: Wilhelmina van Rooy, Faculty of Education and Arts, Australian Catholic University, Locked Bag 2002 Strathfield NSW 2135, Australia.
Email: wilhelmina.vanrooy@acu.edu.au

opportunities for volunteers to work in the environment and include Conservation Volunteers Australia (<http://www.conservationvolunteers.com.au>), bush care groups with local councils such as Landcare Australia (<http://www.landcareonline.com.au>), and Australia's largest volunteer community environment event, the Clean Up Australia (CUA) Day (<http://www.cleanup.org.au>). Positive, continuing and informed community engagement has important implications for the environment and for people (Gwekwerere, 2014).

This study reports on the developing understanding about the environment of pre-service primary teachers as they prepare for their future role working with young children in schools to bring about the vision of a sustainable future. When asked to participate in a community event such as the CUA Day, these preservice primary teachers undertook the task with enthusiasm, energy and drive. They began to develop their knowledge and understanding about the environment and sustainability as they worked collaboratively with others while collecting and sorting rubbish, and later, when required to reflect on their involvement as part of the assessment task. Along with students, the author also participated in the CUA Day with Rotary International at a local creek near her home. Through her own involvement, experience and reflections as a citizen, and later, following discussions with students about their experiences, the author was better placed to understand students' perspectives gathered through both verbal and in written formats. Moreover, students were aware of the instructor's personal involvement in this voluntary environment event.

Clean Up Australia

CUA is a community-based organisation dedicated to the removal of rubbish in all its forms from the Australian landscape through its mission 'To inspire and work with communities to clean up, fix up and conserve our environment'. CUA Day is held annually in March and is now Australia's largest community environment event. In 2015, an estimated 526,268 volunteers cleaned up 13,563 tonnes of rubbish at 6,165 sites across Australia. Rubbish included rusted car bodies, plastics of all kinds, glass bottles, cigarette butts, electrical appliances and electronic equipment — all manufactured consumer products. Since its inception in 1990 by a group of Sydney residents concerned about the increasing volumes of rubbish on the Sydney Harbour foreshore and within the harbour itself, CUA Day has continued to ignite 'an enthusiasm and desire among the community to get involved and make a difference to their local environment themselves'. Other CUA initiatives now include: a container deposit scheme, 'say no to plastic bags', recycling cigarette butts, electronic waste (e-waste) recycling, 'clean up mobile phones', 'clean up our climate', and 'say no to bottled water'.

Australian Curriculum and Research Reporting Authority

The Australian Curriculum and Reporting Authority (ACARA) is Australia's national government agency charged with the planning, development, implementation, and assessment of all school curricula in Australia, collectively termed the Australian Curriculum. Each Australian state and territory develops specific syllabus documents for their own educational jurisdictions underpinned by obligatory requirements from ACARA. In addition to each subject discipline, there are three mandatory 'cross-curriculum priorities' to be embedded in all learning areas: education for sustainability, Indigenous perspectives, and Asian perspectives (ACARA, n.d.). Sustainability as a cross-curriculum priority is therefore a requirement in all Australian school syllabuses. In New South Wales (NSW), where this study took place, sustainability education

issues are advanced and supported, in part, through each school's School Environment Management Plan (SEMP; Office of Environment and Heritage, Department of Premier and Cabinet, n.d.), initiated by the NSW government to assist schools with their environmental education and environmental management.

In Australia, respective state and territory statutory government authorities accredit university preservice teacher education programs. In NSW, programs are accredited with the Board of Studies Teaching and Educational Standards (BOSTES; <http://www.nswteachers.nsw.edu.au>), which also develops curriculum, teaching, assessment, and teacher registration requirements. The preservice teacher education programs from the university involved in this study were accredited by BOSTES.

Overview of Relevant Research Related to the Study

Over the past 12 years, much has been written about teacher identity and teacher self-efficacy (Brigido, Borrachero, Bermejo, & Mellado, 2013; Cantrell, Young, & Moore, 2003; Nilsson & Loughran, 2011; Palmer, 2006; Wilson & Kittleson, 2012) of which *environmental education and education for sustainability* (EfS) have been part of that discussion and debate (Amisshokoohi, 2010; Effeney & Davis, 2013; Kennelly, Taylor, & Serow, 2012; Moseley, Reinke, & Bookout, 2003; Wilson, 2012). Preservice teachers must be self-confident and confident about themselves as future teachers, and have a positive disposition towards sustainability education content knowledge and pedagogy (Effeney & Davis, 2013). ACARA's mandatory inclusion of cross-curriculum priorities in all Australian school syllabi, as detailed above, necessarily requires that all preservice teacher education programs include preservice professional development in ecological literacy (Cutter-Mackenzie & Smith, 2003), the environment, and sustainability (Nielsen et al., 2012). The inclusion of concepts related to EfS, environmental education, and ecological literacy in Australian teacher education programs is readily addressed through participation in activities such as CUA Day.

Teacher educators must first ascertain preservice teachers' dispositions, views and perspectives to effectively foster the development of knowledge and understanding in the area (Miles, Harrison, & Cutter-Mackenzie, 2006). Learning experiences need to seamlessly integrate the acquisition of content and pedagogy situated in the everyday world (Cutter-Mackenzie & Edwards, 2006), and teacher educators need to be cognisant of the 'drivers' and 'blockers' for understanding the social and personal perspectives of students who believe that individuals do not make a difference and thus have no role (Wilson, 2012). Research by Kennelly, Taylor, and Maxwell (2008) using a pre- and postinstruction survey in environmental education demonstrated that 'confidence about teaching environmental education can be attributed to improved pedagogical content knowledge and an appreciation of how to integrate environmental education into the everyday learning of their students' (p. 150), with high self-efficacy leading to increased motivation and confidence. Wilson (2012) and Kennelly et al. (2008) all advocate for the inclusion of more specific environmental education content in teacher education courses. However, their research is not without its critics, such as O'Gorman and Davis (2013), who contend that both in Australia and internationally, teachers are ill prepared for the challenges and opportunities that education for sustainability provides because of inadequate knowledge and understanding about core environmental and sustainability principles, and 'there is little research conducted into preservice teachers' attitudes or understanding sustainability' (p. 783). Within an Australian context, this is now more important than ever,

given that sustainability principles and concepts are part of mandatory curriculum implementation.

Context of the Study

The university where this study took place is a multicampus, publicly funded university with Australia's largest preservice teacher education faculty. The study took place at one of the university's NSW campuses. As with other Australian universities involved with primary teacher education, all preservice primary teachers must undertake studies in science learning and teaching. Students involved in the study undertake three mandatory science education units (which include EfS) with an optional fourth unit in further environmental education studies. It is the first of these four units that is the focus of this research.

Embedded in the learning outcomes of the first unit are those that address environmental education and sustainability. Here, critical issues of sustainability are addressed through selected content that allows preservice primary teachers to engage with science and technology through a range of environmental issues within an authentic local project. The content and related activities include: interacting with concepts associated with biodiversity; renewable and non-renewable resources; practical work with plants and animals; calculating personal carbon and ecological footprints via online activities; a classroom simulation activity of the 'journey of a river' as it passes through rural and urban settings; and critiquing an online information video, such as *The Story of Stuff* (Story of Stuff Project, 2017). Initial briefing related to the local project (such as CUA Day) takes place in the first week of the 12-week unit, followed by debriefing in the final week when student groups present their work to peers. Content and related activities are integrated into the unit through a variety of learning strategies, such as peer, cooperative, experiential, and inquiry learning approaches.

The expectation is that these future university graduates will be able to collaboratively plan, develop, and initiate programs of learning for young people that focus on learning about the environment through immersion in activities that are hands-on and minds-on. Events such as CUA Day provide opportunities for preservice teachers to link their university-based learning experiences with a complementary, authentic, community-based activity, thereby preparing them to do the same when they are teaching students in primary school settings.

Throughout the study, a sociocultural approach was used to examine the social practices used by participants to make meaning of an authentic learning task involving both community action and engagement. The preservice primary teachers (actors and non-experts) worked, talked, and communicated with CUA site managers (actors and experts) and fellow community volunteers (actors, some of whom could have been experts) as a social group for one day (community of practice). The study addressed how preservice primary teachers asked to participate in a community-based environmental event made meaning of this experience in relation to their everyday practices, and how participation might have an impact on themselves as future teachers (Smith & Stevenson, 2017). The preservice teachers engaged in learning by working with others, collecting and sorting rubbish (artefacts), noting their origins (acquiring information and making inferences based on available evidence), and sourcing information (site and cultural knowledge) from experts about their particular site and the CUA event itself. The sociocultural approach adopted ensured that first, knowledge was gained by interactions with experts and by examining artefacts collected on the day, and second, that learning was a collective process both on the day and again later when preservice teachers were required to present their findings as a group presentation in-class.

Method

This study used a qualitative methods approach set within a sociocultural context to investigate the experiences of first-year, first-semester preservice primary teacher education students ($n = 300$). Student participation in an environmental community activity of their choosing was a mandatory assessment task (details described below). Most students participated in the 2015 CUA Day. The author investigated the impact, if any, that participation at such an event had on these students and whether an assessment task requiring intending primary teachers to engage in community environment tasks was a worthwhile learning and teaching experience. Anecdotal observations by the author in 2013 and 2014 indicated that most students had been positively influenced by their participation. This study is the first formal reporting of such findings. There were no reports from students that the assessment task was not a worthwhile learning and teaching experience despite informal (via in-class conversations with the instructor in the week after CUA Day) and formal opportunities (via the written component of the report or university surveys about students' evaluation of learning and teaching) to provide such feedback.

University Research Ethics permission was granted to send an email to the entire student cohort ($n = 300$) asking them to submit a de-identified clean copy of the written work that formed part of the assessment task. Thirty students ($n = 30$) formed the sample for this study when they voluntarily submitted their written reports for analysis. The request was sent after students had received their final grade for the unit. Students were asked to reflect on their experience of CUA Day and what they had learnt from their participation. Similar work by Blatt and Patrick (2014) confirmed the value and importance of the relationship between preservice teachers' own experiences of the outdoors and their wish for their future students to engage with the environment. In the context of these authors' work, CUA sites would be considered experiences and examples of 'outdoor places'.

Participants

Study participants were first-year, first-semester undergraduate, preservice primary teacher education students (aged 18–40 years), the majority of whom had not studied science since the end of junior high school (age 16). As part of the assessment, they were able to choose the type of environmental activity in which they would participate, such as bush regeneration, bush care, working in community gardens, participating in clean-up events held by local councils, or participating in the annual CUA event. While some students chose to work with community groups who care for the local environment, the majority of students participated in CUA. Participation involved students registering online through the CUA event website, nominating a park, reserve or roadside area, and arriving at their chosen site on the day. Students worked at sites throughout the Sydney metropolitan area and its hinterlands. CUA provided all personal protective equipment along with colour-coded bags for each type of collected rubbish and a 'certificate/letter of attendance' as evidence of students' involvement. Surprisingly, no students indicated that they had participated in CUA Days in the past. Following participation, students formed their own groups and designed presentations to showcase their work, which was assessed through both verbal and written comments.

Data Collection

Study participants were required to engage with a community environment event as detailed above and to present evidence of their participation in two ways: first, as a group presentation to peers in class, and second, as a written component (1–2 pages),

TABLE 1: Assessment Details With Explanations

| Aspect of assessment | Explanation |
|----------------------|--|
| Purpose | <ul style="list-style-type: none"> • Engage with local environment issues. |
| Action | <ul style="list-style-type: none"> • Participate in a local environmental issue that involves some time (4–6 hours) actively working in the environment; • Contact and then work with an established environmental group. |
| Criteria | <ul style="list-style-type: none"> • Provide an overview of the work done by the group with evidence of time spent in the environment; • For Clean-up Australia Day provide a description of the type of rubbish collected on the site, its origin, amount, disposal and effect on the environment in relation to native flora and fauna. Include a photo of your group and the rubbish; • Discuss new learning as a result of participation; • Discuss how participation contributes to sustainability. |
| Product | <ul style="list-style-type: none"> • Produce a report (1–2 pages) of the environmental experience that is informed and concise, with accurate science, environment and sustainability concepts; • The class presentation should be visually stimulating and include legible slides and with incorporated multimedia. |

which formed the data source for this study (Table 1). Once grades for the unit were finalised, all students were invited to submit a de-identified copy of their work, of which 30 presentations were received. The small sample size, while a limitation of the study, was bounded by University Ethics Committee requirements that de-identified data be collected after final grades were released.

Analysis

Data analysis of the students' written work employed the constant comparative method (Strauss & Corbin, 1998) where the author iteratively explored the data (students' reports) while being mindful of her role as an instructor for the unit and as a participant in the CUA Day. Creswell's (2009) three-step approach was used where the researcher initially became familiar with the data through multiple readings (O'Gorman & Davis, 2013). This was followed by thematic analysis (Denzin, 2011), when responses were compared with emerging categories or themes. Finally, synthesis was used to investigate whether any of the themes could be combined. Arising themes were verified through cross-checking by two colleagues familiar with the unit's organisation, learning outcomes and the assessment tasks, thus lending credibility and trustworthiness of the final three themes.

Findings and Discussion

A number of findings emerged for the written data provided by participants. These are expressed as three themes arising from their responses:

1. Participation in CUA — what preservice teachers learnt and realised.
2. Preservice teachers' awareness of their developing content knowledge and understanding about the environment and sustainability issues.

3. Preservice teachers' awareness of the power of community participation in events that foster responsibility for the common good, the environment and society.

Theme 1: Participation in CUA — What Preservice Teachers Learnt and Realised

Participants described the type, distribution, and sources of collected rubbish. They suggested problems and solutions for the disposal of dumped rubbish and how they and local councils could take responsibility for rubbish removal. They detailed the impact of rubbish on flora and fauna (both endemic and exotic species) and the problems of toxins leaking from rubbish or resulting from physical and chemical changes in the rubbish; and finally, they described the value of organisations such as CUA in raising community awareness about rubbish.

Of the many responses provided by students, it was their *emotional response* to the sheer volume of rubbish and its impact on the area's flora and fauna that engaged them with the assessment task (Table 1). As one student so succinctly stated: 'Australians are living in their own filth.' Many students wrote that they simply did not realise the amount of rubbish in any given area, nor its effect on the environment. They identified and classified rubbish using their own criteria; namely, what was deliberately dumped (e.g., car parts, shopping trolleys, prams); what had been blown or washed in from other areas where it had been dropped as litter (e.g., bottles and food wrappers); and what had been physically broken down by abrasion (e.g., plastics that now were found washed up along the beach, in the gut of marine animals or wrapped/embedded in trees). Many students commented on the irony of McDonalds being a sponsor of the CUA Day, since much of the rubbish collected came from their and other fast food outlets. As one student pair reported from their site:

We became shocked and saddened by just how much rubbish is discarded into the environment and its detrimental effects on the environment. This was a real eye opener for both of us as it was literally right on our doorsteps in our own suburbs!

When it came to how CUA Days could be improved, students provided many suggestions, including what they themselves could do on a regular basis, such as picking up litter and notifying local councils of the need to provide bins and more regular rubbish collections, particularly after weekends. As one student remarked about her work at a Sydney beach:

In Cronulla, there were not enough resources to dispose of all rubbish properly, for example, litter left behind on the beach is due to laziness, lack of resources and limited bins in the area.

Another student who worked at Sydney Olympic Park wrote:

The waste (in the mangroves) ... has been floating around the river. The bulk of the litter had been well hidden underneath the ground, therefore showing us that the rubbish has been there for quite some time now.

Students were asked to discuss the effect of rubbish on plants and animals. While most of the participants had not studied formal science past age 16, they displayed, through their group presentations as observed by the instructor, an understanding about the effect of rubbish on living things. For students who worked in parks or in the local bush, this was evidenced in their critique of rubbish found wrapped around or in trees, in their commentary about areas devoid of plants where floor carpets had been dumped, or through their observations and remarks about weeds resulting from the dumping of garden refuse that now compete with native plants. Australian native animals were

of most concern, particularly when their habitat was invaded and occupied by exotic animals attracted by the rubbish, such as feral cats as predators of small marsupials, reptiles and birds, and Indian myna birds as scavengers that nest in tree hollows formerly occupied by native birds. Typically, students wrote about plants and animals in the following terms:

Noxious weeds had taken over the site, killing native plants such as the red spider flower; noxious weeds include trad [Tradescantia], moth vine, pigeon grass, pampas grass, asparagus fern, asthma weed, and pitch fork etc. This meant that the native plants were more susceptible to damage. Weeds compete for water, nutrients and sunlight with native flora — effect detrimental.

Our site leader shared with us that the ring-tailed possum and the swamp rat were native to the valley but now are not to be found as a result of the large amount of rubbish dumped onto the area.

For students working at the beach, in mangroves or along creeks, their focus was on marine animals: fishing wire choking marine life, plastic bags mistaken for food, and micro-plastics now found in fish stomachs.

Rubbish such as plastic bags, elastic bands can get wrapped around small animals and beaks of birds, which can all cause choking ... animals can get trapped inside the cans and bottles.

The reserve used to be filled with platypuses in the bush creeks, but for many years there have been no sightings of this animal due to the amount of littering being undertaken.

Several students chose sites where people with disabilities could participate in the CUA Day. Meeting and working alongside these community members enriched their learning and understanding about the range of experiences offered to everyone in reaching common goals. This was described aptly by one student:

Education is key — despite there being a lot of bins in the area the general public just tossed their rubbish anywhere. We need to help organisations such as this one [referring to persons with a disability] to build the population's understanding of why the environment is important — small changes help the environment.

Preservice teachers applauded CUA as a community organisation, and through their work became aware of the deep impact that their personal actions have on the environment, such as their consumption of manufactured products and resources and how to dispose of them, and the need to protect the environment for future generations.

Theme 2: Preservice Teachers' Awareness of their Developing Content Knowledge and Understanding About the Environment and Sustainability Issues

Based on available data, it appears that preservice teachers decided to make positive decisions and to undertake positive actions to protect and conserve the natural world, and to enhance environmental sustainability. This was evidenced by all participants being able to articulate some understanding of the environment and its importance to living things through interactions between living things and between living and non-living components of the environment. When participants described the effect of rubbish at their site, it was in terms of its effect on plants and animals as well as its effect on water and soils. The effect of toxic leakage and corrosion from dumped rubbish on biota was well understood, with much of this information obtained by participants speaking with the site manager and other community members on the day. Evidence for this

community engagement was seen in the photographs participants used in their in-class presentations and typified by three written comments:

We now strongly understand that it is our personal responsibility as active Australian citizens to prevent this [referring to invasive species and rubbish] situation from happening and get involved and make a difference.

It was evident that pollution is an ever-growing issue that is destroying our natural environment. The troubling issue was made a visual reality [on CUA Day].

We reflect[ed] on ways of ... protecting environments through informed actions.

Sustainability was described by participants in a number of ways depending on their level of understanding. Those with naive understandings quoted definitions from reputable dictionaries, prescribed textbooks or the internet, while those with deeper understanding correctly wrote about sustainability using their own words and linked present needs for resources with those of future generations. Examples of basic understanding of sustainability were:

Sustainability — an important aspect in care for the environment, which flows naturally out of and is enriched by those who are concerned to preserve the environment and our duty of care towards the natural environment.

Sustainability — as the ability to meet present needs without jeopardising these same needs for future generations.

Participants with a more sophisticated understanding of sustainability linked the concept to the environment, resources, community involvement, present and future needs, and ecological balance. The following two quotes are illustrative of their more holistic understanding:

When talking about sustainability, we are referring to ecologically beneficial actions, for instance, waste and water minimisation. This can be done through using our resources more sensibly and reducing our ecological footprint; focus on responsible disposal of rubbish — we can make an incredible difference for future generations; removal of rubbish — we can support human, plant and animal life.

Environmental sustainability can be defined as the quality of not being harmful to the environment or depleting natural resources, and thereby supporting long-term ecological balance. The term 'sustainability' essentially means living within the resources of the planet without damaging the environment. In order to achieve sustainability, we as a community must perceive a long-term view of how our actions affect future generations and make sure we do not deplete resources or cause pollution at rates faster than the Earth is able to renew them.

From participants' comments, it appears that understanding about the environment and sustainability was garnered by most participants from their own and their site manager's experiences of the CUA Day and further developed for the in-class presentation and written work. It would seem that for many of these preservice teachers, being actively involved in the CUA Day drew their attention in positive ways to the environment and issues of sustainability.

Theme 3: The Power of Community Participation in Events That Foster Responsibility for the Common Good, the Environment and Society

There were no reports from students that they had been involved previously with CUA or any other environmental work, either paid or voluntary. Although participants had heard about and were supportive of the work of CUA, many initially questioned the instructor as to why they should be involved, and they were sceptical of the value, if any, that their small token contribution could make in removing rubbish. Once students understood the rationale for their involvement, how this involvement would contribute and benefit their learning, and indirectly, future work with young children, they were satisfied. Evidence for this was provided in the written work from two participants:

When I arrived at the site ... it was very reassuring to know that there are large numbers of community members who are willing to devote themselves to ensuring we have a healthy and clean environment.

The experience of CUA Day led to us gaining a valuable insight as to just how large our impact can be on our environment ... we all acknowledge the impact is profound. We have learnt there is an increasing need to raise awareness in others, particularly our future students, on the cause and effects of what our rubbish and litter have in public areas.

Informal discussions between students and with the instructor, and formally in the written component of the assessment task, revealed that CUA Day participation was an overwhelmingly positive learning experience. Students reported enthusiastically on what they had learnt about the environment and sustainability (Themes 1 and 2) but equally emphasised how ‘good’ it felt to be part of a team or group during the activities, and how satisfied they felt at the end of the day when they surveyed the amount and type of rubbish collected and the improved appearance of the site. Students felt empowered knowing that they had made a contribution to improving the environment, despite some initial reservations. They had come to further appreciate in a real sense that as consumers they have a direct responsibility to the environment and to society (via future work with children at school). Moreover, they questioned their own lifestyle and how it needed to become more environmentally sensitive, beginning with simple tasks such as recycling, repurposing, reusing and reducing consumption, thereby acknowledging personal responsibility. Through participation in an in situ experience, the students learnt the deep impact their actions have on the environment and their responsibility to ensure that Earth’s resources are conserved for the common good now and for future generations. Most importantly, they learnt about the benefits of wider community work with people outside their social circle of acquaintances; for example, people with disabilities and those from other social, ethnic and religious groups. Several students summed up the theme of care and stewardship for the Earth’s resources for future generations as follows:

Having done this work so close to home made me realise just how little we know about the environment. I couldn’t believe that all this pollution ... was happening in my local bushland!

Knowledge is power, therefore more individuals who are aware of the issues in regards to pollution, the more chances there are for change.

Finally, we all learnt one certain concept — that rubbish belongs in the bin!

While these participants acknowledged the work of community volunteer groups such as CUA to foster responsibility for the common good, the environment and society, many

felt that local councils and government lawmakers could do more to support volunteer community groups in their environmental and sustainability efforts. Particular comments were directed at these organisations' failures to be vigilant about the removal of rubbish and toxic waste, and to fine offenders.

Learning about stewardship and care for the environment, the result of participation with CUA is explored further in the discussion section.

Discussion

This study reports on the impact that participation with CUA had on preservice primary teachers. While the study has limitations (e.g., small sample size) and is not generalisable to other teacher education courses nationally or internationally, it does provide insights into how one university works with students at the outset of their teacher education course to engage them with EfS as future primary school teachers. Participation in the CUA Day is a powerful learning tool, particularly when integrated with a suite of EfS learning tasks within a preservice primary teacher science education unit associated with developing students' understanding and commitment to sustainability and the environment (Inoue et al., 2016; O'Gorman & Davis, 2013). This assertion is supported by the recent work by Avraamidou (2015) where informal science experiences such as fieldwork supported preservice teachers to develop a contemporary view about science and the nature of scientific work and its importance as a force for the common good. The preservice primary teachers from this study valued their CUA Day experience. They learnt about the environment (e.g., effect of toxins on biota, the introduction of exotics and their effects on endemic species), the inherent value of Australia's landscape, the importance of stewardship and care of the Australian environment, and developed confidence and a desire to incorporate EfS into their teaching. While they have some way to go in their development of pedagogical expertise, these preservice primary teachers have displayed basic understanding of environmental and scientific content knowledge through their engagement with positive environmental practices. Further studies with this cohort may reveal how their experiences influence their EfS teaching (Miles et al., 2006; Summers, Corney, & Childs, 2004) and how this knowledge and understanding translates theory into action during professional experience/school practicum and into the future (Gwekwerere, 2014; Thomas, Girgenti, & Jackson, 2017).

Students in this study reflected positively on CUA Day as an event and about what they had learnt about the environment and the associated science (e.g., toxins, introduction of exotic species) and the community and government's responsibility towards the environment. Anecdotal reports by students indicated that several were keen to participate in further volunteer work in plant nurseries and local council environment groups, indicating that the CUA Day might not be an isolated event in their lives, which bodes well for them as future teachers. It is hoped that these students will incorporate EfS into all areas of classroom practice as they develop their professional identities — for example, using the data from rubbish collection in Maths, to blog their reflections in English, to create photographic collages in Art, and display the corpus of their learning using IT presentation skills (Danielsson & Warwick, 2014; Nielsen et al., 2012). Research by Jones (2013) provides strong support for extending cross-curriculum possibilities, in that being outdoors is a strong stimulus for creativity and group work and 'liberates' students from 'the constraints of the formal classroom and peer judgement' by taking them 'away from the safe world of the classroom to extend their limited world of learning' (p. 107).

Blatt and Patrick's (2014) work on how outdoor experiences influence students' attitudes towards the outdoors has precipitated calls for researchers to explore teachers'

own outdoor experiences, their responses to these, and the activities provided for students. The present study contributes to this 'call' by documenting the positive impact of an outdoor experience on one small cohort of preservice teachers and how their knowledge about the detrimental effects of rubbish on the environment have been realised through participation in an authentic activity. Students successfully worked together both at the CUA site and through subsequent meetings (either in person or via social media), to discuss their final presentations and written work. They shared and negotiated content, views, beliefs and opinions before receiving formal feedback from the instructor. These participants now understand the importance of the environment and are beginning to develop their own worldviews on these and related issues. Teacher educators would be well advised to provide opportunities for preservice teachers to critically reflect on their beliefs and knowledge about EfS and to enhance that understanding before they are expected to implement syllabus and curriculum requirements when they begin their teaching careers, a finding supported by the recent literature review of Jeronen, Palmberg, and Yli-Panula (2017) on the teaching methods for promoting sustainability with student-centred, first-hand authentic experiences.

Even before their university studies began, these preservice teachers may have had aspirations to act with environmental sensitivity, a finding already reported by Kennelly, Taylor, and Maxwell (2008) who reported a high proportion of students with a strong or very strong desire to improve the environment. CUA Day participation could well have enhanced that sensitivity by informing them about the breadth, depth and location of rubbish, the effect of rubbish on both endemic and exotic biota, and the importance of their own environmental responsibilities. Clearly, participants' awareness and sensitivity is important, but this must be supported with in-depth science knowledge and pedagogical content knowledge gained through participation in science curriculum units and professional experiences in schools for it to become part of preservice teachers' efficacy (Effeney & Davis, 2013; Gwekwerere, 2014; Mills & Thomas, 2013).

Preservice teacher education students' participation in community work such as CUA demonstrated to themselves (and was acknowledged by the instructor after in-class presentations) that they had significant power as individual citizens to make a difference, with many commenting on the poor state of their local CUA site. There was no display of lethargy toward EfS, and through their participation in CUA Day, students have developed their capacity to source information (e.g., from the CUA website) and to draw on the expertise of local organisations (e.g., local councils) and individuals such as CUA site managers (Kennelly et al., 2012). These are developing preservice teacher attributes Stevenson, Ferreira, and Emery (2016) might consider as evidence of authentic learning, including a case for examining 'sites and spaces where this occurs' (p. 7) and 'collective capacity to think critically and creatively about socioecological issues' (p. 7).

Early participation by preservice primary teachers in a voluntary community environment event such as CUA Day appears to be a powerful foundational learning and teaching experience. Social interactions on the day between experts (i.e., site managers) and other knowledgeable volunteers required students to be engaged and involved with knowledge construction, learning in novel contexts and thus gaining new understandings (Tenenbaum, To, Wormald, & Pegram, 2015). This sentiment was echoed through the voice of one such future teacher:

I learnt that although Australia is very proud of its waterways and the environment in general, we do not always treat it with the respect it deserves. In the future I would like to contribute more to helping the environment, especially in the form of education about the areas where that rubbish ends up.

The future looks bright for young children's learning and working in the outdoor environment when preservice teachers hold such positive, grounded views about the environment and sustainability.

Conclusion

One aim of the science education unit that provided the context for this study was to begin to develop knowledge and understanding about the environment and sustainability in preservice primary teachers. While the sample size was small (and thus a limitation of the study in terms of written material), participants were active learners, as evidenced in their written work. It would appear that these preservice teachers have gained some valuable knowledge and understanding about the environment and sustainability from the CUA Day that could form a positive basis for future university studies, with the CUA Day assessment task providing provocation for action.

I believe asking everyone to complete clean up Australia Day was great as it allowed many people such as myself who had always wanted to do it to actually give it a go while doing common good for our country.

While further research is needed on how best to support preservice primary teachers to become better informed and to gain confidence in their ability to provide student-learning experiences about the environment and sustainability, the findings of this study provide an example of a possible approach. Participation in the CUA Day allowed preservice primary teachers to work with environmentally concerned community members, while requirements within the assessment task provided opportunities for students to showcase their perspectives on the environment and sustainability issues. The challenge remains for teacher education courses to manage the expectations of preservice teachers when their school practicum experiences may differ from what they had envisaged, an expectation that can be managed when preservice teachers understand that building partnerships with school colleagues by sharing knowledge, understanding and commitment about EfS takes time, and in the long term there are mutual benefits to young people, the school, and the local community.

It would appear that involvement in the CUA Day opened windows of possibilities for these students as future primary school teachers, as shown in the following comment:

I have come to realise that I play an extremely significant role in making a difference for the next generation's understanding of the importance of sustainability, as well as being involved in community programs. I have also learnt the importance of respecting the Indigenous people of Australia by preserving land they hold of great value to their beliefs.

CUA Day is a win-win event: a win for rubbish-free local areas and a win for possible future environmental and sustainability action by groups of preservice teachers. While care for nature and the environment, stewardship, environmental custodianship, and prudence in the use of the Earth's resources were acknowledged as important by participants in their written work, the question remains as to why no one had been involved with previous community environment work. Answers to this question and those dealing with future actions plans through further research would provide additional insights into preservice primary teachers' perspectives on EfS and what is of value and importance in the environment, a notion well captured by Australian novelist and environmentalist Tim Winton (2015) in his work at the time of the study:

More and more of us take pride in our natural heritage. At last it seems we've begun to see past Dampier's infernal flies, to behold in our remarkable diversity

of habitats, landforms and species the riches of a continental isolation that so long troubled us. Things once seen as impossibly homely, weird or simply perverse are now understood as precious ... not only have we started to integrate and internalise all these lessons, we're learning to appreciate the fragility of what sustains us.

Acknowledgement

Thanks to the students who provided de-identified copies of their written work.

Keywords: preservice science primary teacher education, environmental education, sustainability education, preservice teachers, elementary teachers

References

- Australian Curriculum, Assessment and Reporting Authority (ACARA). (n.d.). Cross-curriculum priorities. Sydney, Australia: Author. Retrieved from <http://www.australiancurriculum.edu.au/science/cross-curriculum-priorities>
- Amirshokooi, A. (2010). Elementary pre-service teachers' environmental literacy and views toward science, technology, and society (STS) issues. *Science Educator*, 19, 56–63.
- Avraamidou, L. (2015). Reconceptualizing elementary teacher preparation: A case for informal science education. *International Journal of Science Education*, 37, 108–135.
- Blatt, E. (2014). An investigation of the goals for an environmental science course: Teacher and student perspectives. *Environmental Education Research*, doi:10.1080/13504622.2014.918935.
- Blatt, E., & Patrick, P. (2014). An exploration of pre-service teachers' experiences in outdoor 'Places' and intentions for teaching in the outdoors. *International Journal of Science Education*, 36, 2243–2264.
- Brigido, M., Borrachero, A., Bermejo, M., & Mellado, V. (2013). Prospective primary teachers' self-efficacy and emotions in science teaching. *European Journal of Teacher Education*, 36, 200–217.
- Cantrell, P., Young, S., & Moore, A. (2003). Factors affecting science teaching efficacy of pre-service elementary teachers. *Journal of Science Teacher Education*, 14, 177–192.
- Creswell, J.W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches*. Los Angeles, CA: Sage.
- Cutter-Mackenzie, A., & Edwards, S. (2006). Everyday environmental education experiences: The role of content in early childhood education. *Australian Journal of Environmental Education*, 22, 13–19.
- Cutter-Mackenzie, A., & Smith, R. (2003). Ecological literacy: The 'missing paradigm' in environmental education (part one). *Environmental Education Research*, 9, 497–524.
- Danielsson, A., & Warwick, P. (2014). You have to give them some science facts: Primary student teachers' early negotiations of teacher identities in the intersections of discourses about science teaching and about primary teaching. *Research in Science Education*, 44, 289–305.
- Denzin, N. (Ed.). (2011). *The Sage handbook of qualitative research*. Thousand Oaks, CA: Sage.
- Effeney, G., & Davis, J. (2013). Education for sustainability: A case study of pre-service primary teachers' knowledge and efficacy. *Australian Journal of Teacher Education*, 38, 32–46.

- Gwekwerere, Y. (2014). Pre-service teachers' knowledge, participation and perceptions about environmental education in schools. *Australian Journal of Environmental Education*, 30, 198–214.
- Inoue, M., O'Gorman, L., & Davis, J. (2016). Investigating early childhood teachers' understandings of and practices in education for sustainability in Queensland: A Japan-Australia research collaboration. *Australian Journal of Environmental Education*, 32, 174–191.
- Jeronen, E., Palmberg, I., & Yli-Panula, E. (2017). Teaching methods in biology education and sustainability education including outdoor education for promoting sustainability: A literature review. *Education Sciences*, 7, 1. doi:10.3390/educsci7010001.
- Jones, J. (2013). Re-discovering the arts: The impact of engagement in a natural environment upon pre-service teacher perception of creativity. *Thinking Skills and Creativity*, 8, 102–108.
- Kempton, W., & Holland, D.C. (2003). Identity and Sustained Environmental Practice. In S. Clayton & S. Opatow (Eds.), *Identity and the natural environment: The psychological significance of nature* (pp. 317–341). Cambridge, MA: MIT Press.
- Kennelly, J., Taylor, N., & Maxwell, T. (2008). Addressing the challenges of preparing Australian pre-service primary teachers in environmental education. *Journal of Education for Sustainable Development*, 2, 141–156.
- Kennelly, J., Taylor, N., & Serow, P. (2012). Early career primary teachers and education for sustainability. *International Research in Geographical and Environmental Education*, 21, 139–153.
- Miles, R., Harrison, L., & Cutter-Mackenzie, A. (2006). Teacher education: A diluted environmental education experience. *Australian Journal of Environmental Education*, 22, 49–59.
- Mills, R., & Thomas, L. (2013). Integrating education for sustainability in preservice teacher education: A case study from a regional Australian University. *Australian Journal of Environmental Education*, 29, 152–164.
- Moseley, C., Reinke, K., & Bookout, V. (2003). The effect of teaching outdoor environmental education on elementary preservice teachers' self-efficacy. *Journal of Elementary Science Education*, 15, 1–14.
- Nielsen, W., Andersen, P., Hurley, A., Sabljak, V., Petereit, A., Hoskin, V., & Hoban, G. (2012). Preparing action competent environmental educators: How hard could it be? *Australian Journal of Environmental Education*, 28, 92–107.
- Nilsson, P., & Loughran, J. (2011). Exploring the development of pre-service science elementary teachers' pedagogical content knowledge. *Journal of Science Teacher Education*, 23, 699–721. doi:10.1007/s10972-011-9239-y.
- Office of Environment and Heritage, Department of Premier and Cabinet. (n.d.). *School Environment Management Plan (SEMP)*. Retrieved from <https://www.environment.nsw.gov.au/resources/sustainableschools/SEMPguideweb.pdf>
- O'Gorman, L., & Davis, J. (2013). Ecological footprinting: Its potential as a tool for change in preservice teacher education. *Environmental Education Research*, 19, 779–791.
- Palmer, D. (2006). Sources of self-efficacy in a science methods course for primary teacher education students. *Research in Science Education*, 36, 337–353.
- Smith, G., & Stevenson, R. (2017). Sustaining education for sustainability in turbulent times. *Journal of Environmental Education*, 48, 79–95.
- Stevenson, R., Ferreira, J., & Emery, S. (2016). Environmental and sustainability education research, past and future: Three perspectives from late, mid, and early career researchers. *Australian Journal of Environmental Education*, 32, 1–10.

- Strauss, A., & Corbin, J. (1998). *Basics of qualitative research* (2nd ed.). Thousand Oaks, CA: Sage.
- Summers, M., Corney, G., & Childs, A. (2004). Student teachers' conceptions of sustainable development: the starting points of geographers and scientists. *Educational Research*, 46, 163–182.
- Story of Stuff Project. (2017). *The story of stuff*. Retrieved from <http://storyofstuff.org>
- Tenenbaum, H., To, C., Wormald, D., & Pegram, E. (2015). Changes and stability in reasoning after a field trip to a natural history museum. *Science Education*, 99, 1073–1091. doi:10.1002/scs.21184
- Thomas, L., Girgenti, S. & Jackson, C. (2017). Pre-service teachers' attitudes toward education for sustainability and its relevance to their learning: implications for pedagogical practice. *Environmental Education Research*, 23, 324–347.
- Wilson, S. (2012). Drivers and blockers: Embedding education for sustainability (EfS) in primary teacher education. *Australian Journal of Environmental Education*, 28, 42–46.
- Wilson, R., & Kittleson, J. (2012). The role of struggle in pre-service elementary teachers' experiences as students and approaches to facilitating science learning. *Research in Science Education*, 42, 709–728.
- Winton, T. (2015). *Island home: A landscape memoir*. Melbourne, Australia: Penguin Books.

Author Biography

Dr Wilhelmina van Rooy is Professor of Learning and Teaching in the Faculty of Education and Arts at the Australian Catholic University. Her research interests include secondary science education in particular biology, assessment and multi-modal representations and more recently primary science teacher education.