CHAPTER TWO

MEETING COMMITMENTS FOR A SUSTAINABLE FUTURE:

ENVIRONMENTAL EDUCATION IN PRE-SERVICE TEACHER EDUCATION

Amy Cutter-MacKenzie and Daniella Tidbury

ABSTRACT

Education is key to the implementation of commitments made at the recent United Nations World Summit on Sustainable Development (WSSD) in Johannesburg. The Implementation Plan demands communication of the issues and engagement of people in action and informed decision-making for an improved environment. It positions education as a critical tool for social change and places high expectations upon education and more specifically upon formal environmental education. However, there are concerns that prospective and practising teachers are not up to the challenge.

This paper reports the results of two independent studies, namely a qualitative ethnographic study and a quantitative survey, which investigated final year primary education student teachers' pedagogical content knowledge of environmental education. Both studies revealed that student teachers possess limited knowledge of environmental education content and pedagogy. The student teachers tended to dismiss the importance of substantive knowledge, preferring to focus upon the formation of attitudes towards the environment. Thus, the

results of this study suggest that Australian primary schools will struggle to meet the outcomes agreed upon at the World Summit for Sustainable Development

These findings have significant implications for environmental education and, in particular, for the commitments made at Johannesburg. A lack of teacher education in environmental education may explain why primary schools are not meeting policy expectations in this area of learning. However, this study suggests that a renewed focus upon knowledge, specifically pedagogical content knowledge, is timely and necessary in environmental education if the field is to evolve.

EDUCATION: KEY TO A SUSTAINABLE FUTURE

As the recent United Nations World Summit on Sustainable Development reached its conclusion, nation states reaffirmed their commitment to protecting environments and improving the quality of life for people around the world (United Nations, 2002). Environmental and biodiversity conservation, changing unsustainable patterns of production and consumption and protecting and managing the natural resource base, poverty eradication and socio-economic development were key ingredients of the sustainable development plan agreed upon at Johannesburg (United Nations, 2002).

Education was identified as a cross-cutting theme within the Implementation Plan (United Nations, 2002) which commits governments to undertaking concrete actions and measures at all levels to make a transition towards a more sustainable future. Goldstein (2002) reiterates such views and maintains that without education this plan of action cannot be implemented. Communication of issues and engagement of people in action and informed decision-making for an improved environment are central to the Implementation Plan (United Nations, 2002).

The Implementation Plan provided that to achieve an improved environment and quality of life we need active and knowledgeable citizens as well as informed decision makers capable of making the right choices about complex and interrelated economic, social and environmental issues facing the world today (UNESCO, 2002, p. 7).

UNESCO (2002) is particularly critical of the lack of social learning taking place in schools and teacher education. The Implementation Plan calls for education that questions our current mental models and the assumptions which underpin them and for reflection upon cultural models of understanding, rather than a focus upon the development of attitudes for the environment (UNESCO, 2002, p.7). The Implementation Plan calls for 'deeper, more ambitious ways of thinking about education, one that retains a commitment to critical analysis while fostering creativity and innovation' (United Nations, 2002, p.8). This interpretation of education has been promoted by environmental educators such as Saul (2000) who calls for culturally critical perspectives and by Huckle (1983;1996;1997) who argues that only through asking socially critical questions can we progress towards a more sustainable future. UNESCO (2002, p.9) notes that 'society must be deeply concerned that much of current education falls far short of what is required'. In particular:

> *Few attempts are made to link the health of people to the health and sustainability of ecosystems: and students and community members are rarely asked to* reflect upon the impacts of their activities, *and those of their families and wider society on the functioning of ecosystems*
>
> (UNESCO, 2002, p. 4).

This is despite the fact that the ambitious goals for education outlined by UNESCO (2002) in the abovementioned document mirror those contained in earlier environmental education documents which have informed practice over the past thirty years. It was the 1972 United Nations Conference on Human Environment which formally acknowledged the emerging field of environmental education and recommended it be promoted in all countries. The United Nations International Environmental Education Programme (IEEP 1975-1995) which resulted from this recommendation did much to inspire and promote environmental education policies designed to question thinking and assumptions and promote action for change. The 1977 Tbilisi Declaration gave momentum to these early commitments to environmental education, although translating these into classroom practice, as UNESCO (2002) recognises, has proved to be a considerable challenge.

ENVIRONMENTAL EDUCATION IN THE PRIMARY SCHOOL YEARS

> *There are over 60 million teachers in the world – and each one is a key agent for bringing about the change in lifestyles and systems that we need*
>
> *(UNESCO, 2002, p. 11).*

Many authoritative international documents confirm the important role that teachers play in bringing about the social change needed to address environment and sustainable development concerns (Tilbury 1993; 1994; 2002). Teachers are seen as key multipliers who can help society learn from past actions, question current relationships with the environment and consider actions towards a sustainable future. However, there is little evidence to suggest that teachers, in particular primary school teachers, are taking on board the goals set out in the various UNESCO agreements such as those identified in Agenda 21 (UNESCO-UNEP, 1992).

Accordingly, little is known about the extent to which environmental education has been incorporated into school systems, particularly in regards to primary schools. In Australia, there have been relatively few studies examine environmental education practice. Despite the rising levels of policy advocacy for environmental education, the evaluation studies that have been conducted indicate that policy expectations are rarely met (Cutter, 1998, 2001a, 2001b; Cutter-Mackenzie, 2003 forthcoming; Gough, 1997; Greenall, 1981; Murdoch, 1989; Phipps, 1991; Spork, 1990, 1992; Walker, 1995a, 1995b).

In 1973 and 1974 Linke (1980) conducted a combined qualitative and quantitative national study of environmental education practice in Australia. In short, Linke's (1980) study revealed that the implementation of environmental education was scant in Australian primary schools, and that primary school teachers' knowledge of environmental education was quite limited. Linke (1980) also discovered that environmental education was occasionally included with other discipline areas, namely science education and social studies (studies of society and environment).

Robottom et al. (2000) conducted a qualitative study, using a case study methodology, in five different Australian primary schools. Like Linke (1980), Robottom et al. (2000) also found that environmental education is most often incorporated into subjects such as 'studies of society and environment'. Robottom et al. (2000) also reported that, in some cases, 'environmental education curriculum has moved out of the school and into the community' (Robottom, 2000, p. 146). Robottom et al. (2000, p. 157) concluded that 'behind every successful environmental education program is a committed teacher'.

Stapp and Stapp (1983) conducted 530 interview sessions about environmental education with various people, including primary and secondary school teachers, students, educational organisations, ministers of

education and the environment, business and industrial representatives and the general public. This study outlined over one hundred items identifying the environmental education advancements, with regards to policy and curriculum, at the state and territory levels in Australia. Despite a rigorous methodological approach, this study was limited as issues to do with teachers' practices, knowledge and attitudes about environmental education, for example, were not investigated.

Other than the abovementioned studies (see Linke, 1980; Robottom, 2000; Stapp, 1983), only small-scale regional (see Clark, 1997; Cutter, 1998; Phipps, 1991; Skamp, 1996; Spork, 1990, 1992; Walker, 1995a, 1995b) and state (see Cutter, 2001a, 2001b; Cutter-Mackenzie, 2003 forthcoming; Education Department of Victoria, 1981; Greenall, 1981) investigations have been carried out.

All of these studies, save Skamp (1996) and Clark and Harrison (1997), claim that the present status of environmental education practice is substandard. Contrary to wider belief, Skamp's (1996) and Clark's and Harrison's (1997) New South Wales regional studies suggest that teachers are practising environmental education action components, namely education *for* the environment. Clark and Harrison (1997, p. 34), hypothesise that 'many Australian primary schools are addressing environmental education, although they might not call it that'.

Notwithstanding, Spork (1990; 1992) claims that primary school teachers consider environmental education to be an important learning area, but seem to lack the skills and knowledge to effectively practise (teach) environmental education. Similar statements have also been echoed in the works of Cutter-Mackenzie and Smith (2001a; 2001b; 2003 forthcoming), Gough (1997), Greenall (1981), Murdoch (1989) and Phipps (1991).

According to Tilbury (1992; 1994), this problem has been largely associated with the lack of preparation which teachers receive in their teacher education. In the case of Queensland Australia, Spork (1990; 1992) found that only 4.9% of a sample of primary school teachers had undertaken pre-service training in environmental education with 6.6% having received later in-service training. Cutter-Mackenzie and Smith (2001a; 2001b; 2003 forthcoming) further reiterated such trends in a state-wide (Queensland) study of primary school teachers.

To date, a dearth of research exists regarding student teachers' interpretations of and knowledge about environmental education. Scott (1996)

notes that there is yet to be comprehensive research about how and why novice teachers implement environmental education in the classroom, but suggests that the awareness, motivation and disposition of the individual novice teacher will determine the extent to which opportunities for teaching environmental education will be taken up.

In accordance with Scott's (1996) research, this paper focuses upon student teachers' knowledge, specifically pedagogical content knowledge, about environmental education. We now discuss the latter concepts, before turning to a discussion of the research methodology.

A Focus upon Pedagogical Content Knowledge

There is a well documented tension between traditional knowledge as 'knowing facts, being able to recall important ideas and concepts, having a well-stocked memory' and knowledge as 'knowing how to do things, being able to evaluate information, having access to learning skills and competencies' (Wilson, 1998). The former view did not prevail until the 1970s and 1980s as education theorists turned to learning theory as the basis of communication and pedagogy.

Palonsky (1993, pg.7) maintains that the profession of teaching assumes 'that good teachers possess a special knowledge base – 'a codified or codifiable aggregation of knowledge, skill, understanding, and technology, of ethics and disposition, of collective responsibility' – as well as a means for representing and communicating it'. Shulman's (1987) work has brought focus to this view. Shulman (1987, pg.8) maintains that 'pedagogical content knowledge' lies at the heart of teaching because it represents the ways in which teachers 'blend academic content with teaching methods, organize instruction, and unite all these elements with the interests and abilities of the students in their class'. Shulman (1987) claims that 'teachers' knowledge of the content affects both what teachers teach and how they teach it' (cited in Grossman, 1995, pg.21). In this way, 'teachers are likely to emphasize those areas in which they are more knowledgeable and to avoid or de-emphasize the areas in which they have relatively less content knowledge' (cited in Grossman, 1995, pg.21). To this extent, it could be contended, based upon the arguments presented in this paper, that primary school teachers, including prospective student teachers, may avoid or de-emphasise environmental education if they have relatively less content knowledge about environmental education. Such propositions can be situated in the wider debates surrounding teacher knowledge preparation.

Grossman, Wilson and Shulman (1989) outline four types of 'pedagogical content knowledge', namely content knowledge, substantive knowledge, syntactic knowledge, and beliefs about the subject matter:

- ☑ *content* is the substance of the discipline, the facts, principles, concepts (Grossman, 1989, pg.27);
- ☑ *substantive knowledge* is associated with the structures of the discipline and the paradigms in which such structures are located so as to guide inquiry (Grossman, 1989, pg.29);
- ☑ *syntactic knowledge* is created in the discipline, about the canons of evidence (Grossman, 1989, pg.29); and
- ☑ *beliefs* influence what teachers select to teach and in turn how such subject matter is interpreted. Grossman, Wilson and Shulman (1989) point out that beliefs have not been thoroughly researched and are less understood than the other identified areas of knowledge (cited in Whelan, 1992, pg.82).

This 'pedagogical content knowledge' framework is grounded in the academic rationalist tradition which assumes that the teacher is an expert of the discipline/s and is able to effectively disseminate such knowledge to students. However, Whelan (1992) argues that Shulman's academic rationalist model of 'pedagogical content knowledge' is rarely implemented nor achieved in classrooms. Whelan (1992, pg.83) further explains: 'it is acknowledged... even among its supporters (Shulman, 1987)... that there is inadequate support for the claim that this model is achieved often'.

According to Wilson (1998), 'knowledge' as a focus in education has been more or less abandoned for over thirty years now. In Wilson's (1998, p. 3) view, this emerged during the 1960's and 70's when '... while we weren't watching, knowledge became a bad thing. It was erased from educational offer, or at least reduced substantially in importance'. Wilson's (1998, p. 5) explanation of this shift is that educators who anticipated the postmodern age were antagonistic to knowledge and reason, especially empirical knowledge and scientific rationality. Such teachers sought self-realisation in personal experience, creativity and imagination as a means for understanding the world, as a reaction to the perception that teaching in the 1960's was too 'fact' oriented and susceptible to rapid changes in knowledge content.

Thus, Bernstein's (1990) position is that an emphasis on the internal workings of the learner rather than measurable learning outcomes have dominated teaching and teacher education for at least thirty years. This is

also reflected in the acquisition-competence model that dominates thinking and practice in much contemporary pedagogy.

Accordingly, the emphasis and importance of 'knowledge', both in primary schools and teacher education courses has declined. In the environmental education field, it is not surprising then that Cutter-Mackenzie and Smith (2001a; 2001b; 2003 forthcoming) point out that, in attempting to produce environmentally educated teachers and students, curriculum developers and teachers have promoted and implemented environmental values, in lieu of knowledge. Ormrod and Cole (1996, pg.37) have also reported that geography, a closely related subject area to environmental education, 'is a discipline for which many teachers have little content knowledge or pedagogical content knowledge'. Thus, if the commitments made at Johannesburg are to be met, a renewed focus upon knowledge, specifically pedagogical content knowledge, is necessary.

INVESTIGATING ENVIRONMENTAL EDUCATION PRACTICE: SEEKING EVIDENCE

Two independent investigations were carried out for the purpose of this paper.The first investigation was a qualitative ethnographic study of twenty-three pre-service teacher education students. The second investigation consisted of a small-scale quantitative survey of twenty-one teacher education students.

Investigation one

The researchers investigated two pre-service teacher education courses in two different universities (U1 and U2). Drawing on the experience of Tilbury (1993), the study employed an ethnographic interviewing approach to capture the complexity and key variables within the pre-service teacher education context. Twenty-three informants (fourteen and nine fourth year students in U1 and U2 respectively), enrolled in two different pre-service environmental education courses were interviewed. Both cohorts received pre-service environmental education preparation. U1 students received their training by studying a specialised subject, whereas U2 students received their training through integrated social science subjects. This paper does not specifically compare the two courses, although the data suggest some differences between the U1 and U2 students' understandings. Rather, the focus of this paper is about the common features of environmental education internalised by students in both samples.

The standard ethnographic interview technique of intensive interviewing, also referred to as 'unstructured interviewing', was utilised (Lofland, 1995; 1984). In total, twenty-three one to two hour interviews were conducted. Further, Lofland and Lofland's (1995; 1984) techniques for generating categories and patterns were applied for analysing interview data.

Investigation Two

Twenty-one student teachers participated in a small-scale survey about environmental education, with nineteen female participants and two male participants, accurately depicting the gender imbalance found within primary school classrooms. The questionnaire was personally administered to two tutorial classes in a teacher education programme. As such, all student teachers participated in the survey.

As this study was exploratory, each item was analysed individually. Nominal scales were applied for collating demographic data, albeit age which was collected using numerical scales. As the survey consisted of only closed ended questions, ordinal and ranking techniques were utilised, such as likert and multiple choice questions. Univariate analysis techniques (descriptive statistics) were applied to each individual question. The quantitative data collected was analysed using the statistical software package for the social sciences, SPSS (2000).

Although the chosen methodology allowed the researchers to obtain an understanding of student teachers' pedagogical content knowledge of environmental education, by no means are the findings presented in the next section conclusive or definitive rather a snapshot view of current practices.

STUDENTS TEACHERS' PEDAGOCIAL CONTENT KNOWLEDGE OF ENVIRONMENTAL EDUCATION

Pedagogical Purposes of Environmental Education

The researchers sought to determine the pedagogical and substantive environmental education knowledge owned by the U1 and U2 novice teachers. In this regard, the following comment is a typical perception of the purpose of environmental education offered by U1 and U2 student teachers:

> *To develop an awareness in relation to environmental issues and develop consequential attitudes (U1).*

Both the interviewed informants and surveyed participants identified the development of 'action' and 'attitudes' as the core purposes of

environmental education within the primary school curriculum. The latter is typified in the following student teacher comments:

'Attitudes are more important than knowledge.'

'Without attitudes, knowledge seems useless.'

'I think it really starts with the children's attitudes towards the environment.'

'Depending on their attitudes, their skills and knowledge will build from there.'

'Teachers as a whole can give a child the emotion to go out and take action.'

The implicit message of such comments is that environmental education is treated as an exercise in inducing 'positive' attitudes towards a socially valued object. Moreover, university based teacher education reinforces 'attitude' by its emphasis on what Wilson (1998) refers to as 'the down-playing of knowledge'. Students are positioned by social experience and tertiary education to adopt a relativist view of knowledge (see Orr, 1992; Wilson, 1998). The students in question confirmed such propositions, as exemplified in the following comments: 'Knowledge will always be up-dated and out-dated.' 'Knowledge can be disproved many years later.' 'Knowledge is always changing.'

To this extent, the interviews reinforced the survey results which revealed that student teachers were primarily concerned with the development of values and attitudes in environmental education.

Environmental Education Principles

During the interviews, the researchers sought to engage the participants in discussions about environmental education principles, such as those documented in the environmental education literature. Students struggled to identify principles, and tended to affirm their lack of knowledge about environmental education. The survey further reinforced student teachers' lack of knowledge about the principles of environmental education and their awareness of their limitations in this area. Eighty percent of those sampled rated their knowledge about environmental education as *'low* to *average'*. Ten percent of the sample rated their knowledge as *'very low'*.

Environmental education is grounded in a field of knowledge including 'facts'. It has a specific vocabulary, a set of concepts and theories, and should motivate disciplined inquiry if it is to effectively develop an environmentally

informed, committed and active citizenry (Gardner, 1999). Students seemed to lack not only the vocabulary, but also an understanding of the basic concepts about the environment as well as theories associated with learning in environmental education.

Environmental Concepts

The questionnaire (second investigation) included three multiple-choice questions about three different environmental concepts, namely carrying capacity, pollution and the greenhouse effect. As such, the sample revealed a low understanding of the latter concepts. For instance, the participants were asked 'Which of the following phrases refers to the potential ability of a system to support population growth without harming the environment?' As Figure 1. conveys, eighty-seven percent of the sample selected the incorrect answer, with only thirteen percent selecting the correct response (carrying capacity).

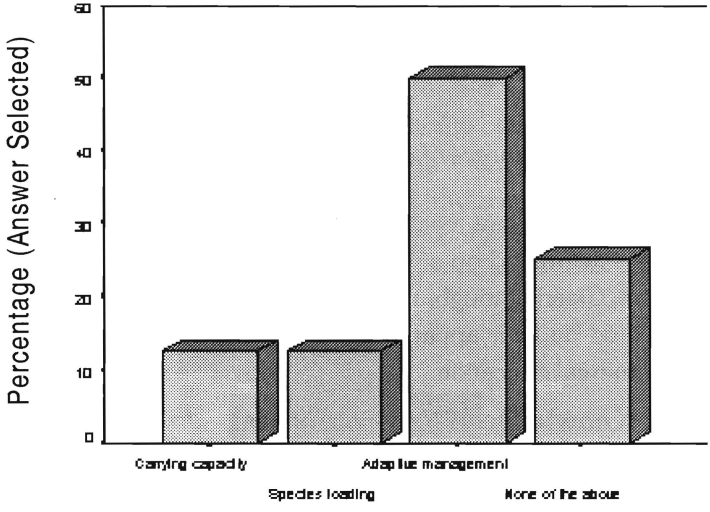

Figure 1 *Concept Question (carrying Capacity)*

Dove's (1996) research of student teachers' understanding of environmental concepts further supports this finding. She (1996, p. 97) wrote that there appears to be 'widespread confusion' among student teachers insofar as understanding key environmental concepts. This type of finding was common in both investigations, suggesting that the level of concept awareness and consequential theoretical foundation is low in these samples of prospective teachers.

Notwithstanding, as shown in Figure 2. seventy percent (thirty percent and forty percent respectively) of student teachers indicated that the environment is in a state of crisis.

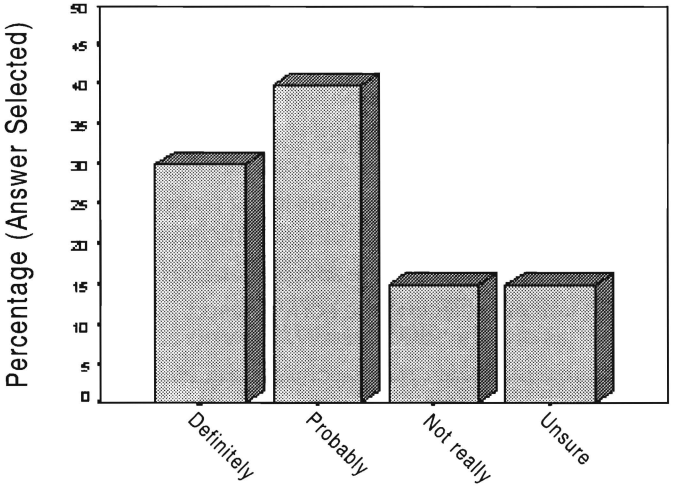

Figure 2 *Belief in the Concept of an Environmental Crisis*

The majority of student teachers in both investigations indicated that 'radical' action is warranted on a widespread scale to protect and preserve the environment. Clearly though, their ability to participate in such action is severely hampered by their apparent lack of knowledge in and about the area of environmental education.

Pedagogical Knowledge of Environmental Education

At least three quarters of the interviewed student teachers acknowledged that they lacked significant knowledge of environmental education and environmental concepts. They displayed general, simplistic views when asked to define and conceptualise environmental education in a pedagogical framework. Comments tended to lack substantive content and terminology associated with environmental education processes. As Figure 3. illustrates, the survey further confirmed such findings with seventy-four percent of the sample indicating that they 'had never heard of the (common) approaches education *about* the environment, education *in* the environment and education *for* the environment'.

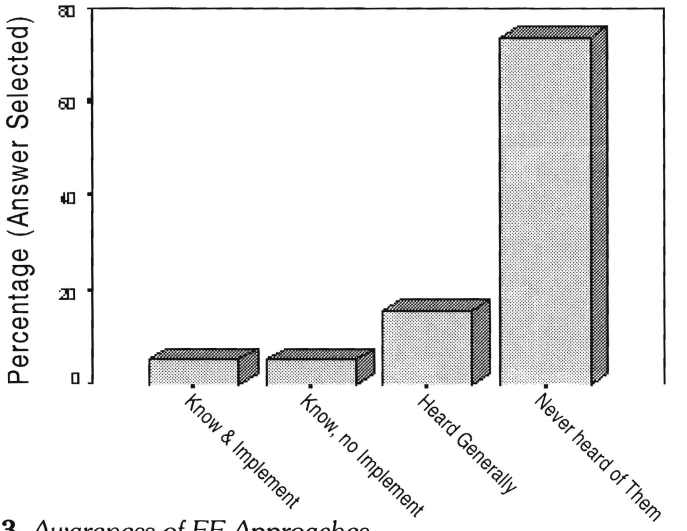

Figure 3 *Awareness of EE Approaches*

Notwithstanding, both the interviewed students and surveyed participants were not particularly concerned about their own lack of knowledge. As shown in Figure 4. the majority of the surveyed participants disagreed that teachers need a thorough knowledge of environmental education concepts, approaches and theories in order to practise environmental education at the primary school level.

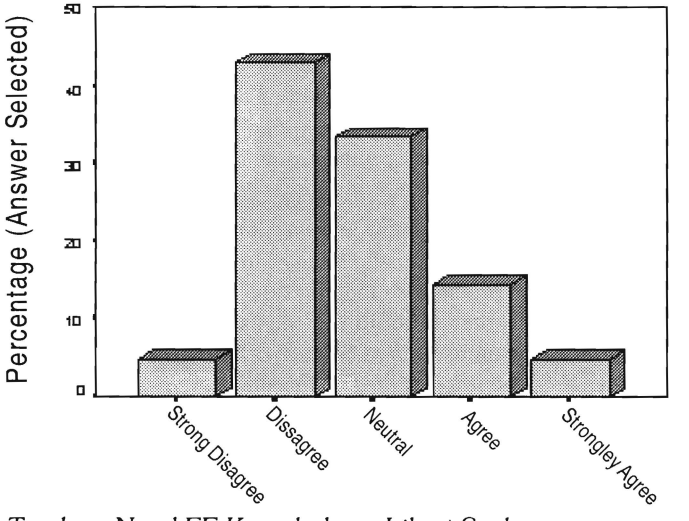

Figure 4 *Teachers Need EE Knowledge – Likert Scale*

Clearly the student teachers who participated in these independent investigations lack content, substantive and syntactic knowledge of environmental education. Their beliefs about the subject matter (environmental education) are also hindered by their lack of knowledge in and about the area. To these ends, more research is needed to identify the core pedagogical content knowledge components of environmental education and the extent to which these are known by student teachers and teachers, and are taught in schools. Indeed, it warrants as a priority area in environmental education and education generally.

CONCLUSION

If the situation captured by this small-scale study is correct, then prospective teachers do not have the pedagogical content knowledge to effectively teach environmental education in primary schools. This has significant implications for environmental education and for the commitments made at Johannesburg. Steps towards a better world require the use of education, including knowledge, as a tool for change. Evidence suggests that, novice teachers in Australia, will not have the necessary pedagogical content knowledge to reorient environmental education practice in primary schools towards approaches promoted at Johannesburg. Even so, if the commitments made at Johannesburg are to be met, a renewed focus upon knowledge, specifically pedagogical content knowledge, is timely and essential Thus, this research suggests that teacher educators, key stakeholders and environmental educators have significant work to do if they are to produce graduates capable of pursuing environmental education for a sustainable future.

ENDNOTES

1. It must be noted that there is no more known about environmental education at the primary school level than there is at the secondary and tertiary levels. However, this paper specifically focuses upon primary level environmental education in the pre-service teacher education domain
2. There is limited research about the inclusion of environmental education in other discipline areas such as Studies of Society and Environment (Social Studies). Thus, the implications of this shift in paradigm are yet to be fully explored.
3. Shulman (1987, pg.8) identifies seven categories of teacher knowledge. These are: content knowledge; general pedagogical knowledge; curriculum knowledge; knowledge of the learners and their characteristics; knowledge of educational contexts, knowledge of educational ends, purposes, and

values and their philosophical and historical grounds; and pedagogical content knowledge which is 'that special amalgam of content and pedagogy that is uniquely the province of teachers, their own special form of professional understanding'

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