

# Are Educational Outcomes Relevant to Environmental Education Addressed by Primary School Teachers?

Julie Clark

Australian Catholic  
University  
Sydney



Terry Harrison

University of  
Melbourne



## A B S T R A C T

Concern exists over the extent to which environmental education is being addressed in Australian primary school curricula. This is especially so since the release of the nationally developed Statements and Profiles in eight key areas of learning because no documents specifically relating to environmental education were produced. This paper reports the results of a study in which a survey based on outcomes relevant to environmental education, as drawn from curriculum documents in use in the Australian states of New South Wales and Victoria, was completed by a sample of primary teachers from both states. Results indicated that, in most schools, outcomes relevant to environmental education were being given significant attention. However, the extent to which different outcomes were addressed varied widely, as did the extent to which individual schools addressed outcomes over the years kindergarten/preparatory to year 6 (K/P-6). Implications for teacher education drawn from the findings are discussed.

As summarised by Skamp (1992), environmental education has been envisioned in a variety of ways including the notions of global education, of education towards an appreciation of 'inner ecology' and of experiences *about*, *in* and *for* the environment. According to Spork (1992) objectives included in the Australian literature for environmental education largely centre on the last of these, the broad areas of education *about*, *in* and *for* the environment. Spork asserted that education *about* and *in* the environment was concerned with developing knowledge, awareness, attitude and skill objectives, whilst education *for* the environment focused on values, ethics, problem-solving and action. Further, she considered it necessary that all three aspects be included in any education that was truly environmental. The New South Wales Department of Education Environmental Education Curriculum Statement (NSWDE EECS) (NSW Department of Education 1989) stated that environmental education was a process which should lead to action, supporting particularly the education *for* the environment component.

Despite this, some writers have reported that little education *in* or *for* the environment was occurring in Australia. According to Greenall Gough (1990), environmental education was largely related to the *about* the environment component, with few instances of teaching *for* the environment. This observation was supported in a review of environmental education by the NSW Quality Assurance Directorate (Boston 1994). In addition to this the environmental education occurring in Australian schools has been described as having a strong scientific leaning (Cross 1996), with a concentration on conceptual development, that is education *about* the environment.

While Australian and overseas writers have emphasised the main aim of environmental education as education *for* the environment, there has been concern by some that students' knowledge about the environment has been taken for granted. It has been assumed that students' knowledge existed at a level of sophistication sufficient to their needs as students and consumers. However, a Netherlands study of young adolescents' views about environmental issues found that while all students were concerned about such issues, particularly pollution, many had misconceptions about them (Wals 1992).

*\* attitudinal outcomes were being achieved but knowledge and understanding...were not \**

Ham and Sewing (1987/1988) and Lane et al (1994) have reported on the implementation of environmental education in the USA. In several states there environmental education is a mandatory part of primary and high school curricula in its own right. A recent survey in the state of Wisconsin attempted to find out what students knew, thought and did about environmental issues (Yockers & Sivek 1995). The results of these environmental literacy assessments indicated that fifth grade students had positive attitudes towards the environment, were concerned about environmental problems and believed they could and should take action to help solve those problems. However, results in the cognitive domain were less encouraging. Although fifth grade students seemed to know and understand basic ecological terms, the terms 'food chain' and 'competition' being understood by about 90% and 70%

of students respectively, their understanding of ideas to do with energy and energy transfer was low. For example, 36% of students reported that the original source of energy for all living things was water. The Wisconsin study found that for most students attitudinal outcomes were being achieved but knowledge and understanding outcomes were not. It may be inferred that teachers in the Wisconsin schools surveyed gave sufficient attention to educational outcomes which dealt with ecological concepts, but dealt less adequately with concepts regarding energy sources and transfer.

### Environmental education in schools in Australia

A small number of studies have dealt with the implementation of environmental education in Australia. When the science topics taught by year 5 teachers were surveyed in all states of Australia in the 1980s those relevant to environmental education achieved relatively high ratings (Rosier & Symington 1990). For example, on a scale in which a rating of 3 meant "major emphasis" and 0 meant "not included", *Cycles in Nature* was rated as 2.4 and *Environmental Impact, Habitats and Natural Environment* each received a rating of 2.3. In contrast, *Vibration and Sound* rated only 1.8. However, Murdoch (1989) had previously suggested that, while children were aware of environmental issues and used associated terminology, they were often "poorly equipped" with the concepts and understandings to be able to make sense of the issues. This suggested that the extent of teaching of environmental education topics was only one part of the picture.

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*‘One...survey ...concluded that environmental education was alive and well ...[a] second ...that [it] was not ’*

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The NSWDE EECS provides clear guidelines regarding the concepts and understandings to be addressed by teachers. However, Phipps (1991) claimed that one third of the teachers she surveyed had not implemented this document, and that teachers felt ill-prepared to teach about environmental issues. Skamp (1996) reported on two surveys. One, a small survey conducted by the Australian Teachers' Union in 1990, concluded that environmental education was alive and well in Australian schools, the second that in many Queensland schools in 1993 environmental education was not a high priority and was often absent. In contrast, Spork's (1992) results indicated that Queensland teachers did include aspects of education about and in the environment in their class programs, 98% incorporating information about the environment, and 91% addressing "positive attitudes to the environment". However, in her survey only 20% of teachers included "taking environmental action" as part of their program.

A survey of NSW State schools concluded that quality environmental education was occurring in some schools but not others, in most cases being dependent on the presence of interested teachers (Boston 1994). In a survey carried out in one region of NSW in 1993 for the NSW Department of School Education, principals or environmental education contact teachers in primary and secondary schools were asked to describe the environmental education practices in their schools (Skamp 1996). A large proportion (77%) of primary school personnel rated their implementation of the NSWDE EECS document as being to "a fair extent or extensively", with a similarly high proportion of teachers active in teaching environmental education. In contrast with Spork's 1992 findings, in Skamp's survey many schools reported being actively involved in school environmental projects with an average of 4 projects /school, "Clean up Australia Day" being particularly popular. In a survey of environmental education in Western Australia, Ross (1996) also found that schools were actively involved in a number of environmentally based projects, with a third of schools cooperating with their local communities in these projects. How far this "productive environmental education activity" addressed and met the need to include a comprehensive environmental education program in school curricula is a moot point; such programs were rare in primary schools (Skamp 1996). Ross (1996) acknowledged that his "research...says nothing about the quality of understanding gained by students on completion of their studies". However, a positive chord reported by Ross was a strong interest by many teachers in increasing the amount of environmental education in their schools.

Walker (1994) summarised the place of environmental education in primary schools claiming that "the quality and standard of the teaching of environmental education in (primary) schools is inadequate". On the basis of four research projects she suggested "the problem of incorporating environmental education in the school curriculum is not much closer to being resolved in the 1990s than it was in the 1970s". She further suggested there was insufficient research to say how widely environmental education was taught in schools (Walker 1995).

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*‘a closer analysis of what is being included in environmental education and how it is being surveyed in schools is clearly desirable.’*

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Although the Australian Education Council nationally developed Statements and Profiles included no specific document for environmental education, an environmental perspective was meant to be included within them, specifically in the key learning areas of Science, Technology, and Studies of Society and Environment (SOSE) (Hunt 1991, Fien 1991). Spork (1992) contended

that there was a mismatch between what “environmental education *should* be...and what *is* generally being implemented under the label of environmental education” (original emphases).

A closer analysis of what is being included in environmental education and how it is being surveyed in schools is clearly desirable. It is possible that environmental education is occurring in schools but is not labelled as such by teachers. Are teachers aware, for example, that when children are investigating local natural habitats they are developing concepts, skills and attitudes relevant to environmental education? It is possible that teachers’ perceptions of their ‘doing environmental education’ might be lost between the eight key learning areas. Although the NSWDE EECS stated that environmental education was best approached as a cross-curricular initiative, Skamp (1996) found that 41% of primary schools had developed separate environmental units, suggesting that environmental education was not seen to take place significantly within existing learning areas.

As there was insufficient research reported in the literature to determine whether environmental education was taught in Australian schools and the lack of a key learning area in environmental education it seemed necessary to gather evidence to gauge whether outcomes relevant to environmental education were being addressed by teachers and schools, as a basis for any changes in approaches to teacher education and professional development in environmental education. In view of the intended use of the nationally developed Statements and Profiles, or documents developed from them, by education systems in New South Wales and Victoria, a natural starting place seemed to be to determine whether environmental education outcomes were, in fact, included in current documents, and to use these as the basis of a survey to ascertain whether they were being addressed by teachers.

### Research investigation and methodology.

A study was undertaken which incorporated the following research questions:

1. To what extent were knowledge and understanding outcomes relevant to environmental education in primary schools contained in key curriculum frameworks in Australia?
2. To what extent were primary teachers addressing these knowledge and understanding outcomes?

Outcomes listed in current Australian curriculum documents, intended for teachers to work with directly, formed the basis for the survey conducted in this study. The documents analysed were:

- the nationally developed Profiles in Science, SOSE and Technology (Australian Education Council 1994a, b & c).
- the Victorian Curriculum and Standards Framework for

the Science, SOSE and Technology Key Learning Areas (Victorian Board of Studies 1995a, b & c).

The authors also considered other environmental education programs to see whether significant areas covered by those programs which were considered relevant to environmental education were not present in the above documents. This was done by comparing the outcomes selected from the above documents with those of two existing programs:

- the current NSWDE EECS
- Project Learning Tree (American Forest Foundation 1994), an environmental education curriculum from the USA.

When referred to collectively in this paper these documents are called “key curriculum frameworks”. First, the authors separately developed a list of environmentally related outcomes which were then combined. The selected outcomes were then independently assessed by a number of science educators, social science educators and classroom teachers. There was a high degree of agreement amongst the reviewers. At an environmental education interest group meeting and a workshop conducted by the authors, both held in Canberra in July 1996, participants agreed that the outcomes to be incorporated into the teacher survey seemed to be relevant and useful in an analysis of the current place of environmental education in curriculum frameworks documents. However, at a workshop in Melbourne in August 1996 the participants were divided over the matter. Although views ranged from including “everything as it is all part of the environment” to including those aspects most closely associated with the education for the environment component, the majority supported the authors’ position.

Because it was decided to limit the survey to conceptually oriented strands of the documents investigated outcomes from strands concerned with values, attitudes and scientific skills, though relevant, were not included. Decisions on what was to be included were based on the authors’ and others’ experiences rather than having specifically defined boundaries. It was noted that, traditionally, other groups such as the Project Learning Tree have omitted areas that could feasibly be embraced by environmental education, and included areas which are generally not so embraced. For example, astronomy is not included in most comprehensive environmental education programs. For the purpose of this analysis, we decided to include in environmental education the areas of ideas that we believed had been judged as most appropriate for inclusion in other studies. Outcomes which addressed ecology, energy issues, conservation and the relationships between people, technology and the environment were considered to be particularly relevant. Those less directly linked to generally accepted areas of environmental education; for example, outcomes related to the seasons were not included. Details of the process of analysis of the curriculum documents and development of the survey are reported elsewhere (Clark & Harrison 1997).

The final survey contained 58 outcomes which are set out in the Appendix to this paper. The survey asked for information about the school, and asked teachers to indicate those outcomes which were included in a significant way in their class program in 1994. The questionnaire was structured so that a representative of each year level in a school could complete the questionnaire. It was also discussed informally and at several stages with a small sample of about ten teachers.

The survey was completed in 1995 by teachers in a sample of schools in Victoria and NSW. The Victorian schools were all Melbourne government primary schools; NSW schools were Catholic primary schools in Sydney. In all, 97 teachers in 24 schools, that is 40 teachers in 10 schools in Victoria and 57 teachers in 14 schools in NSW, were surveyed; each year level from kindergarten/preparatory to year 6 (K/P- 6) was approximately evenly represented. The results might be biased towards Science and Technology since these were learning areas whose conceptual strands the respondents had recently dealt with in formal educational settings. In seven of the schools a teacher from each year level completed the survey to give whole-school data. In many schools, however, a smaller sample of teachers or only one teacher from the school completed the survey.

***6 The intention ...was [to]...provide some indication of the extent to which teachers were addressing environmental education outcomes<sup>9</sup>***

Associated research questions about environmental education related outcomes which were also considered in this study were:

3. Were some outcomes addressed more commonly than others and, if so, which?
4. For the school surveyed, were the outcomes more commonly addressed in the NSW schools participating different from those more commonly addressed in the Victorian schools?
5. What outcome levels were most commonly addressed by teachers working in different year levels?
6. Did the outcomes addressed show a preference for ones derived from Science or from SOSE?

The intention of the investigations was to provide information to complement data reported by authors such as Phipps (1991) and Spork (1992) whose work has been discussed earlier in this paper, and to provide some indication of the extent to which teachers were addressing environmental education outcomes. Teachers were not asked if outcomes were achieved because it was considered unrealistic to expect teachers to have evidence of this. Instead, the survey asked teachers to indicate items they included in their programs "in a significant way". It needs

to be acknowledged that the use of the expression "in a significant way" creates something of a problem. One school indicated that they ticked an item so long as they did "anything" about the item. Other schools might not have treated this so broadly. There is no way of knowing whether an item was addressed in depth or not, how it was addressed, or where it was addressed, for example in Science and Technology or Religious Education units and so on. In other words, responses within the survey from any one teacher and from different teachers in the one school and in different schools might not be strictly comparable.

**Results and discussion**

***1. To what extent were knowledge and understanding outcomes relevant to environmental education in primary schools contained in key curriculum frameworks in Australia?***

The learning area origin of outcomes relevant to environmental education in the primary school curriculum is summarised in Table 1.

**Table 1: Learning area origin of environmental education outcomes used in this survey**

Science	SOSE	Technology	Total
26	26	6	58

In answer to questions 1 and 6 above, there were 58 outcomes considered to be relevant to environmental education and these came equally from Science and SOSE curriculum frameworks, with about 10% coming from Technology curriculum frameworks. This finding suggests that the environmental education contained in the curriculum frameworks considered in this study showed no preference for being derived from the learning areas of Science or SOSE.

***2. To what extent were primary teachers addressing these knowledge and understanding outcomes?***

***2.1 Extent to which environmental education outcomes were addressed by whole schools***

Table 2 sets out the results for seven schools in which a teacher from each year completed the survey to give a picture for that school of the extent to which environmental education outcomes were being explicitly addressed by the school.

**Table 2: Environmental education outcomes addressed by whole schools responding—years K/P-6**

NSW schools					Victorian schools	
A	B	C	D	E	A	B
74	66	66	76	100	83	98

Schools responding to the survey with whole-school data

said they were addressing between 66% and 100% of the outcomes, the average being 80%. That is, most schools responding with whole-school data were including in their programs more than three quarters of the knowledge and understanding outcomes which were judged in this study to be relevant to environmental education. It must be acknowledged that while such a small sample cannot be representative of schools in general, the data provides an indication of what some schools were doing. Reliable information regarding whole-school approaches in the NSW Catholic system and the Victorian public system awaits further data. In all probability there is cause for concern that some areas of knowledge relevant to environmental education were missing from the curricula of those schools which reported that only 66% of these outcomes were being addressed.

## 2.2 Extent to which environmental education outcomes were addressed by teachers in various year grades.

The number of survey outcomes each teacher reported addressing was tallied and the average number of outcomes addressed by teachers in each grade was calculated for each state. These averages are given in Table 3.

**Table 3: Extent to which environmental education outcomes were addressed by teachers in various grades.**

K/P	1	2	3	4	5	6	Average
Average number of survey outcomes addressed by NSW teachers (number of teachers shown underneath in brackets)							
10	9.8	11.8	14.3	12.9	18.8	20	14.2
(8)	(8)	(8)	(8)	(7)	(9)	(9)	(57)
Average number of survey outcomes addressed by Vic teachers (number of teachers shown underneath in brackets)							
11	10.4	15.3	22.8	21.7	25.2	23.7	18.3
(7)	(5)	(7)	(5)	(3)	(6)	(7)	(40)
Average number of survey outcomes addressed by all teachers (number of teachers shown underneath in brackets)							
10.5	10	13.4	17.5	15.5	21.3	21.6	15.9
(15)	(13)	(15)	(13)	(10)	(15)	(16)	(97)

On average, teachers reported addressing during the year approximately 16 outcomes relevant to environmental education. However, the range in the number of outcomes addressed appeared to be quite wide, from 3–39 in responding schools in NSW and from 1–35 in responding Victorian schools. This is a more positive finding than the contention of Walker (1994 & 1995).

The 58 environmental education outcomes used in the survey were spread fairly evenly across the outcome levels. However, overall, grade 5 and 6 teachers reported addressing what appears to be significantly more outcomes than teachers in earlier grades.

The results included in Tables 2 and 3 show that primary teachers indicated they were addressing outcomes relevant to environmental education. According to Walker (1995), teachers said they were not including environmental

education in their curriculum. It may be that teachers did not always recognise aspects of environmental education, or that they had a narrower definition of environmental education than some researchers. Alternatively, it may be that curriculum documents were providing teachers with a framework in which to address environmental education in terms of other curriculum areas. This may help solve the problem of the “constraints” due to the different theory sets of associated disciplines discussed by Walker (1995).

## 3. Were some outcomes addressed more commonly than others, and if so which?

### *6 Half of the most commonly addressed outcomes were concerned with relationships between people, technology and environments<sup>9</sup>*

The ten most commonly addressed outcomes of the 58 in the survey are listed in Table 4.

**Table 4: Most commonly addressed outcomes**

No.	Outcome	Origin	Level	Extent
36	Needs of humans/ other living things	SCI	1	68
35	Observable features of living things	SCI	1	63
14	Cares for a significant place	SOSE	1	57
15	Cooperation to care for local places	SOSE	2	51
4	Environmental influences on daily life	SCI	1	51
7	Local/regional natural features	SOSE	1	48
37	Feature/function links in living things	SCI	2	46
38	Animal/plants features assisting survival	SCI	2	44
57	Rules/laws—origin/effect on everyday life	SOSE	4	42
18	Sources of energy in daily life	SOSE	1	42

Half of the most commonly addressed outcomes were concerned with relationships between people, technology and environments—4,15,18,36,57. Four were based on students making observations of living things and their local environments—7,35,37,38. Outcome 14 involves the participation of students in local projects—*takes part in routines and projects to care for a significant place*. In light of Spork's (1992) and Walker's (1994) comments about a

lack of environmental education for the environment it was interesting to find so many schools (57%) where students were actively involved in local projects and was similar to the positive findings of Skamp (1996) and Ross (1996) for schools in northern NSW and WA. Education for the environment is usually described as the action component, but action may be interpreted in different ways. It may be that teachers, while arranging opportunities for environmental action in local projects, did not identify with the view of education for the environment described by some writers.

The ten least commonly addressed outcomes of the 58 in the survey are listed in Table 5.

Table 5: Least commonly addressed outcomes

No.	Outcome	Origin	Level	Extent
30	Resource use/development	SOSE	4	7
45	Unique Australian biodiversity	SCI	3	7
55	Changes in natural systems	SOSE	4	7
47	Elements of simple systems	T	2	9
33	Individual/group resources	SOSE	1,2	10
24	Resources, goods & services	SOSE	2	11
22	Community energy options	SCI	4	12
28	Appropriateness of products/processes	T	4	12
46	Elements of natural systems	SOSE	1	12
29	Limited resources	SOSE	3	14
34	Innovation, enterprise & environment	SOSE	3	14

Of the least commonly addressed outcomes, three involved the idea of elements of a system—46,47,55; six related to resource management—22,24,29,30,33,34; and one to biodiversity—45. This contrasts with Ross's (1996) survey for secondary school curricula in which he found that resources was an area commonly included. Two of the least commonly addressed outcomes—28 and 47—related to technology, a relatively new curriculum area for Australian primary schools.

Perhaps the level of complexity and abstractness of the language contained in those outcomes which were least

commonly included in teachers' programs influenced their responses. Informal comments from participating teachers with whom the survey was discussed revealed that this was a factor in their responses. For example, some of these teachers suggested that outcomes referring to the abstract notion of a 'system' were unlikely to be appropriate for their students. It may also be that responding teachers perceived that issues to do with the conceptual strands of place and space were more about environmental education than those to do with resource management, systems, and biodiversity. This aspect is discussed further in the section on implications for teacher education.

#### 4. For the schools surveyed, were the outcomes more commonly addressed in NSW different from those more commonly addressed in Victoria ?

The list of outcomes most commonly addressed in each state was very similar; outcomes 36 and 35 headed the list in both cases. Outcomes 30, 33, 45, and 55 were rarely addressed in either state. The group of outcomes showing the clearest interstate differences in the number of teachers addressing them were those concerned with basic ecology and conservation; these were outcomes 43 (conserving endangered species), 49 (relationships between living things in habitats), 51 (factors that affect balance in an ecosystem), 42 (why some living things become extinct) and 39 (external and internal features of living things that form systems). In each of these cases the outcomes were addressed more by the sample of Victorian Government school teachers than those from NSW Catholic primary schools at levels which were statistically significant.

#### 5. What outcome levels were most commonly addressed by teachers working in different year levels?

The average level for the most commonly addressed outcomes was 1.6 and for the least commonly addressed outcomes was 2.9. That is, the outcomes most commonly addressed by respondents teaching in the K/P to grade 6, as one might expect, were ones about midway within the range of levels generally considered to represent the level of achievement of primary students, that is levels 1-4.

The averages for the number of outcomes addressed at levels 1 and 3 for teachers in K/P-1 and 5-6 are given in Table 6.

Table 6: Averages of the number of outcomes addressed at different year level

Grade	K/P-1	5-6	Average over all grades
Average number of outcomes at level 1	4.8	6.3	5.3
Average number of outcomes at level 3	1.3	6.9	4.3

These results are not surprising with year 5–6 teachers addressing, in general, greater numbers of environmental education-related outcomes and, in particular, more of those outcomes at higher levels. Most K/P-1 teachers reported that they did address some outcomes at levels 3 and 4, supporting the contention of the developers of the key learning area Profiles that the outcomes contained within those Profiles were not necessarily to be tied to year levels. This, and the fact that respondents indicated that lower level outcomes were the ones most commonly addressed across all year levels, supports the notion that the Profiles contain a set of semi-concentric rather than linear outcome levels consistent with the idea that "...Organisers and strands interlock at each successive level to complement and reinforce one another..." (Australian Education Council 1994a).

#### *6. Did the outcomes addressed show a preference for ones derived from Science or from SOSE?*

There is an associated question of whether, with the incorporation of environmental education to a large extent into Human Society and its Environment in NSW and into the SOSE national Statement and Victorian Curriculum and Standards Framework, environmental education might be becoming less science oriented. The relatively large number of SOSE outcomes among the least commonly addressed outcomes, and the even distribution of SOSE and Science outcomes among the most commonly addressed outcomes, did not support the contention that environmental education was becoming more oriented to the key learning area of SOSE rather than Science, at least as far as could be judged by the approaches used in this study.

#### **Concluding discussion and implications for teacher education.**

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*6 teachers reported addressing outcomes relevant to environmental education and yet...much of what they did was not perceived by them as environmental education 9*

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Some outcomes such as those that related to involvement in a local project were addressed by many teachers. There are problems in any survey which asks teachers to report on their practice. The survey reported here recorded what teachers said they were addressing, which might be different from what was actually happening in their classrooms. Nevertheless it is valuable to compare these results with other surveys in which teachers were asked about their implementation of environmental education. This survey revealed that teachers reported addressing outcomes relevant to environmental education and yet informal discussion with them at several stages in the implementation of the survey suggested that much of what

they did was not perceived by them as environmental education.

Also, it cannot be said that because teachers were addressing certain knowledge and understanding outcomes that student appreciation of broader relationships and the implications of these for their involvement in the natural world were developed, or that such increased appreciation would lead to action. Whilst students might be aware of certain ideas related to the environment they might not be able to use the information in ways which provide them with ideas and motivation to take appropriate action leading to active levels of involvement both in and for the environment.

However, some findings of this study were more positive than those of Walker (1994 & 1995) reported earlier. Teachers reported addressing outcomes relevant to environmental education which included outcomes from Science, SOSE and Technology and included energy and resource issues as well as those related to living things. Some outcomes such as those that related to involvement in a local project were addressed by many teachers (57%) which reinforced the finding by Skamp (1996), although Spork (1992) reported the significantly lower figure of 20% of teachers. It seemed also in this study that in practice environmental education was no more strongly oriented to the key learning area of SOSE than Science which differed from the view of Cross (1996).

In Australia, it seems there is still to be resolved the issue of what environmental education should be in relation to its *about, in* and *for* objectives, and how it should be incorporated into curriculum frameworks in ways which make clear what teachers need to do to assist their students to acquire the understandings which are amongst the established aims of this area of learning.

Discussing the challenges ahead for environmental education in Europe, Filho (1996) suggested a need to include an effective environmental education component in teacher education. Skamp's (1996) survey showed that schools which had undertaken teacher inservice in environmental education were perceived to have school level environmental education policies and to be including environmental education to a greater extent than those that had not undertaken such a program. Similarly, Lane et al (1996) argued the place of professional development as a factor in encouraging teachers to implement environmental education in their classrooms. It follows that the implementation of environmental education in primary schools might well depend on effective initial teacher education and professional development programs. Scott (1996) echoed this, emphasising the need for the professional development of an "environmentally educating teacher" in preservice teacher training.

The need to specifically address teachers' understanding of environmental concepts and issues has been mentioned in several documents about teacher education programs, for

example in the Environmental Education in Initial Teacher Education in Europe discussions (Filho 1996) and in recent work by Fraser (1993) and Ross (1996). Some of the results reported here suggest that teachers perceive that issues to do with the strands of place and space are more about environmental education than those to do with resource management, systems, and biodiversity. This may have implications for teacher education given the emphasis in Australia accorded to biodiversity. Teacher educators need to ensure that teacher education programs provide teachers with experiences which will enable them to understand the language of environmental issues and concepts such as biodiversity and resource management, and which can assist them to incorporate these into their teaching programs. As Ross (1996) suggested, preservice and inservice teachers need a comprehensive understanding of environmental matters and associated teaching skills. Lane et al (1994) found that a lack of background knowledge was often given as a reason for teachers not teaching environmental education. One of Skamp's (1996) respondents also pointed to the need to develop "knowledge content beyond hands-on sensitising activities".

It seems clear that the respondents in this survey considered they were giving substantial attention to curriculum outcomes related to environmental education

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**6 ...a basis for more substantial environmental education programs exists in primary schools<sup>9</sup>**

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It is of significance that in Skamp's study of environmental education implementation in a region of the NSW education system only four of 99 primary schools surveyed had identified how environmental education could be incorporated into existing key learning areas (Skamp 1996). It is, therefore, probably fair to say that there needs to be a strengthening of teachers' understandings of the environmental education related links which can properly be made with each of the key learning areas so that the development of cross-curricular approaches to environmental education in primary schools can be enhanced.

As reported earlier, Ross (1996) suggested that teachers were interested in increasing the amount of environmental education in their classrooms. This augers well for the development of this area of learning in schools. Data reported here complements that reported by Skamp (1996) that a basis for more substantial environmental education programs exists in primary schools. It seems clear that the respondents in this survey considered they were giving substantial attention to curriculum outcomes related to environmental education. To the extent that this study's findings are generalisable, because the responding schools and teachers held no particular brief for environmental education, then it might be the case that teachers in many

Australian primary schools are addressing environmental education although they might not call it that. Much more investigation of what teachers say they are doing, and of what observers report seeing occur in school learning experiences, is needed before any clear answer to this question can be provided. However, as indicated above, a range of sources support an extension of explicit and appropriate environmental education in preservice and inservice teacher education, including full documentation of cross-curricular approaches. It has also been suggested in this paper that continuing efforts to clarify for teachers what education *in, about* and *for* the environment actually is, and what environmental action consists of, will assist teachers to increase their effectiveness as environmental educators. ☺

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2. Describes changes that occur in the local environment.
  3. Relates changes in the physical environment to physical processes.
  4. Lists ways that the environment influences daily life.
  5. Illustrates ways that use of the Earth's resources changes the physical environment.
  6. Distinguishes between changes that can be readily reversed and those that cannot.
  7. Identifies natural features of local and regional places using observation.
  8. Identifies built features of local and regional places using observation.
  9. Describes places according to their location and natural features.
  10. Describes places according to their location and built features.
  11. Identifies places that are important to people.
  12. Describes how natural features affect the ways that people live in particular places.
  13. Describes how people's beliefs and practices influence the ways they interact with places.
  14. Takes part in routines and projects to care for a significant place.
  15. Identifies how people can cooperate to care for places in a community.
  16. Identifies issues about care of places arising from the different ways in which they are valued.
  17. Describes different views of individuals and groups about issues related to the care of places.
  18. Identifies sources of energy in daily life.
  19. Describes ways energy is used in daily life, and ways that energy could be better used and conserved.
  20. Explains ways people in the community use energy.
  21. Reports on patterns of energy use in the home, school and other workplaces.
  22. Compares energy options available for particular purposes in the community.
  23. Identifies how resources are used and valued.
  24. Describe how goods and services are made by combining resources.
  25. Matches characteristics of materials and processes to design requirements.
  26. Examines and identifies key design features including aesthetic features and environmental effects of products and processes.
  27. Recognises production processes which are appropriate to the design with a minimum of wastage of materials.
  28. Determines the appropriateness of products and processes for communities and environments.
  29. Describes how limited resources necessitate choice.
  30. Describes factors that affect resource use and development.
  31. Investigates how resources can be managed in different ways.
  32. Identifies the work done by self and others, and how this is influenced by the environment.

## Appendix—Outcomes used in the survey

### No. Outcome

1. Distinguishes major features of the physical environment.

33. Makes suggestions about, and participates in, the management of individual and group resources.
34. Describes ways in which innovation and enterprise affect people and environment.
35. Identifies observable features of living things.
36. Identifies human needs and the needs of other living things.
37. Links observable features to their functions in living things.
38. Notes features of animals and plants that assist them to survive in their environment.
39. Identifies external and internal features of living things that work together to form systems with particular functions
40. Identifies personal features and those of animals and plants that change over time.
41. Compares and contrasts similarities and differences within and between groups of living things.
42. Explains why some living things have become extinct and identifies current endangered species.
43. Investigates ways we conserve endangered species by protecting habitats and introducing legal restrictions.
44. Explains how living things have changed over geological time, using evidence from various sources.
45. Explains ways in which bio diversity in Australia is unique.
46. Identifies examples of elements of natural systems.
47. Describes how some of the elements of simple systems work together.
48. Describes ways in which elements of natural systems form communities.
49. Describes relationships between living things in a habitat.
50. Identifies cause and effect relationships in systems including some of their effects on people and the environment.
51. Identifies factors that affect balance in an ecosystem.
52. Recognises that ecosystems may change over time.
53. Describes an example of a cycle within natural systems and the place of people in it.
54. Describes simple ways in which energy flows through a natural system.
55. Describes responses of different elements to changes in natural systems.
56. Illustrates the linkages between rights and responsibilities for members of a community.
57. Describes how rules and laws are made and affect everyday life, and the environment.
58. Identifies decisions that have to be made by groups and individuals about production and consumption, that affect environment.

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Julie Clark, a lecturer in Science and Technology Education at the Australian Catholic University in Sydney and Terry Harrison, Chairperson of Science and Technology Education and Health and Physical Education at the University of Melbourne share an interest in cross-curricular perspectives on primary school science, technology and environmental education. Their current research includes an investigation of the understandings, attitudes and behaviours of preservice primary teachers in relation to the environment. They also share an interest in enhancing the place of environmental education as a component of both preservice and inservice primary teacher education programs.

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