

# Young People and the Environment: Predicting Ecological Behaviour

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## Environmental attitudes

Environmental attitudes have been conceptualised in several different ways. Recently, Olsen, Lodwick and Dunlap (1992) developed the Ecological Social Paradigm (ESP) as a way of measuring these. The ESP is an extension of the New Environmental Paradigm (NEP) (Dunlap & Van Liere 1978) which challenges the 'dominant social paradigm', that is, the paradigm promoting abundance, growth, faith in science and technology and separateness from and domination over nature (the technological social paradigm, or TSP). Measures of its endorsement generally ask people to choose between beliefs and values that promote limits to growth and harmony with nature, and beliefs and values that promote industrial and technological development.

Olsen *et al.*, in their survey of a large sample of United States adults, found the ESP to be widely held by the public and most extensively held by younger people and by those with graduate education. Yencken, Fien and Sykes (2000) in their extensive cross-national survey of adolescent environmental attitudes, knowledge, and behaviour, found young Australians (Year 10s, median age 16 years) ranked protecting the environment as the number one national goal. A majority of these Australian students (53%) held attitudes consistent with an ecological social paradigm (Sykes, Yencken, Fien & Choo 2000), a finding also reflected in seven of the eight countries surveyed. Connell *et al.* (1998) surveying more than 5000 16- to 17-year olds from schools in Melbourne and Brisbane, also found strong support for an ecological paradigm. Additionally, their results indicated that 81% of young people reported a medium to very strong desire to protect the environment and rated 'protecting the environment' as the most important national goal.

This positive picture is not necessarily consistent across all groups. Rockland (1995) studied the environmental concerns and behaviours of 982 students from non-disadvantaged schools and 2,139 students from disadvantaged schools in the United States. Disadvantaged school students were more concerned with immediate and present environmental issues, whereas students from non-disadvantaged schools were more concerned about future generations. Additionally, two recent studies have found that young people are not always as idealistic or optimistic as frequently believed. Connell, Fien,

## A B S T R A C T

The aim of this study was to assess the environmental attitudes, knowledge and behaviours of young people aged 11 - 16 years, and evaluate which factors best predict ecological behaviour, through testing the Model of Responsible Environmental Behaviour' (Hines, Hungerford & Tomera 1986-1987). Results indicated that while young people are not negatively disposed toward the environment, they have limited knowledge about the issues. Perceived personal responsibility toward the environment was shown to be the strongest predictor of ecological behaviour, followed by 'action skills' for boys and knowledge levels for girls.

To what extent are young people committed to or apathetic about environmental conservation, and what do they see as the barriers with respect to taking environmental action? One aim of the study reported in this paper was to assess the environmental attitudes, knowledge and behaviours of young people aged 11 - 16, and to assess gender differences in these variables. A second aim was to evaluate which factors best predict ecological behaviour in young people, through testing a model which incorporates environmental knowledge, attitudes, perceived action skills, beliefs about personal responsibility, and other personal factors as potential predictors. This 'Model of Responsible Environmental Behaviour' (Hines, Hungerford & Tomera 1986-1987) has not been previously applied to the prediction of adolescent ecological behaviour, by which we mean 'any action taken to ensure that ecological relationships among living things do not deteriorate' (Caltabiano & Caltabiano 1995, p. 1080).

Young people's relationships to the environment are important developmentally, and because adolescents are the 'next generation' of potential activists for environmental concerns. The task of identity formation (or development of a 'sense of self') in adolescence has been conceptualised as including the shaping and maturing of a personal ideology, with its associated beliefs, values, and behaviours (Erikson 1971, Kroger 1989). Marcia (1966) using Erikson's framework, conceived of ideology as incorporating views about religion and politics. However as social concerns change, so might the importance of different content areas for the formulation of ideology (Bennion & Adams 1986). For young people today, thinking about environmental concerns and dilemmas may be part of their identity development in the sense that such thoughts may be part of forming an ideology about the world. In Australia, the National Union of Students surveyed 7,400 students in 1990 and found that 'the environment was hottest election issue amongst university students in Australia' (cited in Youth Research Centre 1991, p. 3). Similar findings of strong environmental concern have been found in a range of other Australian studies of adolescent populations (Clark 1996, Connell *et al.* 1998, Irving Saulwick & Associates 2000, Sykes, Yencken, Fien & Choo 2000). Environmental concerns involve several aspects, including attitudes toward the environment, knowledge of issues, and participation in pro-environmental behaviour. It is to these topics that we now turn.

Lee, Sykes and Yencken (1999) interviewed 16-17-year-old Australians in 24 focus groups. While they found that the majority were highly concerned about the environment, these young people nevertheless expressed a deep sense of frustration, pessimism and 'action paralysis' in regards to the future and any hope of the environment being saved. Protection of the environment seemed to these young people too big an issue, and outside their ability to deal with. Eckersley (1999) also concluded that young people held a pessimistic attitude towards their environmental future, which they believed would be full of greed, materialism and ecological degradation.

## Environmental knowledge

As with attitudes, the picture of adolescent environmental knowledge is also complex, depending to some extent on how knowledge is assessed. Clarke (1996) reviewed several studies that assessed adolescent environmental knowledge and found it to be consistently poor. This may seem surprising, when

there is so much information on this issue being addressed in mainstream culture (Arcury, Johnson & Scollay 1986, Gambro & Switzky 1996). However, research seems to support Gigliotti's (1990) conclusion that 'we seem to have produced a citizenry that is emotionally charged but woefully lacking in basic ecological knowledge' (p. 9).

One of the main aims of Yencken *et al.*'s (2000) research was to explore if young people have a good understanding of concepts of sustainability. Both conceptual and factual knowledge items were included in their questionnaire. Conceptual knowledge was defined as having a basic awareness of environmental issues, while factual knowledge involved having correct information about the issues (not just having heard of them). All of the knowledge items used in the study were chosen to reflect recommended curriculum guidelines and environmental issues covered in national policy statements. The average percentage of correct responses for the factual knowledge questions for Australian young people was only 53%. Yencken *et al.* (2000) concluded that awareness of environmental concepts was reasonably good, however, young people clearly lacked understanding of concepts, especially those dealing with sustainability. These findings are consistent with other measures of adolescent environmental knowledge, both in Australia (Blum, 1987; Clarke, 1996; Connell *et al.*, 1998) and elsewhere (Blum, 1987; Boyes & Stanisstreet, 1998; Gambro & Switzky, 1996; Hausbreck, Milbrath & Enright, 1992; Kuhlemeier, Bergh & Lagerweij, 1999). Yencken *et al.* also asked participants to rate their perception of their action skills and knowledge to help the environment, and the majority of young people rated their skills and knowledge in the 'medium' range. Connell *et al.* found that adolescents rated their skills and knowledge to protect the environment as moderate to very low. This may relate to the findings of Connell *et al.* (1999) that young people felt a sense of 'action paralysis' in regard to the hope that they are able to do anything to prevent environmental degradation.

### Ecological behaviour

Pro-environmental behaviour is likely to be related to both positive environmental attitudes and higher levels of knowledge, but these may not be the only relevant factors, especially for adolescents who have limited options with respect to their ecological activities. The following brief review of adolescent environmental behaviours gives support for this reduced action repertoire. Yencken *et al.* (2000) presented participants with a list of ten environmental behaviours and asked if they had participated in these actions in the past 12 months. In all countries except Japan, a majority of students stated that they had taken some deliberate action to improve the environment and most respondents stated that they felt good about their actions. The most frequent actions were choosing household products that are better for the environment, recycling/reusing, reducing water consumption and taking part in clean-up campaigns. Connell *et al.* (1998) found from a list of twenty behaviours, the most commonly reported actions were: reusing/recycling, choosing 'green'

household products, reducing water consumption, and encouraging someone else to change an action or practice. The least reported actions were information gathering exercises, political activities (eg. writing a letter), community oriented actions (eg. tree-planting), and financial actions (eg. making a donation). In the next section, we consider the factors which might predict environmental behaviour among young people.

### Theoretical framework

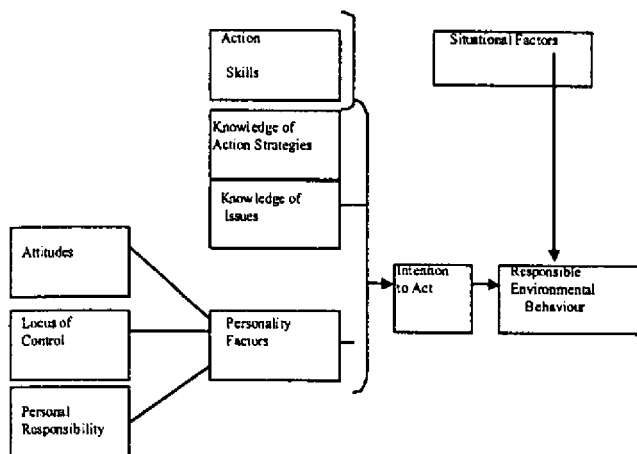
With the growing awareness that the natural environment is being consistently damaged by human activities, governments at all levels are implementing strategies designed to promote positive attitudes towards conservation. These strategies are based upon the assumption that such attitudes are linked to pro-environmental behaviour. (Boldero 1995, Stern & Oskamp 1987). However, pro-environmental attitudes do not always lead to pro-environmental behaviours (Scott & Willits 1994), and research has found that environmental behaviour is influenced by more than just positive environmental attitudes. Environmental research has been criticised for its lack of cumulative studies that predict environmental behaviour (Stern & Oskamp 1987). The development of theoretical models of environmental behaviour prediction are seen as a step forward to address such criticisms (Widegren 1998).

The Model of Responsible Environmental Behaviour (Hines *et al.* 1986-1987) was developed as an attempt to integrate the many variables found to be associated with ecological behaviour. They conducted a meta-analysis of 128 studies of environmental behaviour reported since 1971. Their aims were to (1) identify the variables associated with ecological behaviour, (2) determine the relative strengths of association between the variables and behaviour, and (3) formulate a model of ecological behaviour representative of the findings synthesised in the meta-analysis. Factors found to be significantly associated with intention to behave in an environmentally responsible manner were perceived personal responsibility for the environment, positive environmental attitudes, action skills, and knowledge (of action strategies and issues). Locus of control, or the sense that one can have an effect on events, was a further factor influencing behavioural intention. Situational factors (for example, barriers to or opportunities for action) were assessed as directly affecting environmental behaviours. Figure 1 illustrates the proposed model.

The present study included a test of the Hines *et al.* (1986-1987) model to predict ecological behaviour in a sample of school-age adolescents. Action skills and personal responsibility were assessed through self-ratings, knowledge variables were operationalised through conceptual and factual knowledge measures, attitudes were measured via the Ecological Social Paradigm, and locus of control was included as a personality variable. Behaviour was assessed along with behaviour/ intention as the dependent variables. In this study, while participants selected barriers to ecological behaviour from a given list, situational factors were not measured in a

way that they could be included as part of the model.

**Figure 1 The Model of Responsible Environmental Behaviour**



### Method

Five hundred and fifty Year 7 to 10 students from a secondary school in a western suburb of Melbourne, Australia, were approached for participation in the study. The school was indexed as a 'disadvantaged school' based on the low socio-economic status of families, number of single-parent families and number of students on Education Maintenance Allowance. Furthermore, 94% of parents were from non-English speaking backgrounds and 25% of students were born overseas. Ninety students declined the opportunity to participate or were absent on the day of questionnaire administration. One Year 10 class, comprising of 25 students failed to complete the questionnaire. Sixty-one students, who had agreed to participate, were not included in the study due to the large amount of missing and / or erroneous data, leaving a total of 374 participants; the response rate obtained being 68%.

The sample consisted of 175 males and 199 females, relatively evenly spread across Years 7 to 10. The mean age of the sample was 13.6 years ( $SD = 1.16$  years, Range = 11-16 years).

The questionnaire included measures (described below) to assess the various aspects of the Hines *et al.* model, plus demographic variables of age, gender, school year, country of birth and parents' countries of birth. In addition, participants were asked what factors prevented them from protecting the environment (barriers). They were given a list of 11 different statements (eg. 'I don't have time'), and asked to indicate four that related to them. Other measures were as follows:

**Personal responsibility toward the environment:** Participants responded to the question: 'How much do you want to be involved in helping the environment' on a 5-point scale ranging from 'very strongly' to 'very weakly'.

**Perceived action skills/knowledge of action strategies:** Respondents rated their 'skills and knowledge to help the

environment even if it is only in a small way' on a 5-point rating scale ranging from 'very high' to 'very low'.

**Knowledge of issues:** Knowledge was measured in two ways, labelled conceptual and factual knowledge. Conceptual environmental knowledge was assessed using the 11-item Yencken, Fien and Sykes (2000) Conceptual Knowledge Scale (CKS). All of the items related to the concepts of sustainability and were selected from a range of environmentally related school syllabuses, as well as (Australian) national environmental policy statements (Connell *et al.*, 1998). Respondents were asked to indicate whether they had 'never heard of' or had 'heard of' an environmental concept (e.g., the greenhouse effect). A total score was obtained by adding the number of concepts with which participants were familiar. The range of possible scores was 0-11.

Factual environmental knowledge was measured using the 11-item Yencken, Fien and Sykes (2000) Factual Knowledge Scale (FKS). This scale followed a multiple-choice format in which one answer was correct for each item. The items related to the concepts listed in the CKS. The total score for the FKS was achieved by adding the sum of correct responses, with scores ranging from 0-11.

**Ecological Behaviour/Behavioural Intention:** An eight-item Ecological Behaviour Scale (EBS) was used to measure the environmental behaviours/intentions of adolescents (Yencken, Fien & Sykes 2000). The scale consisted of eight types of behaviours that are available to Australian young people (eg. 'recycling'). Respondents were asked to indicate one of three categories for each behaviour—'I have done in the last 12 months' 'I would like to do' or 'I would not like to do'. Thus it was possible to assess actual pro-environmental behaviour through summing the 'have done' items (which were scored 1 per item), producing an Ecological Behaviour Scale ranging from 0 (low) to 8 (high). A less strict assessment of the tendency to behave pro-environmentally was made through including behaviour intention in the scale. Thus an Ecological Behaviour/ Intention Scale scored actual behaviours as 2, intention to behave as 1 and non-intention as zero, producing a scale with a potential range of 0-16, higher scores representing stronger tendencies to behave pro-environmentally. Thus in subsequent analyses it was possible to compare predictors of each of Ecological Behaviour and Ecological Behaviour/ Intention.

**Attitudes toward the environment:** To test young people's attitudes towards the environment the Ecological Social Paradigm (ESP) scale was used (Olsen, Lodwick & Dunlap 1992). The ESP consists of two sub-scales, one which measures values and the other which measures beliefs. The full scale ESP is obtained by summing the scores of both the Ecological Beliefs Sub-scale and the Ecological Values Sub-scale. ESP scores range from 0 – 16; low scores suggest weak alignment with an Ecological Social Paradigm and high scores strong alignment, or positive attitudes. Olsen *et al.* (1992) reported a standardised alpha coefficient of .71.

**Locus of Control:** The 21-item short form version of the Nowicki-Strickland Internal-External Control Scale for

Children (CNSIE; Nowicki & Strickland 1973) was used to assess beliefs about the extent to which respondents felt that they had control over their actions and various aspects of their lives (or whether these actions/aspects tended to be controlled by others or outside forces). The scale was designed for use with participants in grades 7-12. Scores range from 0-21 with low scores suggesting an internal locus of control and high score suggesting an external locus of control. Nowicki and Strickland (1973) reported internal consistency coefficients ranging from .63 to .81.

Permission to conduct the study was obtained from the Human Research Ethics Committee at Swinburne University and the principal of the secondary school where the study was conducted. All students were invited to participate, and teachers asked to administer the questionnaire during class time. The questionnaire took about 50 minutes to complete.

Data analysis included presentation of descriptive data on attitudinal, knowledge and behaviour variables, assessment of sex differences on these variables, and evaluation of the power of the personality, attitudinal and knowledge variables to predict behaviour/behaviour intention. This latter analysis was conducted via standard regression techniques.

## Results

### *Attitudes, knowledge and behaviour*

Table 1 shows the descriptive statistics for the variables. On average young people rated their personal responsibility with respect to the environment, and their action skills, as moderate. ESP scores were also in the moderate range, suggesting relatively neutral attitudes toward the environment.

Young people's knowledge of environmental concepts was low and factual knowledge was even lower. Analysis of specific items showed that students had greatest awareness of the ozone layer, greenhouse effect and renewable resources. Sustainable development, intergenerational equity and the precautionary principle were the least known concepts. The concepts that the majority of young people had correct information about were biodiversity, carrying capacity and greenhouse effect. The least understood concepts were carbon cycle, ozone layer and precautionary principle.

Behaviour scores were also low, with young people on average saying they had participated in approximately two environmental behaviours in the last 12 months. Behaviour/intention scores reflected the desire to participate in more environmental behaviours than currently. Analysis of specific behavioural items showed that 52% had recycled/reused materials, 29% had chosen household products better for the environment, and 24% had encouraged someone else to be more environmental. These were the most frequently endorsed behaviours. Less than 20% had taken part in a tree-planting scheme, made a gift or donation to a conservation group, made a complaint about something bad for the environment, taken part in a clean-up campaign, or written a letter/signed a petition.

**Table 1: Means and standard deviations of males, females and total sample on environmental variables**

Variable	Range	Males			Females			Total		
		M	SD	N	M	SD	N	M	SD	N
Personal Responsibility	1-5	2.91	1.15	172	3.24	0.98	199	3.09	1.07	371
ESP	0-16	7.17	3.83	174	8.73	3.28	199	8.00	3.63	373
Factual Knowledge	0-11	2.69	1.82	174	3.21	1.82	199	2.97	1.84	373
Concept Knowledge	0-11	4.83	2.40	173	5.04	2.07	198	4.94	2.23	371
Action Skills	1-5	3.09	1.16	171	3.24	0.81	199	3.17	0.99	370
Behaviour	0-8	1.54	1.58	168	1.86	1.60	195	1.71	1.60	363
Behaviour/Intention	0-16	6.01	3.59	168	7.66	3.11	195	6.90	3.44	363
Locus Control	0-23	10.34	3.30	164	9.96	3.90	185	10.13	3.63	349

Note: ESP = Ecological Social Paradigm Scale.

A multivariate analysis of variance indicated significant gender differences in environmental attitudes, knowledge and behaviour (Wilks = .88,  $F(9, 330) = 5.17$ ,  $p < 0.001$ ). Mean scores on the dependent variables are shown in Table 1. Univariate tests revealed that on average females had significantly stronger feelings of responsibility towards protecting the environment ( $F(1,338) = 8.19$ ,  $p < 0.01$ ), were more aligned with the ecological social paradigm than males ( $F(1,338) = 16.59$ ,  $p < 0.001$ ), had higher factual knowledge scores than males ( $F(1,338) = 7.90$ ,  $p < 0.01$ ) and intended to participate in significantly more environmental behaviours than males ( $F(1,338) = 22.18$ ,  $p < 0.001$ ). There were no significant differences between males and females on conceptual knowledge, perception of action skills, actual behaviour, or locus of control.

Age was not correlated with environmental social paradigm scores, perceived action skills, personal responsibility, ecological behaviour, behaviour/intention, conceptual knowledge, or locus of control. There was a weak significant positive correlation between age and factual knowledge ( $r = 0.17$ ,  $p < 0.01$ ).

### Barriers

Participants cited their major barrier to ecological behaviour as 'not enough time' (45%), followed by the belief that their actions would not make a difference (40%). Thirty-one percent of students said they did not have a clear understanding of what they needed to do. In a more negative vein, 26% were not interested, 23% did not like being told what to do by an authority, and 22% felt that environmentally friendly options were often not practical, or cost effective. Finally, 14% said 'I don't want to do things that are different to what my friends are doing' and 13% did not believe what people say about damage to the environment. Endorsement of the barriers was related to actual behaviour for only two out the ten barriers listed. Participants who said they were not interested in the environment were less likely to engage in environmental behaviour than those who did not check this barrier ( $F(1,361) = 12.37$ ,  $p < 0.001$ ), as were participants who said they did not have time ( $F(1,361) = 5.07$ ,  $p < 0.05$ ).

## Evaluation of the model of responsible environmental behaviour

In order to test the power of the Model of Responsible Environmental Behaviour (Hines *et al.* 1986-1987) to predict ecological behaviour, standard multiple regressions were conducted in which behaviour or behaviour/intention was the dependent variable. Ecological attitude (ESP), personal responsibility, conceptual knowledge, factual knowledge, action skills and locus of control were the independent variables. Regressions were carried out separately for the sexes to assess whether patterns of predictors differed by gender (see Table 2).

**Table 2: Predictors of Ecological Behaviour and Behaviour/Intention**

Variable	Beta Weights					
	Ecological Behaviour			Ecological Behaviour/Intention		
ESP	.14	.12	.11*	.11	.11	.12*
Personal Responsibility	.01	.32***	.18***	.29***	.42***	.36***
Conceptual Knowledge	.06	.16*	.09	.08	.25***	.15**
Factual Knowledge	-.03	.21**	.12*	.01	.13*	.09
Action Skills	.22*	-.03	.08	.20*	.07	.13**
Locus of Control	.01	-.05	-.05	-.02	-.07	-.06
R <sup>2</sup>	.085	.264	.137	.231	.396	.312
F Value	2.32*	10.53***	8.78***	7.50***	19.24***	25.19***
df	6,150	6,176	6,333	6,150	6,176	6,333

Note: \*p<.05; \*\*p<.01; \*\*\*p<.001. ESP = Ecological Social Paradigm Scale

All regressions were statistically significant. Ecological behaviour was predicted by the independent variables, however only 13.7% of the variance of behaviour was accounted for. Predictions were better for females, with 26.4% of the variance of behaviour accounted for in comparison with only 8.5% for males. For behaviour/ intention, predictions were stronger than for behaviour alone, with 31.2% of the variance accounted for. Again, prediction was better for females than for males. In addition, the pattern of independent predictors (as indicated by significant beta weights) was somewhat different for males and females. For males, the only significant independent predictor of ecological behaviour was higher perceived action skills, which also predicted behaviour/intention along with (higher) perceived personal responsibility. For females, higher levels of factual and conceptual knowledge were significant independent predictors of ecological behaviour and behaviour/intention, as well as a stronger sense of personal responsibility for the environment. Action skills did not figure as an independent predictor of behaviour or behaviour/intention for females, while knowledge was not a significant predictor for males. When data from both sexes were combined, greater endorsement of positive environmental attitudes was predictive of ecological behaviour and behaviour/intention. Thus locus of control was the only variable which did not show predictive relationships with behaviour or intention as expected by the model. There was,

however, a significant correlation between (internal) locus of control and ecological behaviour ( $r = -0.13$ ;  $p < 0.05$ ), but it was weak and did not independently predict behaviour when the other variables were included in the regression equations.

## Discussion

Young people from this disadvantaged school in Melbourne were at least moderately interested in environmental issues, rating their attitudes as midway between strongly technological and strongly environmental paradigms. They saw value in both approaches, but were not, on the average more committed to one than the other. In addition, young people perceived their 'action' skills, or skills and knowledge to help the environment as moderate, and their personal responsibility for the environment as moderate. The sample appeared to be expressing an acknowledgment of environmental issues but hardly a passion for them.

As in the Rockland (1995) study, perhaps these relatively disadvantaged students are more concerned with immediate environmental issues than long-term issues of sustainability. Their social disadvantage may not square with positive views of the future and motivation to commit to ecological change. Our results also align with Connell *et al.*'s (1999) and Eckersley's (1999) findings that young people tempered their enthusiasm for the environment with pessimism and 'action paralysis' in regards to the future. It is possible that these feelings of frustration and impotence lead to a certain level of apathy about the environment. On the other hand it may be that young people are realistic in their assessment of what is in their power to change, know their skills are limited, and recognise that the competing claims of environment and technology (as reflected in the ESP scale) each have some merit.

Sex differences did emerge in the attitudinal domains, with girls expressing stronger feelings of responsibility towards protecting the environment and greater alignment with the ecological social paradigm than boys. Such gender differences are well documented in the literature, for example Connell *et al.* (1998), Hampel *et al.* (1996), Van Liere and Dunlap (1981), Sykes *et al.* (2000). One speculative interpretation of such differences comes from ecofeminist theory which argues that gender role socialisation promotes females as more nurturing, caring and sensitive, leading them to be more environmentally concerned than men (Hampel *et al.* 1996, Macdonald & Hara 1994).

Interestingly, attitudes and personal responsibility beliefs did not become more environmentally oriented with older age, as might be expected from developmental theory. In this finding, our study was inconsistent with the work of Kwan and Miles (1998) who found that adolescents' environmental attitudes strengthened as they got older. Adolescent theory suggests that ideological and value orientations of early adolescence are not well developed, but by mid-adolescence it might be expected that young people would be working to form their own ideologies with respect to issues like the environment.

The young people in this study may be developmentally lagging in identity development in this ideological domain, or their ideological struggles may be in different areas. Indeed, Wearing (1984) suggests that the notion of ideological commitment developing in adolescence is unrealistic, given the complexity of values-related issues in today's society. She argues that such developmental tasks are particularly out of reach for disadvantaged youth when matters of economic survival and peer acknowledgment loom so large.

While knowledge does not necessarily lead to attitude change, limited knowledge about any issue will mean that attitudes cannot be fully informed. One clear finding of this study was that the knowledge levels of young people about environmental issues were limited indeed. On average, the students' conceptual environmental knowledge was low and their factual environmental knowledge very low, a finding shared by other Australian studies (Blum 1987, Clarke 1996, Connell *et al.* 1998, Sykes *et al.* 2000). Students had greatest awareness of the concepts of ozone layer, greenhouse effect and renewable resources, while the least known concepts concerned biodiversity, carbon cycle, sustainable development and intergenerational equity. There were some discrepancies between conceptual knowledge and factual knowledge. For example, the majority of students had heard of the 'ozone layer', however this was one of the least correctly defined concepts.

An important knowledge deficit was that students were largely unaware of (and could not correctly define) 'sustainable development'. Yencken (2000) also found that the 'concept of sustainability is not nearly as well known or understood as it might be, given its central position in environmental debates internationally and nationally' (p. 235). Clarke (1986) attributed low levels of knowledge about important ecological concepts to the limited state of development of environmental education in Australia, and this may be reflected in the consistency of results across all Australian studies of adolescent environmental knowledge. Blum (1987) also concluded that schools have much to do to improve the environmental knowledge base of young people. These writers were however commenting on the state of affairs in the 1980s - it is of concern that by 2000, young people are still uneducated in these domains. If we are to ever achieve ecological sustainability then knowledge of key concepts is essential, not only for political awareness, but for the purpose of informed and active citizenship.

With respect to actual behaviours, the majority of students had participated in at least one, and on average two, environmentally friendly activities in the past 12 months. Young women were somewhat more likely to have engaged in ecological behaviour than young men. As pointed out in the results section, the most frequent actions were re-using and recycling, choosing 'green' household products and encouraging someone else to be more environmental. These behaviours were similar to those found by Sykes *et al.* (2000) and Connell *et al.* (1998) to be more frequent among young people. In these studies and ours, activities such as writing

letters, signing petitions and making complaints were the least cited. Fien (2000) attributes the lack of 'political' action as relating to young people's general lack of knowledge about environmental issues, and as being a result of the failure of schools to provide students with experiences of 'active-citizenship' that teach such knowledge and skills. He also noted that it is not the goal of schools to save the environment, but to educate young people on how they can solve environmental problems through promotion of a sense of empowerment.


The most frequently cited factors which young people perceived as preventing them from behaving pro-environmentally were lack of time, feeling that their actions would not make much difference and not understanding what is harmful. Connell *et al.*'s (1999) findings about 'action paralysis' among young people seem to be reflected here, even though the participants in our study rated their environmental action skills as moderate. That young people believe their actions will not make a difference, suggests a sense of helplessness and impotence. The lack of clarity about which actions are helpful and which are harmful could readily exacerbate such feelings. This lack of clarity is reflected in the sample's low knowledge scores, but it also in part reflects the confusion, misunderstanding, and lack of information available in society as a whole. In many cases - for example, logging and fishing - the arguments about the best course of action are overlaid with value judgements, conflict about long and short term social goals, and economic concerns. Fien (2000) argues that environmental education is not action-based enough, meaning that young people are not being shown alternatives to harmful practices and the positive consequences of pro-environmental action. We also need to provide educational experiences which teach values clarification and ways to assess competing claims (scientific, economic and social) associated with pro- and anti-environmental action. Only then can we move closer to a curriculum which equips young people to feel more confident and informed about their environmental ideology and associated practices.

How did knowledge, attitudes and personal factors impact on the environmental behaviour of these adolescents? The predictive validity of the Model of Responsible Environmental Behaviour (Hines *et al.* 1986-1987) was partially supported. Young people's personal responsibility towards the environment, perception of action skills, ecological attitude and conceptual knowledge were all found to be independent predictors of actual and intended ecological behaviour. (Internal locus of control was positively correlated with behaviour intention but not an independent predictor.) A sense of personal responsibility about the environment was the most influential predictive factor. This finding was supported by data indicating that of all the reasons (barriers) given for not behaving environmentally, lack of interest (and perceived lack of time) were the only ones which were associated with behavioural participation. Clearly, finding ways to personalise the environmental curriculum (for example, tackling local environmental issues) is likely to lead to more positive behavioural outcomes than a more theoretical, 'distanced'

approach.

Boys' environmental behaviour was much harder to predict than girls', with 'action skills' coming through as the strongest predictor after personal responsibility for boys while knowledge appeared more influential for girls. Curricula which help to personalise responsibility may work in part through increasing students' knowledge base and in part by increasing students' skill base. This mix of approaches is more likely to suit a range of learning styles.

The partial support for the Hines *et al.* (1986-1987) model integrates the prediction of environmental behaviour into a more 'coherent and parsimonious understanding' (Schultz & Zelezny 1998). However, the variables in the model as tested only accounted for 14% of the variance in ecological behaviour (30% of behaviour intention), suggesting the role of many untested factors. A limitation of our study was that we did not include a measure of social support for environmental action, nor were we able to convert our 'barriers' measure to a continuous variable which could be entered into a regression equation. It is likely, especially in an adolescent sample, that situational factors such as peer influence and social support will either counteract or strengthen the path toward environmental behaviour (Ajzen & Madden 1987, Kaiser 1998).

The prediction of ecological behaviour in adolescent populations is most likely different from predicting behaviour in adult populations due to young people's limited resources and opportunities to participate in ecological behaviours. Qualitative research that asks young people about the specific types of behaviours in which they participate, as well as their experiences and thoughts around these issues could help in the development of measures that better reflect the adolescent experience. 

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