Environmental Attitudes and Knowledge of Year 11 Students in a Queensland High School

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A B S T R A C T

In 1993 a secondary school in Queensland was surveyed in order to measure the environmental attitudes and knowledge of its community. A questionnaire was developed using published items wherever possible. This report describes the responses provided by the year 11 population of the school. Demographic data on gender, region of birth, neighbourhood type and subject orientation were collected. Attitudinal data was collected in three parts: an affective component using the *New Environmental Paradigm* scale, a verbal commitment component and an actual commitment component. Data on factual and conceptual knowledge were also collected. Respondents registered highly positive attitudes and commitments to the environment but generally low scores on the knowledge scales. Demographic, attitudinal and knowledge data were analysed for possible interrelationships; correlations obtained were similar to those reported in the literature. However, the respondents' gender and academic orientation were not statistically related to their pro-environmental attitudes or knowledge.

The goal of environmental education is to produce an environmentally literate citizen who will have a basic knowledge about and concern for the environment, awareness of issues, basic skills to cope with issues and initiate solutions, as well as motivation and commitment...

---Fien 1988

Environmental education is thus concerned with knowledge, feelings, attitudes, skills and social action (Greenall Gough 1990). Environmental education is both a response to and a cause of increased social awareness of environmental issues. As Greenall Gough (1990) observed "during the late 1960s and early 1970s, the mass media and popular authors, together with the scientific community increasingly brought the threat of environmental degradation...to the attention of the general public". The Belgrade Charter of 1976 and the Tbilisi Declaration of 1978 (UNESCO-UNEP 1978) gave international support and direction to environmental education. The frameworks provided by these documents is a key to understanding the nature and objectives of environmental education.

Development of curricula which support these goals requires that curriculum developers be aware of student knowledge about and attitudes towards environmental issues (Blum 1984). Very little is known about the present status of environmental attitudes and knowledge of Queensland secondary school students; for example, these attitudes have not been mapped across a whole community—parents, students, teachers and other staff. Similarly, the effectiveness of classroom based learning in producing responsible environmental behaviour has not been ascertained in Queensland. However, a recent national survey ranked the classroom second only to television as the main source of information on the environment for secondary students (DASET 1992).

The production of the draft National Curriculum Statement on Studies of Society and the Environment (Curriculum Corporation 1992) and the Queensland Department of Education's statement of its priority for Active and Informed Citizenship (Department of Education Queensland 1993) has reinforced the recognition of the need for information about student environmental attitudes and behaviour.

This paper reports the results of a study into the environmental attitudes and knowledge held by the year 11 cohort of a secondary school community. Such a study had not been conducted at that time in Queensland or in other parts of Australia. The study formed part of a Master of Environmental Education dissertation project (Clarke 1993).

Background

The goal of environmental education is to assist students to acquire the knowledge, skills and attitudes which will enable them to be environmentally responsible in their behaviour. However, evidence from national and international polls has suggested that this goal of responsiblity has not been achieved (DASET 1992). Various models have been developed to link all the factors involved in achieving desired pro-environmental behaviours. Sia and others (1986) have presented one model which provides insight into this process.

The models are still imperfect. Van Liere and Dunlap (1981) emphasized the incongruence between attitudes and behaviour which has often been reported in the socio-

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psychological literature. The sub-division of attitude and knowledge into components is widely used to help reduce the effects of the limitations of these models.

Gray (1985) and Oppenheim (1966) considered attitudes to have three components. These were cognitive, affective and conative elements. Cognitive elements include beliefs, principles and facts, and are closely aligned with knowledge in other studies. Affective elements include emotion, feelings and emotional evaluation. They are referred to in the literature variously as emotion, attitude, opinion and the affective component of attitude. Conative elements are the tendencies towards a particular form of behaviour. They are referred to as action tendency, behavioural intention and commitment. Conative elements may be divided into verbal commitment, or stated intentions, and actual commitment, or the record of past actions.

Knowledge about a problem remains an essential motivator to producing verbal commitment towards solving the problem. The connection between knowledge and commitment—verbal and actual—is well supported in the literature; Van Liere and Dunlap's review (1981) found that high correlations between knowledge and actual commitment were common.

Further, whether verbal commitment is accompanied by actual commitment depends on factors such as knowledge and previous successes (Borden 1985, Gifford, Hay & Boros 1982, Hines, Hungerford & Tomera 1986, Maloney & Ward 1973, Maloney, Ward & Braucht 1975, Monroe & Kaplan 1988, Sia, Hungerford & Tomera 1985).

In the literature reviewed for this study, environmental knowledge was divided into factual knowledge about environmental problems or issues, and knowledge about environmental concepts or ecology. The following examples show how Blum (1987) used the division in his comparison of four studies:

- factual environmental knowledge: road accidents, air pollution, water pollution, crime
- environmental or ecological concepts: the sun's primary role as an energy source, living creatures are interdependent, water consumption

Previous studies

Recently, several studies into the environmental attitudes and knowledge of high school students have been published. These include the work of Roth and Perez (1989) and Hausbeck, Milbraith and Enright (1993). A comparison of these findings and those of Blum's (1987) summary is difficult as most publications do not include the research instruments used and there is confusion over the definitions given to the components investigated. However, some common findings across the literature published on secondary students can be noted:

- knowledge scores of participants averaged about 50%; all studies considered these scores to be low
- participants' conceptual knowledge scores tended to be higher than their factual knowledge scores
- knowledge scores of males participants were generally higher than those for females participants
- on average, attitude scores were more pro-environmental than knowledge scores
- on average, where differences were found in attitude scores of female and male participants, females tended to have more positive attitude scores and commitment scores than males

Considerable variation exists between the findings of other studies in relation to correlations observed between environmental knowledge and factors such as gender, education, age and income.

Outline of present study

Two facets of student understanding are routinely identified when planning an appropriate environmental education curriculum. The aim of the study was to measure:

- current environmental attitudes held by students
- the present level of student environmental knowledge

This report is part of a broader study of the environmental attitudes and knowledge of a whole community—students, teachers, other staff, and parents—of a state secondary school in its fourth year of operation. Only data from year 11 students are reported here.

Environmental education has not been established as a separate subject in Queensland. However, many existing subject areas contain elements of environmental education and therefore contribute to its objectives. Accordingly, the whole cohort of year 11 students, 148 in all, was the focus of the present study in order to take account of the cross-curriculum nature of environmental education.

There were five aspects to this study. First, a questionnaire was used which was intended to measure environmental attitudes of the participants: their affective component, verbal commitment and actual commitment. Second, the questionnaire was intended to measure environmental knowledge, that is, their factual and conceptually based knowledge. Third, the questionnaire sought data about demographic variables which might affect attitudes and knowledge. Fourth, items were based upon published literature as far as possible. This allowed the data to be easily compared with other studies. It also avoided adding to the plethora of items and scales described by Gray (1985). Fifth, the instrument had to be structured so that the respondents could complete the questionnaire within 60 minutes since this was considered a reasonable limit for intrusion into the teaching program of the school.

Demographic information was collected at the beginning of the survey. **Academic orientation** was measured by asking the respondents to nominate the cohort in which their best

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subject was found. Cohort was a school-based system of grouping subjects thought to be philosophically related. The four cohorts were:

- Design and Technology (included Sciences, Maths, Home Economics, Manual Arts)
- Communication and Culture (included English, Art, Music, Drama, Dance)
- Personal Development (included Health and Physical Education, Human Relationship Education)
- Social and Business Education (included Social Sciences, Languages other than English, Accounting, Typing, Computing)

Information about participants' region or country of birth and their **gender** was also requested. The nature of the distribution of high and low income areas of the school's catchment meant that determining socioeconomic levels directly was not possible. The concept of neighbourhood housing density was therefore used in the survey. This allowed **residency**, or urban/rural differences, to be considered.

The *New Environmental Paradigm* (NEP) scale was selected to measure the affective component of attitudes. It has been subjected to extended use and validation (Arcury et al. 1986, Geller & Lasley 1985, Gray 1985, Noe & Snow 1990). The version prepared by Geller and Lasley (1985) was modified to remove sexist idioms and to increase the number of anti-environmental statements. In responding to the items in the scale a respondent had to indicate their agreement or disagreement with 12 statements. Each item response was scored using a one to five scale. Scoring was arranged so that pro-environmental responses scored lower. The twelve item scores were then added to produce the NEP scale score for **affective component**. The range of possible scores was from 12 to 60.

To assess the verbal commitment component of attitude, the sub-scale developed by Maloney et al. (1975) was evaluated. Three items from the set of ten were removed because they dealt with smog and this was not thought to be an issue for the intended respondents. The items selected, numbered 13 to 19 in the questionnaire, permitted the following responses: true/false or agree/disagree/not sure. Each item's response was scored by allocating a one for the pro-environmental response, a two for not sure and a three for the anti-environmental response. The resulting scale (VC) for **verbal commitment** was determined by adding the individual scores. The result was a range of scores from 7 to 21.

Maloney et al.'s (1975) sub-scale for the actual commitment component of attitude produced only six items that were considered suitable. Other items were selected from the University of Melbourne's questionnaire presented by Yencken et al. (1991). Item 21e (see Table 3a) on the survey was developed to provide a parallel to item 13 (see Table 2) on the verbal commitment scale. Scores were allocated to each response so that low scores indicated a pro-environmental actual commitment. The resulting scale (AC) for **actual commitment** ranged from 10 to 22.

In none of the literature reviewed for this study was there any discussion of how the attitude scores should be combined to produce an overall attitude score. For this reason no attempt was made to combine the attitude sub-scales.

Knowledge was tested using 19 questions, ten factual and nine conceptual. Nine questions were selected from questionnaires developed by Richmond and Morgan (1977) and Maloney et al. (1975) to cover knowledge about environmental problems. The questions were selected on the basis of their relevance to the respondents and the currency of the issue. A tenth question on ozone layer destruction was added from the Yencken et al. (1991) questionnaire. The sub-scale (FS) for **factual knowledge** was scored by allocating one point for each correct answer, giving possible a range of 0 to 10.

The literature reviewed provided a limited range of questions on environmental or ecological concepts. Seven questions came from the questionnaire of Richmond & Morgan (1977); the other two came from the instrument used by Yencken et al. (1991). Each question scored one point for a correct response. The resulting sub-scale (CS) for **conceptual knowledge** had a range of 0 to 9.

Each question allowed a 'not sure' option and no penalty was deducted from scores to account for guessing.

An overall **Environmental Knowledge Score** (EKS) was determined by adding the two sub-scales, FS and CS, together to form a scale with a range from 0 to 19.

Results and discussion

Attitudes—affective component

The *New Environmental Paradigm* scale was used to measure the affective component of attitude. The population surveyed was clearly pro-environmental, as is evident from the data shown in Table 1.

The NEP scale was divided into three factors by researchers such as Geller and Lasley (1985). Items 1 to 4 were grouped as the *Balance of Nature* factor. In this study these items received the strongest pro-environmental support. In the *Limits to Growth* factor, items 5 to 8, item 6 was the only one receiving strong environmental support. The support accorded to the remaining items, referred to as *[Humans] over Nature*, was stronger than that granted to *Limits of Growth* but less than that shown for *Balance of Nature*.

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Table 1: NEP items and responses

SA = strongly agree; A = agree; U = unsure; D = disagree; SD = strongly disagree.

(Responses are shown as percentages.)

1. The balance of nature is very delicate and easily upset.
SA 31.5 **A 51.4** U 12.8 D 4.7 SD nil

2. When humans interfere with nature it often produces disastrous consequences.
SA 25.7 **A 56.8** U 8.8 D 8.1 SD 0.7

3. Humans must live in harmony with nature in order to survive.
SA 35.1 **A 43.2** U 10.8 D 9.5 SD 1.4

4. Humans are severely abusing the environment.
SA 48.0 **A 35.8** U 8.8 D 6.1 SD 1.4

5. We are approaching the limit of the number of people the earth can support.
SA 22.3 A 23.0 **U 45.3** D 6.1 SD 3.4

6. The earth is like a spaceship with only limited room and resources.
SA 27.0 **A 52.0** U 10.1 D 6.1 SD 4.7

7. There are limits to growth beyond which our industrialised society cannot expand.
SA 16.9 **A 33.1** **U 43.2** D 5.4 SD 1.4

8*. To maintain a healthy economy continuous industrial growth is highly desirable.
SA 5.3 **A 23.0** **U 21.1** **D 27.7** SD 14.9

9*. People were created to rule over the rest of nature.
SA 3.4 A 3.4 U 11.5 **D 45.3** **SD 36.5**

10*. Humans have the right to modify the natural environment to suit their needs.
SA 2.7 A 11.5 U 14.2 **D 39.2** **SD 32.4**

11*. Plants and animals exist primarily to be used by humans.
SA 2.0 A 8.8 U 10.8 **D 34.5** **SD 43.9**

12*. Humans need not adapt to the natural environment because they can shape it to suit their needs.
SA 4.1 A 17.0 U 18.4 **D 31.3** **SD 29.3**

Note: * for these statements D and SD are pro-environmental responses.

Information shown in bold indicates areas of major response.

Attitudes—verbal commitment

On the verbal commitment (VC) scale the overall pattern of responses provided further evidence for the respondents' general commitment to the environment. Items 13, 15, 17 and 19 received the strongest pro-environmental support. Table 2 shows the pattern of responses.

Item 18 seems at variance with the other items, as the majority of respondents selected the anti-environmental response. This response to item 18 may be part of an inconsistency of intentions when compared with item 15. The higher 'not sure' responses could mean that respondents had problems understanding the statements, or an unwillingness to make commitments.

Table 2: Verbal commitment

	Agree	Disagree	Not sure
	(Responses are shown as percentages.)		
13. Even if it was inconvenient I'd be willing to ride a bicycle or use public transport in order to reduce air pollution.	50.0*	23.0	27.0
14. I don't think I'd ever join a group or club concerned solely with environmental issues.	43.9	25.7*	30.4
15. I wouldn't go out of my way to do anything about ecology or pollution because that is the Government's job.	8.2	68.0*	23.8
16. I would donate some of my own money or earnings to help improve the environment.	48.0*	22.3	29.7
17. Even though it might be inconvenient I'd be willing to stop buying goods from companies which pollute the environment.	67.6*	16.9	15.5
18. I'd be prepared to go house to house to distribute literature on the environment.	24.3*	53.4	22.3
19. I'd be prepared to write to my local councillor or Member of Parliament about an environmental issue.	52.0*	26.4	21.6

Note: * show pro-environmental responses.

Attitudes—actual commitment

Three different kinds of questions were used to measure actual commitment. Although the results were still largely pro-environmental there was a decrease in the level of commitment indicated. This may be seen first in Table 3a. Items '21b', '21c' and '21d' recorded extensive pro-environmental scores, while for item '21e' respondents' scores showed anti-environmental orientations.

Table 3a: Actual commitment—responses to Item 21.

	Never	Rarely	Sometimes	Regularly
(Responses are shown as percentages.)				
At home, does your family:				
a) separate garbage	30.4	16.9	27.7	25.5
b) use recycled paper products	10.1	8.8	51.4	29.7
c) buy products in recycled containers	8.8	13.5	54.1	23.6
d) make a special effort to save energy	13.5	22.3	41.2	23.0
e) travel by car when it could walk or ride	14.9	25.7	33.1	26.4

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The responses to items 20, 22, 23 and 26 are summarised in Tables 3b and 3c and highlight the decrease in actual commitment scores compared to verbal commitment scores. The pro-environmental status of the result presented by the response to items 21b, c and d is reinforced by the strong responses to items 24 and 25. The low level of pro-environmental response to items 20 and 26 may indicate that these items were unsuitable for the respondents.

Table 3b: Actual commitment—responses to items 20 and 23 to 26

	Yes	No
(Responses are shown as percentages.)		
20. I have contacted a community body to find out what I can do to help protect the environment.	12.4*	87.6
23. I have attended a meeting of an organisation specifically concerned with protecting the environment.	20.4*	79.6
24. I have switched products for environmental reasons.	56.8*	43.2
25. I have never joined a cleanup drive.	43.9	56.1*
26. I subscribe to environmental publications.	11.0*	89.0

Note: *show pro-environmental responses.

Table 3c: Actual commitment—responses to Item 22

(Responses are shown as percentages.)	
When I am looking for something I want to buy, I never think about its impact on the environment.	
Agree	47.3
Disagree	27.0*
Not sure	25.7

Note: * is the pro-environmental response.

Actual commitment (AC) responses were more inconsistent than scores on the NEP scale and verbal commitment scale. This might be expected because respondents' varied life-experiences would impact most on their actual commitment.

An overview of the scores registered on each scale is set out in Table 3d. The overall trend in attitude scores was that similar responses were given to the three scales. However both the commitment scales drifted away from the pro-environmental perspective a little, compared to the affective scale. It is interesting to note that this is more severe for verbal commitment than actual commitment.

Table 3d: Overview of scores on attitude scales

Scale	Theoretical range (middle)	Sample range	Mean	Standard deviation
NEP*	12 to 60 (36)	12 to 47	25.69	6.59
VC*	7 to 21 (14)	7 to 21	12.57	3.56
AC*	11 to 33 (22)	14 to 27	18.90	2.99

Note: *Lower scores indicate pro-environmental attitudes.

Knowledge

The frequency of responses is shown in Table 4. Within the table each question is followed by the alternatives available to respondents, and the frequency of responses given. The correct alternative to each question and its response are shown in bold.

Table 4: Responses to knowledge items

27. Do you think most air pollution in our cities comes from:
cars (50), jet aircraft (nil), industrial plants (31.8), large trucks (2.7), refuse disposal (3.4), not sure (12.2).
28. Do you think mercury has most often been found at unacceptable levels in:
fruit (2.7), vegetables (6.1), **seafood (26.4)**, beef (12.8), drinks (4.7), not sure (47.3).
29. Which one of the following does not reduce pollution by cars:
properly tuned engines (12.2), **super grade petrol (34.5)**, low lead petrol (5.4), emission control devices (4.1), propane (LPG), engines (9.5), not sure (34.5).
30. Do you think ecology is best described as the study of:
the relationship between humans and the environment (33.1), **the relationship between organisms and the environment (37.2)**, pollution and its control (2.7), the environment (8.8), recycling of products (0.7), not sure (17.6).
31. Which one of the following does not decompose in sea water:
sewage (2.7), garbage (6.1), tin cans (16.3), **plastic bags (55.1)**, chemical fertilizers (6.1), not sure (13.6).
32. Do you think the Greenhouse Effect is best described as:
excess radiation from the sun causing changes in weather patterns including the El Nino effect (1.4), the destruction of the ozone layer by CFC's and halons (42.6), **the warming of the Earth's atmosphere by build-up of gases, preventing re-radiation and heat loss (35.8)**, thinning of the ozone layer over the polar regions causing serious diseases including cancers (8.1), not sure (10.1).
33. Which one of the following do you think is responsible for the build up of most of the lead in our atmosphere?
cars (39.5), aircraft (6.1), industrial plants (21.1), cigarettes (3.4), burning refuse (9.5), not sure (20.4).
weather (6.1), **hundreds of years (28.4)**, anywhere from several days to several years (12.2), not sure (27.7).

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Table 4 (continued): Responses to knowledge items

34. How long do you think DDT (a long lasting insecticide) takes to deteriorate into harmless chemicals?
it never does (25.0), 10-20 months depending on the weather (6.1), **hundreds of years (28.4)**, anywhere from several days to several years (12.2), not sure (27.7).
35. The main damage to the ozone layer is caused by hydrocarbons (4.1), ultra-violet rays (2.0), carbon dioxide (6.1), **chlorofluorocarbons (68.2)**, nitrogen oxides, (2.7), not sure (16.9).
36. Basic chemical materials would be locked up and would not be available for reuse by plants and animals if it were not for the activities of:
decomposer organisms (36.5), photosynthetic organisms (6.1), herbivores (2.0), carnivores (2.7), not sure (52.0).
37. Most of the radiation to which people are exposed is due to:
the normal hazards of work (12.8), TV sets and luminous watches (14.9), medical sources (e.g. X-rays) (10.8), **natural sources (31.8)**, not sure (29.7).
38. Most of the oxygen found in the earth's atmosphere is the result of:
the slow decomposition of silica (SiO_2) in the earth's crust (2.7), the action of volcanoes (1.4), the **photosynthetic action of plants (56.8)**, the splitting of water molecules (H_2O) in the oceans (7.4)
not sure (31.8).
39. Which of the following materials is not biodegradable?
leaves (2.0), bread (3.4), wood (4.1), **glass (81.1)**, not sure (8.8).
40. Most of the electrical energy used in Queensland is produced by:
hydro-power stations (22.3), **coal-burning power stations (37.8)**, oil-burning power stations (5.4), natural gas power stations (3.4), solar power stations (3.4), not sure (27.7).
41. The interaction of environmental, biological and social factors determines the size of the human population.
True (45.9), False (20.3), Don't know (33.8).
42. In any environment, one component like water, air or food may limit the type of life which can survive.
True (81.0), False (6.1), Don't know (12.9).
43. Living things are interdependent on one another and with their environment.
True (72.8), False (8.8), Don't know (18.4)
44. Natural resources are equally distributed with respect to land areas and political boundaries.
True (12.9), **False (55.8)**, Don't know (30.6).
45. Wildlife refuges and undisturbed natural areas may be of value in protecting endangered species and perpetuating gene pools.
True (69.4), False (2.7), Don't know (27.9).

In only one question, item 32, was an incorrect response more popular than the correct alternative. The question asks for a description of the Greenhouse Effect; the most popular response was a description of ozone layer destruction. This suggests that respondents were confused about the nature of the two phenomena.

A high proportion of respondents returned the 'not sure' alternative for two questions, items 28 and 36. Item 28 referred to mercury in food. Perhaps the most recent publicity on mercury contamination was too long ago to have registered with the surveyed population. Item 36 was one of the few complex questions in terms of its wording and students may have therefore chosen the 'not sure' option.

For item 29 the number of correct responses and the number of 'not sure' responses were equal. Given the controversy over tax on leaded petrol at the time the questionnaires were completed, this was not surprising.

Items 33, 37, 38, 40, 41, 44 and 45 also returned a large number of 'not sure' responses. Lack of recent media attention may explain this for items 33, 37 and 44. No explanation is offered for the response patterns for items 38, 40 and 45. The overall knowledge scores are shown in Table 5.

Table 5: Overview of scores on knowledge scales

Scale	Theoretical range (middle)	Sample range	Mean	Standard deviation
FS	0 to 10 (5)	0 to 9	4.31	2.24
CS	0 to 9 (4)	0 to 9	4.89	2.43
EKS	0 to 19 (9)	0 to 18	9.20	4.05

The mean knowledge scores were about 50%, which is consistent with other studies. The slightly higher result for conceptual knowledge may reflect a current educational emphasis on concepts rather than facts. The sample of scores covered the entire theoretical range suggesting that many students were not well informed about environmental issues.

Correlations between attitudes and knowledge, and subject orientation

Subject orientation has been reported in some studies as affecting attitudes and knowledge (Gifford et al. 1982). Therefore, respondents were asked to identify the cohort of subjects which inluded their the best subject. This was compared with each scale. No statistical relationship emerged between subject orientation and environmental attitudes and knowledge. This may be due to the general nature of education to year 10 and the school's philosophy of maintaining a general curriculum into years 11 and 12 as much as possible. Alternatively, the division of subjects into only four groups may not have drawn out the differences that might exist.

Correlations between attitudes and knowledge, and gender

Many studies report a gender bias in environmental knowledge (Blum 1987). Gender data was, therefore, compared with each scale. A correlation with the verbal

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commitment score (VC) was the only significant one indicating that females were moderately more committed than males to the environment. Gifford et al. (1982) reported a similar result. However, no significant difference in actual commitment was recorded. The gender difference in environmental knowledge reported in the literature is not supported by data in this study.

Correlations between attitudes and knowledge, and residency and socio-economic status

Residency and socio-economic status have sometimes been found to influence environmental attitudes and knowledge (Acury & Johnson 1987, Roth & Perez 1989, Van Liere & Dunlap 1981). Data on the kind of neighbourhood in which respondents lived was compared with the scores on attitude and knowledge scales. Results showed that conceptual knowledge and total knowledge were moderately correlated with neighbourhood type. Respondents from more densely populated neighbourhoods had lower environmental knowledge scores. This is in agreement with the findings of other studies (Acury & Johnson 1987, Van Liere & Dunlap 1981).

Correlations between scales

The models of environmental behaviour in the literature suggest strong though not perfect relationships between affective attitude, verbal and actual commitment and knowledge (Hines et al. 1986). For this reason each of the generated scores was compared with the others. The results are shown in Table 6.

Table 6: Correlations between scales

	VC	AC	FS	CS	EKS
NEP	M/S	M	W/M	M	M
VC	1	M	W/M	M	W/M
AC		1	W	W	W
FS			1	M/S	S
CS				1	S

Key: M Moderate, M/S Moderate to strong, S Strong, W Weak, W/M Weak to moderate.

Attitudinal scales were all moderately well correlated, while knowledge scales were strongly correlated. The NEP scale was moderately correlated with each knowledge scale, as was verbal commitment (VC) with conceptual knowledge (CS). Weaker correlations existed between actual commitment (AC) and knowledge scales. As expected, higher knowledge scores were correlated with more pro-environmental attitudes.

A regression analysis is a test for the directness of a relationship. Such analysis was conducted of the scores of the NEP with each of the knowledge scales and the VC scale because strong correlations between them had emerged. The results indicated that only VC showed any definite trend to a direct relationship with NEP. So it is probable that affective attitudes of the respondents as measured by the NEP were directly related only to verbal commitment.

Summary of results

This study investigated the status of environmental attitudes and knowledge in the population of year 11 students at a state high school on the Gold Coast, Queensland. The year 11 students were found to have positive environmental attitudes in each of three components—affective, cognitive and conative.

The knowledge scores in this study tended to be at the lower end of the range reported in the literature.

Environmental behaviour as measured by the actual commitment scale was strongly correlated with the other attitude scales and moderately correlated with the knowledge scores.

A moderate influence of residency on environmental knowledge was found in this study and in other studies. This study found no other relationships with environmental knowledge, although other studies have found gender and academic orientation to be significant. This study found that gender had a moderate influence on verbal commitment but no other statistical relationships were established.

Conclusions

Data from the respondents in this study suggested high to very high levels of affective attitude, verbal commitment and actual commitment towards the environment, despite apparently limited environmental knowledge. This may be a reflection of the limited state of development of environmental education. This view is supported by the respondents' confusion over issues such as the Greenhouse Effect, and the high proportion of 'not sure' and 'don't know' responses.

The lack of statistical relationships between gender and environmental knowledge, and academic orientation and environmental knowledge, could be used to argue the success of equity programs and the generalist curriculum structure of the school from which respondents were drawn. However, such conclusions are beyond the scope of the study. The lack of relationships between academic orientation and attitudes, coupled with low knowledge scores, infers a general failure by most subjects to address environmental education. If this is a common pattern, then schools in Queensland have much to do to improve the knowledge base of students in environmental education. Clearly, even motivated students will be unable to effect desired pro-environmental outcomes if they lack appropriate knowledge. Further research is needed to establish if the pattern of attitudes and knowledge suggested in this study is extensive.

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