

Teacher college students' views of controversial environmental issues: Ambivalence and readiness to adopt a stance

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One of the most important goals of discussing controversial issues in the classroom is to educate students to possess an inclination towards reason, open mindedness and fairness. However, research tends to show that teachers are not adequately trained to lead fruitful discussions about controversial issues and do not possess the necessary skills to perform such a task. This paper refers to one aspect of teaching controversial issues in environmental education, namely, the inclination of teachers towards ambivalence (agreeing to some extent with both favourable and unfavourable arguments concerning a proposition) and its potential consequences. The aim of the current study is to assess teacher college students' ambivalence concerning environmental issues, to explore their readiness to adopt a stance and when doing so to check their tendency to adopt a stance in favour of the environment. The findings showed that ambivalence was less common than non-ambivalence, although it varied across the issues. Most of the ambivalent students voted for a side. Furthermore, ambivalence did not prevent pro-environment decisions. The implications of the findings on environmental education are discussed.

Keywords: ambivalence, controversial issues, environmental education, teacher education

Introduction

Environmental issues are often value-laden, ill defined, socio-scientific controversies. As socio-scientific issues, they are, as defined by Sadler and Zeidler (2004), societal dilemmas with links to science. They are controversial when contrary views can be held without those views being contrary to reason (Dearden, 1981) and significant groups within our society, based on different types of motivations (Richardson, 1986; Hicks, 2007), advocate conflicting explanations or solutions based on alternative values (Stradling, 1985). The science, technology and society

educators (STS) were clearly the precursors of environmental education and indeed used the terms "environmental" and "socio-scientific" issues (Fleming, 1986). However, environmental education nowadays goes further. It makes use of socio-scientific issues to empower students to consider how decisions made about science-based issues reflect "moral principles" as well as "the physical and social world around them" (Zeidler, Sadler, Simmons, & Howes, 2005), and to examine critically the information they are given and the attitudes or values that have led to its production (Cotton, 2006). Young people, say Oulton et al. (2004), need to be aware of the nature of controversy. One aim of discussing controversial issues in the classroom, say Chikoko et al. (2011) is to educate citizens to possess a 'proclivity' to reason, open mindedness and fairness. But are the teachers educated to possess such an inclination?

Research tends to show that teachers are not well trained in leading fruitful discussions about controversial issues, do not possess the abilities or skills necessary to perform such a task, and in Muth's terms (2007) feel uncomfortable, and frequently afraid, to speak about these topics (see also Stronck, 2002; Harber & Serf, 2006; Ersoy, 2010; Chikoko et al., 2011). Teachers may feel that they do not know to which extent they should lean towards environmental advocacy, considering their daunting task of presenting extremely complex and emotive issues to their students in a coherent and unbiased manner (Cotton, 2006), or adopt a neutral and balanced stand. Cotton (2006) suggests three possible strategies about the teaching of controversial issues: a) procedural neutrality – where teachers act as neutral chairs; b) presentation of a balanced picture – where teachers offer a range of alternative viewpoints (Stradling, 1984), and c) commitment, where teachers act as agents of change.

With regard to neutrality and balance, while making sense in the context of teachers' desire to avoid indoctrination (Cotton, 2006) they are heavily criticized, mainly on the grounds that teachers will be unable to avoid conveying their views. A perfect balance is therefore impossible to achieve (Oulton et al., 2004), and may even be undesirable, since neutrality may imply lack of responsibility and convey a wrong message about the role of the teachers in environmental education. Kelly (1989) proposed a strategy of 'committed impartiality', in which teachers express their own views, but explicitly encourage students to critique and evaluate them alongside other positions. From the point of view of educators, De-Shalit's (2005) distinction between neutrality and impartiality is meaningful. In his view, neutrality refers to one's *motivation*, i.e., not to teach aiming to have an influence in this or that direction. Impartiality, like objectivity, refers to the presentation and treatment of the problem, to the method of research, and to the way the results are reported.

Thus, what we may expect from environmental educators is not to be neutral, but to tolerate ambiguity. Jickling (2003), in his thoughtful discussion of the 'difficult relation' between environmental education (teaching *how* to think about environment issues) and environmental advocacy (teaching *what* to think about environment issues), calls, after Dunlop (1999) for tolerating ambiguity because there is no 'right' answer, and also because valuing controversy enhances democratic participation. Such an expectation is quite consistent with Gardner's (1987) distinction between neutrality and ambivalence. People are neutral concerning a proposition when they have no opinion about either favourable or unfavourable arguments. They are ambivalent, when they agree to some extent with both favourable and unfavourable arguments. For instance, they may understand the advantages of the implementation of a certain technology, while at the same time, they also understand its dangers. When confronted with controversial environmental issues, teachers may fail to perceive the controversy, thus appreciating only the pro-environmental arguments. They may revert to indifferent neutrality, thus potentially failing to appreciate the difference between neutrality and impartiality. They may also agree with favourable and unfavourable arguments, i.e., be ambivalent. Ambivalent teachers are the main focus of this study.

Attitudinal ambivalence, defined in a way quite similar to Gardner's definition, as a state in which people are inclined to give an "attitude object equivalently strong positive or negative

evaluations" (Thompson, Zanna & Griffin, 1995) or hold both positive and negative attitudes toward an object or a behaviour (Armitage and Conner, 2000; Ojala, 2008), has been a topic of interest in behaviour and management science. Research tends to find a relation between ambivalence and attitude strength, to moderate the relations between attitudes, intentions and behaviours. The behavioural intentions of ambivalent subjects appear to be less predictable, and ambivalent attitudes appear to be more pliable in face of a persuasive communication (Armitage & Conner, 2008).

For various reasons, mainly related to human nature and to the nature of human problems, being biased is often considered to be a normal human tendency (Double, 1999; Sanera, 1998). One can even ask if we have the moral right to require people to be impartial (Double, 1999). In science, or social science, the teacher may be required to be partial towards some attitudes, because all claims are not equally valid. Some claims cannot be treated impartially by the teacher, because they represent what Scott (2008, p.59-60) called "a small, relatively insignificant and incomplete version of the truth", "a distortion of reality ... of the difference between truth and fiction" or are not based on an appropriate "level of understanding". But in cases of true dilemma, arguments on both sides can be seen as equally valid without being "contrary to reason". The ability of the teacher to be impartial in the presentation of the issue, will then depend on the strength of his/her own human tendency to be biased. Teachers who feel a certain amount of ambivalence concerning specific environmental issues, may therefore be more prone than non- ambivalent teachers to treat those issues *impartially* in their classroom, i.e., to utilize with fairness pro- and non-environmental arguments. However, what is the influence of their ambivalence on their environmental attitudes? Are they able to adopt a stance, to make decisions concerning such issues?

These questions address one of the main dilemmas of environmental education. On the one hand, the environmental crisis which threatens the survival of humankind appears to imply that people should be convinced to adopt some well defined attitudes and behaviours. Such a view supports environmental advocacy (see for instance the Tbilisi charter, UNESCO, 1978), i.e., teaching people what to think and what to do, being partial to some attitudes. On the other hand, as shown above, "education" may be regarded to mean teaching "how to think", how to make decisions on the basis of a good understanding of a variety of arguments. Such a view implies "impartiality" in the presentation of environmental issues, and may lead to ambivalence. Environmental education should make the distinction between two forms of education: on one hand, the "dogmatic, manipulative, and moralistic", and on the other hand, the "critical, open-ended, pluralistic and democratic" (Mogensen & Schnack, 2010, p.63). A critical human being is not to be seen as a "no man", who rejects systematically any idea who does not correspond closely to some ideology, but as someone who is able to refer to environmental problems as "societal issues that involve conflicting interests", and also to search for practical solutions (Mogensen & Schnack, 2010, p.60).

But should we assume that that impartiality and ambivalence about environmental issues must necessarily impair the ability or the tendency to adopt pro-environmental stances? Using a method which took into account the distinction between neutrality and ambivalence, this study addressed three questions:

1. To which degree the teacher college students are ambivalent with regards to environmental issues?
2. To which degree the ambivalent teachers tend less than non ambivalent to adopt a stance, concerning environmental issues?
3. To which degree the ambivalent teachers who adopt a stance tend less than non-ambivalent teachers to adopt a pro-environment one?

We shall now outline briefly the method used to assess ambivalence.

Method

The Measurement of Ambivalence

Gardner (1987) showed that common methods of assessment of attitudes do not distinguish between ambivalence and indifference. For instance, if students, when confronted with two arguments, one in favour of cellular aeriels, and one opposing it, rate both arguments very high on a Likert scale, their ratings will be summed up as neither for nor against that technology, exactly as in the case of the ratings of students who claim to have no opinions on either of the arguments. But the reactions of the two groups are not equivalent: the former are ambivalent, i.e., as far as they are concerned, both arguments are very valid, whereas the latter are indifferent.

In this study we used Kaplan's (1972) idea of semantic half scales to measure the degree of ambivalence of students' responses to environmental issues (see also Dreyfus and Roth, 1991). The following six-item instrument will illustrate Gardner's (1987) technique:

Should the number of cellular aeriels be increased?

Yes, because increasing the number of aeriels is a necessity of modern life	(not)	0	1	2	3 (extremely)
Yes, because cellular phones are part and parcel of the way of life in modern society		0	1	2	3
Yes, because cellular phones are a sign of scientific-technological progress		0	1	2	3
No, because radiation from aeriels may be harmful to human health		0	1	2	3
No, because accumulated effect of the use of aeriels may endanger future generations		0	1	2	3
No, because we have no right to endanger living organisms on our planet		0	1	2	3

The three favourable items yield a positive affect score (P), the unfavourable items a negative affect score (N.), both range from zero to nine. The conventional total attitude score (T) can be expressed as: $T=P-N$. The value of T can run from -9 to +9. Following Kaplan, ambivalence (A) can be defined as: $A=P+N-[T]$, where [T] is modulus (unsigned value) of T. A is zero when T is due entirely to a positive or a negative component, i.e., when one of the components (P or N) equals zero. It takes on nonzero values when both components are present, rising to maximum (18) when the respondent expresses both extremely positive and extremely negative reactions: ($P=3 \times 3=9$; $N=3 \times 3=9$; $T=9-9=0$; $A=P+N-[T]=9+9-0=18$). In this study, because the teachers were used to symmetrical Likert scales and tended to refer to the half scales as if they were full ones, and because we could not train them for the use of half scales, we decided, as in a previous study (Dreyfus and Roth, 1991) to use a fully symmetrical Likert scale for the rating of arguments. (1=strongly disagree, 2= disagree, 3= "don't know", i.e., might be true, do not reject, 4=agree, 5= strongly agree). For the computation of ambivalence we then recoded the answers in the following way (half scale):

1 and 2 (all the "disagree" answers)	= 0
3 ("don't know", i.e., "do not reject" answer)	= 1
4 ("agree")	= 2
5 ("strongly agree")	= 3

In order to make comparisons possible, ambivalent and non ambivalent students had to be identified by means of the questionnaire described above. The following method was used: cases where all the scores on the half scale were 1, i.e., no argument is accepted, but none of them is rejected a priori, were regarded as the lower threshold of ambivalence. The computed ambivalence in such cases would be 6: $P-T = (3+3) - (3-3) = 6$. In fact, if on either side (positive or negative) the three arguments scored 1, the issue could yield a maximum ambivalence of 6. Any score below 6 (4, 2, 0) was therefore classified as 'non-ambivalent'.

The same computation will show that if all the scores on an issue were 2 (all arguments are true, none are very true), the score for ambivalence was 12, and for 6 scores of 3 (all arguments very true), the ambivalence would be 18, i.e., the highest possible. Accordingly, a score of ambivalence from 6 to 10ⁱ was classified as 'medium ambivalence', and from 12 to 18 as 'high' ambivalence (Dreyfus and Roth, 1991).

Research Tools

A questionnaire was designed for this study, which dealt with five 'issues' referring to five interventions of Man in the environment about which decisions were required. Issue A dealt with the establishment of a new settlement in an empty space by a community of people wishing to live together. Issue B referred to the problem of the increasing number of cellular aerials, and Issue C dealt with the building of tourist resorts on the sea shore of a small country which has few unspoiled, free-entry shores left. Issue D dealt with the proposal of a law to impose organic agriculture, and issue E dealt with the replacement of an inner town grove with a supermarket parking. All the issues are authentic ones, known to the general public and part of the social world of the students. The validity of the questionnaire was assessed by a specialist (Ph.D) in educational assessment, who found that all the five issues could be expected to be well understood by the sample of students. He also found all the arguments were relevant to the issues and authentic, in the sense that they had been used in the media as part of the public discourse addressing these controversial issues. The issues and the nature of the controversies are presented in table 1.

All these interventions were presented as controversial, i.e., both useful and harmful: useful to people in general, or to specific groups, but also harmful because they create a dangerous (to people in general or to some groups) environment. Following them six arguments were offered, referring to personal experience, economic development, ecological positions or humanistic perspectives (Dreyfus & Roth, 1991; Patronis, Potati & Spiliotopoulou, 1999). Three of the six arguments were 'pro-environment' (ProE), based on the harmful aspect of human intervention, i.e., environmental considerations, supported the environmental approach. The other three 'non-environmental' arguments (NonE), based on more techno-centric considerations, ignored environmental considerations and placed emphasis on the useful aspects of human interventions in the environment.

The arguments were further classified according to three levelsⁱⁱ of potential relevance to the respondents, of "proximity between the question considered and the students" (Simonneaux & Simonneaux, 2009, p. 684): 1) The personal level refers to effects which can be perceived directly at the individual level (arguments 1, 4); 2) The global-social level concerns aspects of the human population at large or social groups, such as economy, sustainability (arguments 2, 5). The ProE argument in this category, referred to sustainability; 3) the philosophical level refers to ideologies (arguments 3, 6), and its effects are less tangible than those of the social level (Blaga & Cooney, 1981; Dreyfus & Roth, 1991). For each issue, the students were therefore confronted with three pairs of arguments.

Table 1. The contents and characteristics of the five items in the questionnaire*

Item	The issue	The main environmental claim	Who may be directly involved?
D	Should there be a law imposing organic agriculture?	Since agriculture uses various chemical products which are potentially harmful to our health, we may be daily poisoned by performing an activity, namely eating, that we cannot avoid.	Everyone, agriculture copes with one of the most basic needs of human beings. The law may bear on everyone's personal behaviour
B	Should the number of cellular aeriels be allowed to increase?	Electromagnetic waves emitted by aeriels are claimed to be dangerous to people, i.e., they may poison each of us.	Everyone, aeriels refer to a personal need of members of a modern society. Very few people are ready to give up the convenience that the technology provides.
C	Should touristic resorts be built on the sea shore?	Endangers a <i>natural</i> environment, and threatens the quality of our life and our civic rights	Does not happen in everyone's backyard, so that some respondents may consider the issue to concern 'other people'.
E	Should the destruction of a grove in a town be allowed, to create a supermarket parking?	Endangers an <i>urban</i> environment, and threatens the quality of our life and our civic rights	Does not happen in everyone's backyard, so that some respondents may consider the issue to concern 'other people'.
A	Should a community of people who wish to live together be allowed to found a new settlement in an open space?	Acute environmental problem, of extreme importance in the relevant local context (downgrading of open spaces, very high density of population). Actual and political connotations.	Most people are not personally involved in such a problem. The decision has no immediate bearing on the personal behaviour of the respondent. May be seen as concerning 'other people'.

* The items actually appeared in the questionnaire from A to E, in alphabetical order, to avoid making the pattern of decreasing personal relevance too obvious.

Concerning each issue, the task of the students was twofold: rating arguments and voting. Firstly, they were requested to rate each of the six arguments separately. Then they were requested to adopt a stance concerning the issue at stake by "voting" on a 1 to 3 scale, in favour of (3), or against (1) the ProE point of view. They were also allowed to abstain (vote 2). For lack of space we cannot show the whole questionnaire, but the pattern will be exemplified by Issue B in Figure 1.

It can be seen that the questionnaire assessed three types of response according to the aims of this study: a) ambivalence (positive ratings of both ProE and NonE arguments); b) readiness to adopt a stance, i.e., to vote, either for or against, as opposed to the apparent

neutrality displayed by abstention, and c) the tendency, when not abstaining, to adopt a pro-environment stance.

The number of cellular aerials erected in close proximity to human dwellings is growing every year. This problem has triggered a public discussion. Some people do in fact favour the increasing of the number of aerials, according to the actual needs.

Arguments in favour of increasing the number of aerials (non-environmental)

- 1 Increasing the number of aerials is a necessity of modern life, because they make everyone more available and make everyone feel more efficient and more secure (Personal)
- 2 Cellular phones have become part and parcel of the way of life in modern society, and part of our social status. It is imperative to supply the infrastructure necessary to the fulfillment of this culture. (Global-social)
- 3 Cellular phones are a sign of the scientific-technological progress of our modern society. Progress should not be slowed down. (Philosophical)

Arguments against increasing the number of aerials (pro-environment)

- 4 Research has shown that radiation from cellular aerials may be harmful to human health. Each one of us may be affected (Personal)
- 5 Since we cannot sense directly the radiation emitted by cellular aerials, the accumulated effects of their use may endanger future generations. (Global-social)
- 6 Cellular aerials are a rude intervention of man in nature. They may be harmful to other organisms and we have no right to endanger living organisms on our planet. (Philosophical)

As a member of a public committee I would vote:

- 1) In favour of increasing of the number of cellular aerials (NonE vote)
- 2) I would abstain
- 3) I would vote against increasing the number of cellular aerials (ProE vote)

Figure 1. Issue B in the questionnaire, showing a controversial intervention of man in the environment and the pattern of arguments in favour or against the intervention (definitions in brackets were not included in the questionnaire).

In order to appreciate the nature of the task with which the college students were confronted when answering the questionnaire, it is important to realize that it assessed their response to dilemmas: the non-environmental arguments disregarded the pro-environment ones but did not contradict them, and vice – versa, because they did not stem from the same set of values. One could, therefore, regard both sets of arguments as valid 'without being contrary to reason'.

Sample

The research sample (N=97) consisted of four groups of students in a big "Green" College of Teacher Education in Israel. To be certified as "Green", a college must include a certain amount of academic studies in topics relevant to environment, and also display environment friendly methods of campus management. The sample consisted of a wide range of teachers, representing a typical population of students, at various stages of their education and practice: (a) 25 M.Ed.

students in Environmental Education, all of them practicing science teachers; (b) 22 ex-students, graduates of the same program in the last five years from the same college, all of whom are also practicing science teachers with various degrees of involvement in environmental education; (c) 23 B.Ed. third year pre-service students in the Biology and Environmental Education department; (d) 27 M.Ed. students in school management, all of them active teachers or school principals, whose studies had no necessary relation to environmental education. Within the groups the students were not sampled, all of those who belonged to the mentioned groups took part in the study. All the participants had teaching experience, either as trainees during their initial training, or as full-fledged teachers, since being an active teacher with a Bachelor degree is a pre requisite for M.Ed. programs in this college. Additionally, the participants had not been taught formally the topic of ambivalence, neither had it been covered during their studies, according to their own testimony.

Main Findings

The results of the questionnaire are summed up in table 2, for each issue separately. Although the sample was composed of students with different levels of involvement in environmental education, which could have been expected to respond differently to the questionnaire, no significant differences were found between the four groups. The findings of the sample of students are therefore reported as a whole. The Alpha-Cronbach reliability of the ratings of the types of arguments, computed separately for each issue, was high (Issue A, .833; issue B, .767; issue C, .803; issue D, .784; issue 5, .789).

The Frequency of Ambivalent Responses – Research Question No.1

Data in table 2 show that concerning most issues, ambivalence (positive rating of both pro-environment and non-environmental arguments) was less common than non-ambivalence (accepting only one type of arguments). However, ambivalence varied across the issues: the highest mean (7.5) was obtained on issue D dealing with organic agriculture, the only one about which most of the respondents were ambivalent. The lowest mean was obtained (3.6) on issue E, the parking issue. Ambivalence also varied within the issues, as shown by the wide standard deviations. Individual students were not uniformly ambivalent towards the five issues. The average difference between individual highest and lowest degrees of ambivalence (not shown in Table 2) was found to be 9.12, with a standard deviation of 3.8. Correlations between individual degrees of ambivalence on the various issues ranged from 0.05 to 0.3, meaning that even if some correlations were significant, the degree of ambivalence of a student concerning a particular issue was not a good predictor of his or her ambivalence concerning other issues.

To sum up, students did not display any systematic tendency across the various issues. Some of them were ambivalent, but their level of ambivalence appeared to be connected to the nature of the environmental issue as will be shown again and discussed in a later section of this paper (ambivalence and types of issues). Having identified ambivalent and non-ambivalent respondents, we can now examine the relationship between ambivalence, the readiness to adopt a stance and the pro- or non-environment orientation which represents this stance.

Ambivalence and readiness to adopt a stance - Research Question No.2

Table 3 shows the relation between ambivalence and readiness to adopt a stance. The sum of votes 1 (unfavourable to the ProE stance) and 3 (favourable to the ProE stance) represented the readiness to adopt a stance, in either direction. Table 3 shows the frequencies of adopting a stance (decision) and of abstention for each issue demonstrating percentages of the number of respondents in the relevant categories.

Table 2. Frequencies of ambivalent responses for each issue, in numbers and in percentage of the total number of respondents (N=97). The last column shows the average ambivalence

Issue	Category 1: Moderate ambivalence		Category 2: High Ambivalence		Category 1+Category 2: Total ambivalence		No Ambivalence		Mean Ambivalence range: 0 – 18 (standard deviation)
	N ₁	percentages	N ₂	percentages	N ₁₊₂	percentages	N ₀	percentages	
A. New settlement	35	36.08	9	9.28	44	45.36	52	53.61	5.09 (4.28)
B. Aerials	27	27.84	8	8.25	35	36.08	62	63.92	4.54 (3.76)
C. Sea shore	32	32.99	12	12.37	44	45.36	52	53.61	4.88 (4.73)
D. Organic agriculture	37	38.14	28	28.87	65	67.01	31	31.96	7.50 (4.98)
E. Parking	20	20.62	9	9.28	29	29.90	65	67.01	3.60 (4.17)

In spite of the small numbers, results are presented in percentages to make comparisons possible. The data shows that abstention was *not* characteristic of the ambivalent students (maximum of 22.86%). However, its frequency was higher than that of non-ambivalent abstainers, which was to a large extent practically nonexistent.

In fact, when computed for abstainers only (data not shown in table 3), the mean ambivalence was found to be relatively high: 6.00 for issue A, 5.63 for B, 8.00 for C, 8.14 for D and 8.67 for E. It seems that in most cases ambivalent respondents did not refuse to adopt a stance. Most ambivalent students have indeed adopted a stance. This was true even for the highly ambivalent students: a great majority of highly ambivalents did adopt a stance (table 3). However, when abstention did occur, it mostly came from ambivalent students (all the cases for issue E and practically all of them for issue C). To sum up, ambivalence was not found to be equivalent to refusal to adopt a stance.

Ambivalence and Pro-Environment Vote - Research Question No.3

The next question concerned the relation between ambivalence and the direction of the vote: would ambivalent students vote less than those in favour of ProE decisions? Table 4 shows the frequencies of ProE (favourable) votes by ambivalent students.

Table 3. Decision (adoption of a stance) and abstention by ambivalent respondents by issue (in percentages of the number of respondents - N) in each category, and abstention (in percentages of the number) of non-ambivalent respondents

Issue	Category 1: Moderate Ambivalence			Category 2: High Ambivalence			Category 1+Category 2: Ambivalence			No Ambivalence	
	N ₁	Decision	Abstention	N ₂	Decision	Abstention	N ₁ +2	Decision	Abstention	N ₀	Abstention
A	35	77.14	14.29	9	77.78	22.22	44	77.27	15.91	52	7.69
B	27	74.07	25.93	8	75.00	12.50	35	74.29	22.86	62	12.90
C	32	84.38	9.38	12	83.33	16.67	44	84.09	11.36	52	1.92
D	37	72.97	21.62	28	89.29	10.71	65	80.00	16.92	31	9.67
E	20	80.00	20.00	9	66.67	22.22	29	75.86	20.69	65	0

Note: The percentages in each category do not quite sum up to 100 because some students failed to mark the relevant box, and it was impossible to know if they had meant to abstain or just forgotten to vote".

Data in Table 4 show that amongst the ambivalent students, a clear majority voted ProE on three issues (B, C, E), and about 40% did so on issue A. The suggestion to prevent the establishment of a new settlement in an open area (issue A) or to prevent building on the public sea shore (issue C) yielded less support by ambivalent voters than by non-ambivalent ones. This trend was even clearer when referring only to the highly ambivalent voters. However, on three of the five issues (issues A,C,D), and to a lesser extent on issue E, the frequency of ProE votes (vote 3) by ambivalent students was lower than that of the non ambivalent ones. Chi-square tests based on the 1 to 3 vote scale showed that on issues A,C,D, the differences in the pattern of voting of ambivalent and non ambivalent students were significant (6.91, 14.71, 11.36 respectively, $p < 0.05$), whereas those on issues B and E were not (2.33, 2.88 respectively).

The law about organic agriculture (Issue D) was even rejected by a majority of ambivalent voters, whereas about 60 % of the non-ambivalent voters approved it (still, the lowest level of non-ambivalent approval amongst the various issues). Furthermore, the few highly ambivalent students tended overall to vote less in favour of the ProE point of view than the moderately ambivalent ones. To sum up, the ambivalent students held less pro-environmental stances than the non ambivalent students, although ambivalence did not preclude environmental stances. However, the extent of this tendency was connected to the type of issue.

Ambivalence and types of issues

While all the issues referred to human interventions which had environmental implications at the personal, social, and ideological levels, the five dilemma-laden issues were intrinsically different (see Table 1), so that this study did not assess the response of students to a narrow, specific type of issue. Indeed, the findings concerning the five issues were not uniform (Tables 2 to 4). In addition to the data in tables 2 to 4, the following analysis of the patterns of response to the

various issues will also refer to the students' ratings of the ProE and NonE arguments on the original 1 to 5 Likert scale, as summed-up in Table 5.

Table 4. Votes in favour of the ProE decision and against it presented by issues among ambivalent respondents (in percentages of the numbers-N) of ambivalent respondents, and votes in favour of the ProE decision amongst non-ambivalents

Issue	Category 1: Moderate ambivalence			Category 2: High Ambivalence			Category 1+Category 2: Ambivalence			No Ambivalence	
	N	ProE	Against	N	ProE	Against	N	ProE	Against	N	ProE
A	35	40	37	9	33	44	44	39	39	52	67
B	27	74	0	8	63	1	35	71	3	62	74
C	32	66	19	12	42	42	44	62	26	52	92
D	37	35	38	28	14	75	65	26	54	31	61
E	20	80	0	9	56	11	29	72	3	65	86

Issue D - law about organic agriculture

Issue D yielded the highest level of ambivalence. The ratings of the NonE arguments were higher than in any other issue. The average ambivalence was impressive, compared to other issues (7.5) and the frequency of ambivalent responses was higher than that of the non-ambivalent ones. However, while most of the students were ambivalent, they did not abstain (only about 17% abstentions).

It is the only issue which yielded a majority of votes unfavourable to the environmental point of view, especially from the ambivalent voters. 75% of the highly ambivalent students voted against the ProE stance. Even on the side of non-ambivalent voters, the ProE vote was the lowest of all issues. Obviously, in the eyes of many students, the idea of a law imposing organic agriculture went a little too far in the environment direction, in spite of their understanding of the arguments which may support such a motion.

Table 5. Responses to the five issues for the whole sample (N=97): mean ratings of all the arguments (1-5 Likert scale). Arguments 1-3 are Non Environmental, Arguments 4-6 are Pro Environmental

Issue	Arg 1	Arg 2	Arg 3	Arg 4	Arg 5	Arg 6
A : New settlement	3.32 (1.26)	3.09 (1.29)	3.12 (1.24)	3.53 (1.18)	4.11 (1.05)	4.16 (0.89)
B: Aerials	3.05 (1.20)	2.71 (1.21)	2.64 (1.15)	4.29 (0.86)	4.31 (0.85)	3.73 (1.10)
C: Sea shore	2.88 (1.35)	2.94 (1.25)	2.30 (1.15)	4.49 (0.87)	4.70 (0.58)	4.45 (0.81)
D: Organic agriculture	3.59 (1.28)	3.34 (1.16)	3.73 (1.13)	4.06 (1.05)	4.19 (0.94)	4.01 (1.07)
E: Parking	2.62 (1.26)	2.59 (1.20)	2.28 (1.12)	4.27 (0.82)	4.53* (0.81)	4.53* (0.73)
Overall mean ratings	3.10 (0.71)	2.94 (0.62)	2.83 (0.66)	4.13 (0.70)	4.35 (0.54)	4.17 (0.58)

*Scored significantly higher ($p < 0.05$) than the personal argument (4).

Issue E - supermarket parking instead of grove (ambivalence and abstention infrequent, majority of ProE votes).

At the opposite end of the range of responses, this urban environment issue yielded a large degree of agreement with the ProE stance. The NonE arguments were mostly deemed unconvincing. Ambivalence was not frequent and when present, it was not associated with unfavourable votes: only one out of the relatively few ambivalent students voted against the environmentally oriented decision (Table 4).

The social-sustainability and ideological arguments (arguments 5 and 6) scored significantly higher than the personal one (argument 4) (Table 5, $p < 0.05$), so that most students may have felt little concerned at the personal level. Apparently, the majority of the students felt little ambivalence about the essential need to defend the quality of life in town.

Issue C - sea shore (as issue E, but higher frequency of ambivalence and NonE votes):

The outcomes of the sea shore item were on some aspects similar to those of the parking one, as could be expected from the relative similarity of the issues: low ratings of non-environment arguments, low frequency of abstention, great majority of ProE voters. They differed, however, on other aspects: the frequency of ambivalence was higher (see Table 2, about 45%), and so was the frequency of NonE votes by ambivalent voters.

Issue B - cell phone aerials (ambivalence not frequent, large proE majority, ambivalents are ProE).

The idea of legal interference by authorities to limit the number of cell phone aerials did not raise the same level of ambivalence as that of legislation about organic agriculture. In fact, the pattern

of response to that issue was more like that of issue E: The rating of NonE arguments was low (Table 5), the votes were largely ProE (Table 2), and all the ambivalent voters but 1 (Table 4) voted ProE.

Issue A - new settlement (votes of ambivalents divided, but no tendency toward abstention).

This rarely personal issue, with its strong environmental implications, revealed a divided sample of voters. The average of all the NonE arguments ratings was slightly above 3 (non-rejection level) on the 1 to 5 Likert scale (table 5). The average of the ProE arguments, although above 4, was lower than in issues B, C, and E. This pattern resembled the one obtained on issue D (law about organic agriculture), although the average ambivalence was lower.

However, the vote was more ProE than on issue D (57 % voted in favour of the ProE decision). A majority of the non-ambivalent voted ProE, but the ambivalent voters were equally divided (39% favourable and 39% unfavourable, Table 4), a pattern which remained constant in the moderate and in the high ambivalent categories.

The possible reasons why this issue did not yield an overwhelming majority in favour of the obvious and feasible ProE solution, namely preventing the development of the new settlement in the open space, are beyond the scope of this paper. However, concerning the questions asked in this study, the pattern of response to this issue showed that ambivalence, while reducing to some extent the frequency of ProE votes, did not impair the voters' inclination to adopt a stance.

The type of issue appeared to have some influence on the reaction of the students. This can be seen when referring to two extreme issues: the aerials, which may concern anyone, and the new settlement controversy, in which most of the students are not personally involved. In the case of the aerials, the philosophical environmental argument rated lower than the personal and social ones, whereas the new settlement controversy yielded a lower rating of the personal argument. In short, different types of environmental public issues brought about different patterns of response, i.e., different relations between the level of ambivalence, the readiness to take a stand, and the pro-environment direction of the vote.

Summary and Conclusions

As well expressed by the authors quoted in the introduction to this paper, environmental educators cannot afford to be dogmatic "no men" who reject systematically any idea who does not correspond closely to some ideology (Mogensen & Schnack, 2010). In view of the controversial nature of many environmental issues, they may be required to treat such issues with impartiality, for their students need to be aware of the nature of controversy, and must be educated to reason with open mindedness and fairness (Oulton et al., 2004; Cotton, 2006; Chikoko et al., 2011). Ambivalence must be tolerated when there are no universally accepted right answers (Dunlop, 1999; Jickling, 2003).

Paul (1984) wrote a long time ago that 'open-mindedness may be the proper, but is not the "natural" disposition of the human mind'. However, in this study, the sample of students displayed a tangible level of independent thinking, in spite of the fact that they all studied in "a green college" and were aware of the pro-environmental attitudes of the college staff and of the leading environmental organizations in the country. Their individual patterns of response to different issues varied, showing that they did not apply automatically and systematically 'collectively reinforced' (Paul, 1984, p.4) environmental principles, or adopt automatically social 'collective representations' (Simonneaux & Simonneaux, 2009, p 662) of environmental issues. They did not reject a priori arguments which could be regarded to be 'environmentally incorrect'.

Concerning the questions asked in this study, ambivalence was found to be less frequent than non-ambivalence, although its level varied widely amongst the issues. It was clearly not the main response to environmental controversies. Neutrality, on the other hand, (abstention from voting, low rating of all arguments), was nonexistent. Most of the ambivalent respondents (more

than two thirds) made a choice in their votes (favourable or unfavourable to the environment view), i.e., did not abstain, showing that ambivalence was *not* equivalent to a lack of readiness to take a stand. However, when abstention occurred, it came mainly from ambivalent respondents.

Similarly, ambivalence did not prevent pro-environmental votes, but ambivalent respondents voted less than the non-ambivalent ones in favour of the pro-environment decision. On some issues, compared with the overwhelming pro-environmental majority displayed by the non-ambivalent respondents, the ambivalent ones, especially the highly ambivalents, tended more to vote in the opposite direction. This tendency did not stem from a lower appreciation of the pro-environmental arguments, or of being less environmentally-minded: According to Gardner's method used in this paper to assess the level of ambivalence, indifference (low ratings) towards environmental arguments would have precluded ambivalence, and certainly high ambivalence.

When endeavoring to enhance ambivalence, environmental educators should weigh the costs and benefits of such a strategy, in the light of their own educational objectives. From the point of view of the 'what to think' advocacy approach to environmental education, although ambivalence did not prevent pro-environment stands, it appeared to claim a price: in various amounts, according to each specific case, the environment advocacy side lost some supporters. However, the very idea of confronting learners with conflicting views and interests stems from the 'how to think' perspective.

From this point of view, the tendency to make personal attitudinal decisions, on the basis of an unbiased appreciation of both pro- and non-environmental arguments, should be regarded as an educational achievement, notwithstanding the direction of the decision. It may show that ambivalent teachers require a great deal of information before venturing to make a decision. In Yount's (1992) terms (see also Brown, 2000), ambivalence may thus have an influence on an important component of environmental education, namely the 'defensibility' of decisions, i.e., the amount of available supporting evidence (for or against a statement) required before making an attitudinal decision. This may be an important contribution to any educational strategy which is based on controversial socio scientific issues, since the social representations concerning such issues involve beliefs and opinions, and are 'at the crossroad between social, affective and cognitive aspects' (Simonneaux & Simonneaux, 2009, p.662). The emotional and social pressures which characterize such issues make impartial assessment and decision very difficult, and the tendency to rely on evidence may be an important feature in the development of the necessary cognitive skills.

Concerning the main issues addressed in this study, on one hand, environmental educators who aim at changing the behaviour of their students may be wary of ambivalent teachers, because of the relative unpredictability of their attitudes. They may feel that such teachers, being too 'pliable in face of convincing communication' (Armitage & Conner, 2008), are bound to be unable to teach their students unequivocally about what may be considered to be 'correct' environmental behaviours, i.e., to teach them clearly how an environmentally minded citizen should behave when confronted with environmental issues.

On the other hand, our sample of teacher college students has shown that such skepticism about ambivalence is not justified: ambivalent teachers are able to adopt clear stands, and ambivalence does not appear to prevent pro-environmental attitudes. Even more important, from the point of view of education, as opposed to indoctrination and manipulation, the potential contribution of ambivalence, i.e., of the ability to appreciate different types of opposing arguments, appears to exceed its possible disadvantages.

However, the fact that, as shown by this study, ambivalence may not be the most frequent reaction to environmental issues has some implications for teacher training. Environmental issues may not be regarded by a majority of non-ambivalent teachers as truly controversial. The ability to refer to environmental issues as controversial, to treat them impartially as far as possible must therefore be developed during teachers' pre-service and in-service training. Questionnaires of the type presented here may be useful for two reasons. Firstly, they confront the respondent with a

variety of pro- and non-environmental arguments, thus increasing their awareness of the nature of the controversy and making impartiality and fairness easier to achieve. The second reason is related to the fact that the patterns of response to the various issues were not uniform. The different patterns of response to the various issues bear an important educational implication: While encouraging ambivalence may be a general objective of environmental education, and the discussion of some types of issues may be a good platform for the development of student's ambivalence, various issues do not offer equal educational opportunities. Some of them may not provide good opportunities for the fostering of students' inclination towards ambivalence. Characteristics of students and context should be taken into consideration. In a given context, the very idea of ambivalence may be seen by most students as irrelevant or immaterial (e.g., the parking issue). Relatively similar issues (laws about organic agriculture and about cellular aeri-als) may yield very different responses and levels of ambivalence, etc. It follows that the issues to be discussed in a classroom with ambivalence in mind, should be carefully selected and analyzed, and treated according to the reaction of the students.

Concerning the choice and use of any environmental issue to be discussed in the classroom, with ambivalence and 'how to think' in mind, teachers should therefore be encouraged to use questionnaires of the type presented here, prior to the teaching activity or as part of it.

Notes

¹A score of 11 is impossible: since $(P+N)-(P-N)=2N$ (or $2P$ if $P-N$ is negative and the modulus has been used), the values of A (ambivalence) are always even numbers

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