

The Open University

Design Innovation Group

*Towards Sustainable Higher Education:
Environmental impacts of conventional campus,
print-based and electronic distance/open learning systems*

Effects of HE courses on student and staff behaviour and attitudes towards the environment

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Additional appendix to Report DIG-07

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1 Introduction

This appendix reports on the analysis of the qualitative data from the study of the environmental impacts of higher education discussed in the main report. The data was drawn from the sections of the questionnaires that asked students and lecturers to express their opinions regarding the effects of taking the higher education courses on their attitudes and behaviour towards the environment. It addresses the information given by students and Associate Lecturers on two Open University courses: T171, *You, Your Computer and the Net* and T172: *Working with our Environment: Technology for a Sustainable Future* and that of the students and their lecturers at the nine campus-based universities investigated. Six of these campus university courses contained some environmental element, (courses A, B, E, F, G and I; SEE MAIN REPORT) whilst the remaining three (courses C, D and H) did not.

1.1 Analytical Framework

The responses to the questionnaire concerning changes in behaviour and attitudes towards the environment, (e.g. Questions 22-26, see Appendix 2 of the main report) have been analysed according to the following framework. Three distinct categories could be used to describe the effects of attitude and behaviour changes as a result of taking the course.

- i) POSITIVE (MORE ECO-EFFICIENT)
- ii) MIXED
- iii) NEGATIVE (LESS ECO-EFFICIENT)

Positive responses are those where a change in behaviour suggests eco-efficient gains arising from improvements in energy or material usage or changes in travel behaviour. This may include, greater use of energy efficient technology, greater use of recycled material or reductions in the number of car journeys made. The converse applies to the negative replies. These are changes in behaviour which result in a reduction in eco-efficiency, for example, additional travel or increased consumption of energy or materials. The 'mixed' category, is where a substitution effect has been observed. For example, students observed that doing the electronically delivered T171 OU course provided the skills and confidence to buy goods online, instead of physically visiting shops. This may have several effects. First, it will remove a potential journey, but will probably increase energy consumption in the home (for heating, lighting, and powering the PC). An online course also removes the need to travel to face to face tutorials. But it might also stimulate further journeys (e.g. holidays abroad) that may not have occurred without access to the Internet. The 'mixed effect' may be temporary; students commented that their normal travel patterns were disrupted through course commitments, but might be expected to revert back at the end of the course. However, many effects were long-term resulting from behaviour changes resulting from the content of the course. This raises the interesting question as to whether temporary behavioural changes due to the mechanics of studying the course can be separated from more permanent changes due to the content of the course. Further research of a longitudinal nature may be required in order to answer this. Example quotations from the questionnaires follow to illustrate each category.

Positive: "T171 is studied from home eliminating the use of transport, i.e. petrol. As the module material is accessible online and it is convenient to copy to disk and not essential to copy to paper, the OU is not providing vast amounts of hard-copies posted or handed out to all students, thus reducing the production of material." (T171 student)

Mixed: "During the course I have travelled to work using the tube rather than a motorbike in order to use the time to read the set books and printed out course material." (T171 student)

Negative: "Purchase of more paper and printer ink. Staying up late, use of light. Surfing the Internet by all family members." (T171 student)

2. Changes in Behaviour and Attitudes

Students participating in the study were asked to comment on any changes in their behaviour with reference to travel, energy consumption and use of materials.

2.1 T171 Students

Two groups of T171 students responded to our questionnaires. The first group was asked only about their travel habits, the other about their energy consumption and use of materials. The questions were as follows:

Table A1

<p>Group 1</p> <p>Q11. As a result of taking the T171 course have your general household patterns of travel changed in any way?</p> <p>Q12. Again, as a result of taking T171, do you anticipate that your general patterns of travel will change in the next 12 months?</p> <p>Q13. Other comments to do with T171 and travel.</p> <p>Group 2</p> <p>Q17. Have your household patterns of energy consumption and materials changed in any way as a result of taking T171?</p> <p>Q18. As a result of taking T171, do you anticipate that your general household consumption of energy and materials will change in the next 12 months?</p> <p>Q19. Any other comments about the environmental effects of T171.</p>

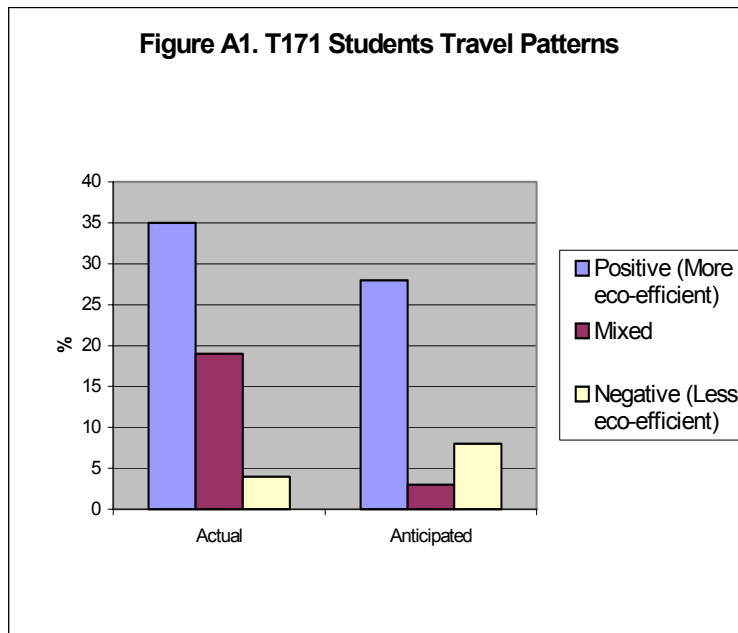
2.1.1 Travel behaviour

Actual and anticipated changes in student travel behaviour as a result of taking the T171 course are shown in Table A2 and Figure A1. The model proposed has been simplified to reflect the single dimension of changes in transport behaviour.

Table A2: Changes in household travel patterns as a result of taking the T171 course (frequencies)

T171 Students	Actual Changes in Travel (Q11)	Anticipated Changes in Travel (Q12)
Positive (More eco-efficient)	35	28
Mixed	19	3
Negative (Less eco-efficient)	4	8
<i>Total</i>	58	39

The overall response rate for Q.11 was 77 from a sample of 987 questionnaires (7.8%) For Q.12 it was 59, from a sample of 1008 questionnaires (5.9%). Those that can be categorised according to the analytical framework are presented in Figure A1.



Actual changes in travel behaviour involved more positive than negative effects, although the extent of environmental impacts is unknown. Most of the positive effects were due to reductions in travel from obtaining information via the Internet rather than from libraries, etc., from studying mainly or exclusively from home, from the opportunity offered by electronic communications to work more from home, and from more Internet shopping. Negative effects arose mainly from local travel to meet other T171 students face to face and from increased travel opportunities provided by Internet booking.

Examples of such changes are illustrated by the following quotes:

Positive: *"We travel less since we have learned to use the Internet to shop and to find information sources. Fewer trips for shopping excursions...fewer trips to the Library."*

"Work from home more, avoid 160 mile round trip to office."

Negative: *I travelled more to meet up with members of another tutorial group I met online."*

"I got a new job as a result of confidence and skills learned on T171. Unfortunately, this involves driving an extra 80 miles a week!"

The complexities involved however are well illustrated by one quote in the mixed category:

Mixed: *"I actually found low cost air flights to Europe on a site through T171, and went to Europe after booking the hotels, ferries and travel arrangement through that site for another trip to Paris!"*

Here any reduction in travel for booking flights would be insignificant compared to the resultant air travel.

For anticipated travel behaviour there were again more positive than negative environmental effects expected, but there were relatively more negative effects than for the actual changes in travel behaviour.

2.1.2 Household consumption

Analysis of T171 students' responses about changes in household consumption patterns as a result of taking the course revealed virtually no 'mixed' category behaviours. The majority of responses indicated negative environmental impacts due to a general increase in energy and materials consumption. The main reasons were increased energy consumption for computing, lighting and heating due to staying up late to use the Internet and/or for staying at home more for study, consumption of paper and ink for printing course materials and greater consumption opportunities offered by Internet shopping.

Table A3: Changes in household consumption as a result of taking the T171 course (frequencies).

T171 Students	Energy		Materials	
	Actual (Q17)	Anticipated (Q18)	Actual (Q17)	Anticipated (Q18)
Positive (More eco-efficient)	3	9	5	4
Negative (Less eco-efficient)	65	9	13	2
Total	68	18	18	6

The response rate for Q.17 was 107 from a total of 341 replies (31.4%) For Q.18, n = 117 from a total of 336 replies (34.8%). Again only those responses that could be categorised according to the analytical framework are displayed in the Figure A2.

The following are some selected quotes from T171 students to illustrate the analysis.

Positive:

"It is possible that I use less energy as I stay in one room all the time and for many hours do not heat the rest of the house much. I also order a lot of books [on the Internet] which saves money and I suppose energy also. I would [had] have to travel about 200 miles just to look for them."

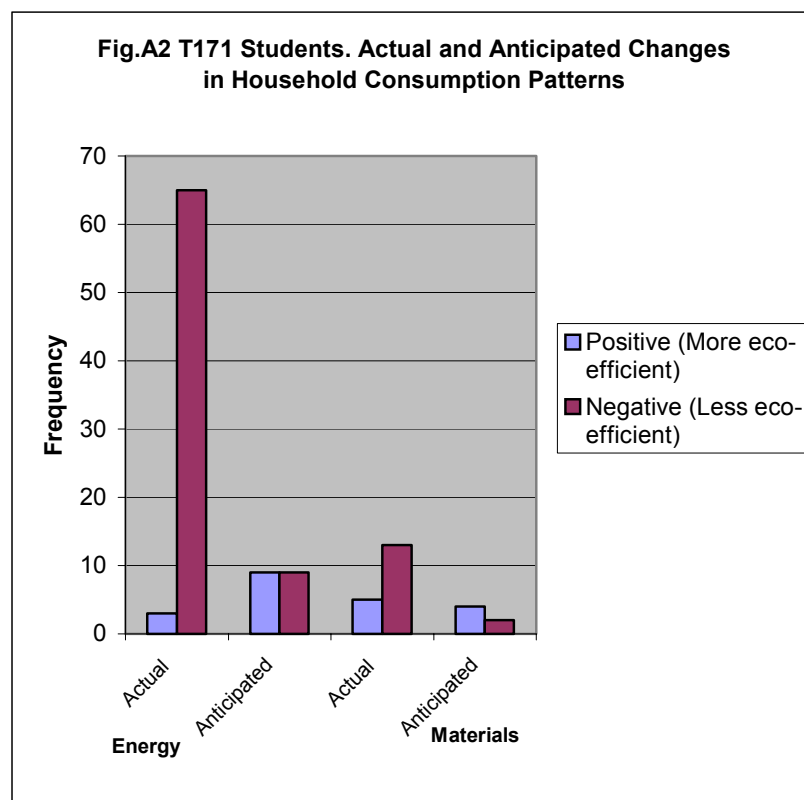
"I am more inclined to keep notes, household books, recipes etc.. on floppy disks and recycle or avoid using the paper these items would be written on."

Negative:

"Definitely use the computer and the Internet much more than previously, and will continue to do so even though the course is finished. It has introduced me to a new way of life!"

"Use more electricity making my study place light and warm as well as powering the PC etc"

There are two cognitive processes associated with these comments. First, there is a general attitude that the course enabled the students to explore alternative ways of consumption, for example, using the Internet for shopping. Second, in other students there is a awareness that such benefits have a cost penalty through increased use of resources in the home (electricity, lighting, heating, and computer consumables).



2.2 T172 Students

The questions were structured in a similar manner to those addressed to T171 students. The first two (Q.11 and Q.12) concerned travel patterns as shown in Table A4. Question.27 and Q.28 were about household energy and materials consumption as shown in Table A5 below. Q.29 specifically asked about changes in diet, Q.30 investigated changes in attitudes, and finally Q.31 was a catch-all question.

Table A4 Actual and anticipated travel as a result of taking the T172 course (frequencies)

T172 Students	Travel	
	Actual (Q11)	Anticipated (Q12)
Positive (More eco-efficient)	23	12
Negative (Less eco-efficient)	1	0
Total	24	12

Figure A3 represents this data graphically.

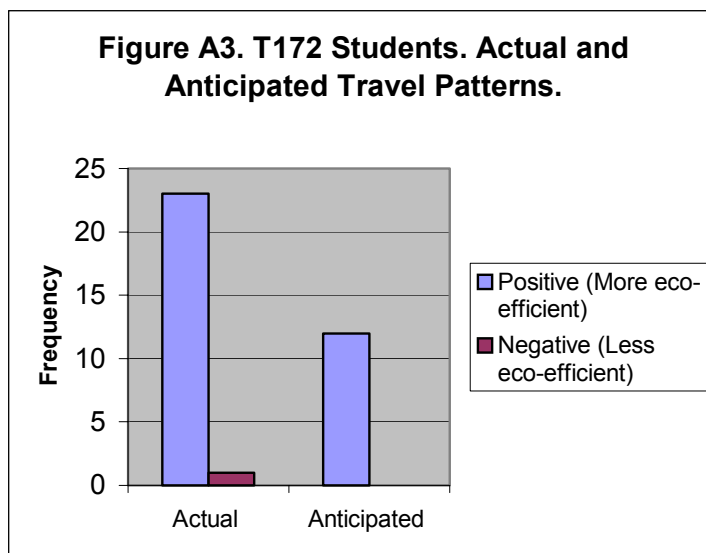
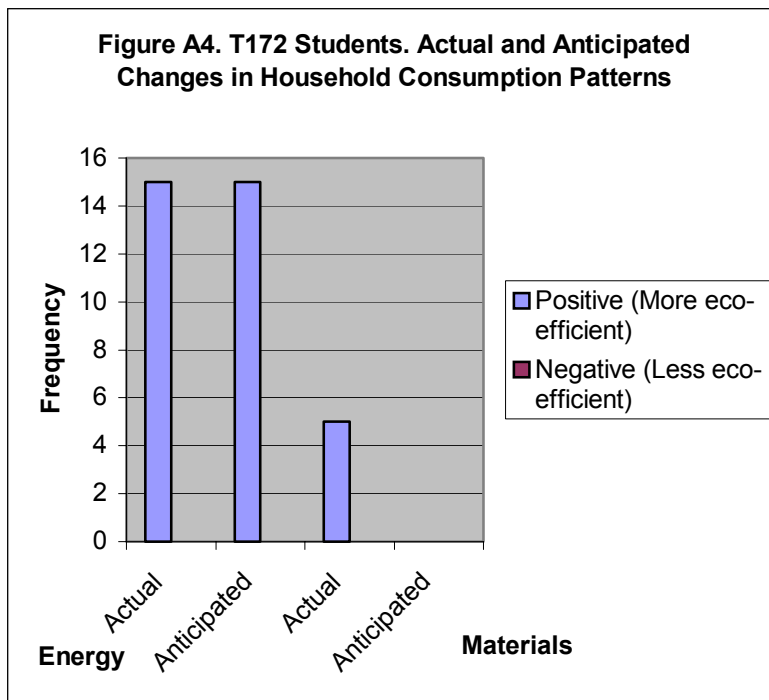


Table A5: Changes in household consumption as a result of taking the T172 course (frequencies).

T172 Students	Energy		Materials	
	Actual (Q27)	Anticipated (Q28)	Actual (Q27)	Anticipated (Q28)
Positive (More eco-efficient)	15	15	5	0
Negative (Less eco-efficient)	0	0	0	0
Total	15	15	5	0

The response rate for Q.27 was 24 from a total of 43 replies (56%) For Q.28, n = 18 from a total of 43 replies (42%) Again only those responses that could be categorised according to the analytical framework are displayed in Figure A4.



An examination of the questionnaires reveals almost wholly environmentally positive behavioural changes claimed by the T172 students. These included a reduction in car ownership and use, greater use of cycling and public transport, more materials recycling, adoption of home insulation and energy efficient appliances, and even moving house to reduce commuting. This is not surprising given that the T172 course was concerned with environmental issues and included a student assignment concerning the possible ways their own households might reduce environmental impacts. Within many of the answers, several categories were covered by appropriate comments. Some examples serve to illustrate this.

Positive:

“Now walk children to school two days per week – result of ‘transport diary’ and CO₂ reduction exercise of module 2.”

“Cancelled junk mail – installed radiator valves – replaced loft insulation – heating thermostat used more. Sell second car. Fully insulate house.”

“We now recycle cardboard and plastic as well as glass and cans which we did previously. We shop for food now with an awareness of ‘food miles’ and unnecessary packaging and what’s ‘in-season’. We think carefully about travel, and combining journeys, or eliminating them if possible.”

“Already eating ‘organic’ produce, but now more aware of ‘country of origin’. Considering ‘growing our own’ partly because of packaging and transportation issues. Also looking to further change our diet to remove ‘processed meals’ and replace with home-made.”

“Moved house to reduce travel to and from work.”

The way the Q.29, concerning changes in food consumption patterns was phrased suggested two possible categories of response.

- The student anticipated buying more locally sourced food; 16 (80%)
- And/or they intended to buy more organic food; 9 (45%)

“Have obtained details of local farmers’ markets and will visit whenever possible to buy locally produced foods... I look more carefully at labels in supermarkets and avoid those foods flown a long way. Try to avoid excessive packaging.”

“Already eating ‘organic’ produce, but now more aware of ‘country of origin’. Considering ‘growing our own’ partly because of packaging and transportation issues. Also looking to further change our diet to remove ‘processed meals’ and replace with home-made.”

However, several students were critical of the means of *delivery* of the mainly print-based T172 course, which they regarded as wasteful of resources. This is encapsulated by the following observation:

“There was a considerable amount of material supplied. Folders could have been sourced by me. The course material used expensive paper and a lot of it. Some material was supplied in interim and final form. This all meant a considerable use of resources and packaging.”

Both Q.30 and Q.31 asked about changes in attitudes towards environmental issues raised by the course.

Fifteen students (41.67%) expressed a general increase in awareness of environmental issues. Four (11.11%) reported an increased awareness of the need to reduce energy consumption, however three (8.33%) believed they were generating increased environmental loading due to the amount of paper consumed during the course.

Table A6: T172 Students; Changes in attitudes as a result of taking the course.

Changes in Attitudes (Q30 & Q31)	Frequency
Increased Awareness of Environmental Issues (general)	15
Increased Awareness of the effects of energy consumption	3
Total	18

Some typical responses included:

“Better awareness of how my lifestyle can affect the environment, discussing their effects with friends and family to raise their awareness.”

“Conscious of the effects of global warming etc., reduce use of energy consumption, etc.”

“My attitudes have changed and when released from prison, my modes of travel will change i.e. walking, cycling and public transport as much as possible.”

2.3 T171 Associate Lecturers

An unexpected finding was that the overall impression given by the T171 Associate Lecturers (tutors) is that they are generally conscious of the environmental impacts of the course, and make efforts to reduce their own environmental ‘footprints’. This is despite T171 having no environmental focus. Their efforts are often compromised, however, through accidental or deliberate rebound effects. For example, many printed out much of the course material and the assignments for portability and ease of marking.

“As the delivery of T171 is electronic, it is reasonable to assume that tutors and students would make less use of paper in the course. However, I found it useful to print out some documents for reference, rather than have to refer to the electronic version.”

“I printed most of the T171 material because I was new to the programme, and felt I could learn more easily from paper than the screen. Paper is much more flexible; I can read anywhere. I will not have to do this for subsequent years.”

In subsequent years, the printing of course materials should not be necessary, unless the course material is extensively revised. The tutors also tried to reduce personal travel. Some noted that tutoring on T171 suited their lifestyle because of the lack of travel involved, but this was often compromised by the students’ and the OU Regional Centres’ desire for face to face tutorials.

2.4 T172 Associate Lecturers

As with T172 students, most T172 tutors expressed positive views and changes in lifestyles reinforced by the course material. Given the subject of the course, it is not surprising that many of its tutors were

apparently already engaged in ‘greening’ their lifestyles and the course provided ideas and opportunities for further positive action. Some mixed category responses were observed, and a couple of tutors were hostile about the intent of the course, regarding it as propaganda!

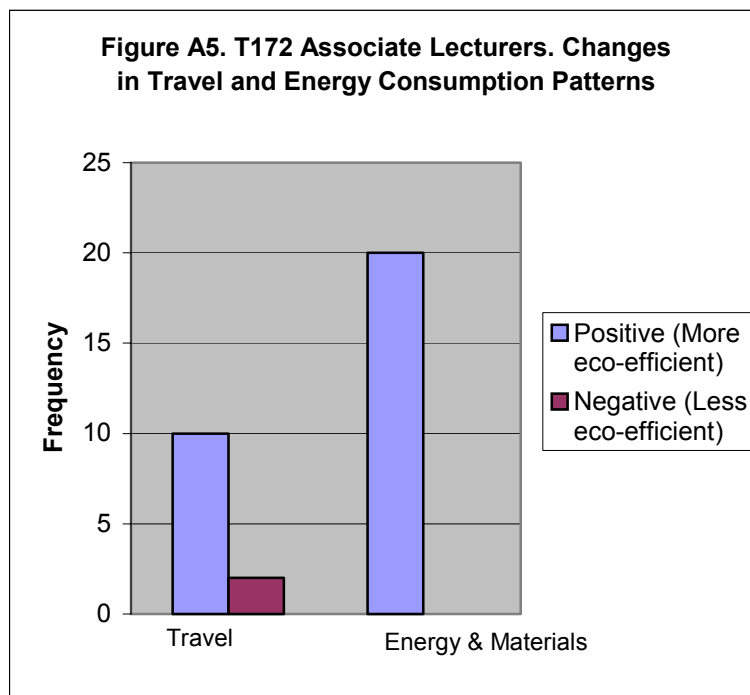
Sixteen T172 tutors made valid replies to Q.22 (changes in household travel patterns as a result of teaching on the course). Of these responses, 2 (12.5%) believed tutoring the course had a negative impact, mainly due to the need to travel to give tutorials at a study centre. 10 (62.5%) believed it had a positive impact, mainly increased use of cycling, walking and public transport and awareness of ‘food miles’ in their household.

Q.23 concerned changes in household consumption of energy and materials. There were 21 responses, of which 20 (95.24%) believed they used less energy and resources due to teaching on T172. The changes included the usual household recycling, home insulation and energy saving lamps; as well as trying to save water and emailing Christmas cards.

Table A7: Changes in travel and household consumption as a result of taking the T172 course (frequencies).

T172 Tutors	Travel (Q22)	Energy and Materials (Q23)
Positive (More eco-efficient)	10	20
Negative (Less eco-efficient)	2	0
<i>Total</i>	<i>12</i>	<i>20</i>

Q24: Changes in food consumption patterns 17 tutors replied to this question. 14 (82.35%) stated they actively sought out local foods (e.g. farmers’ markets), while a further 2 (11.76%) claimed to have



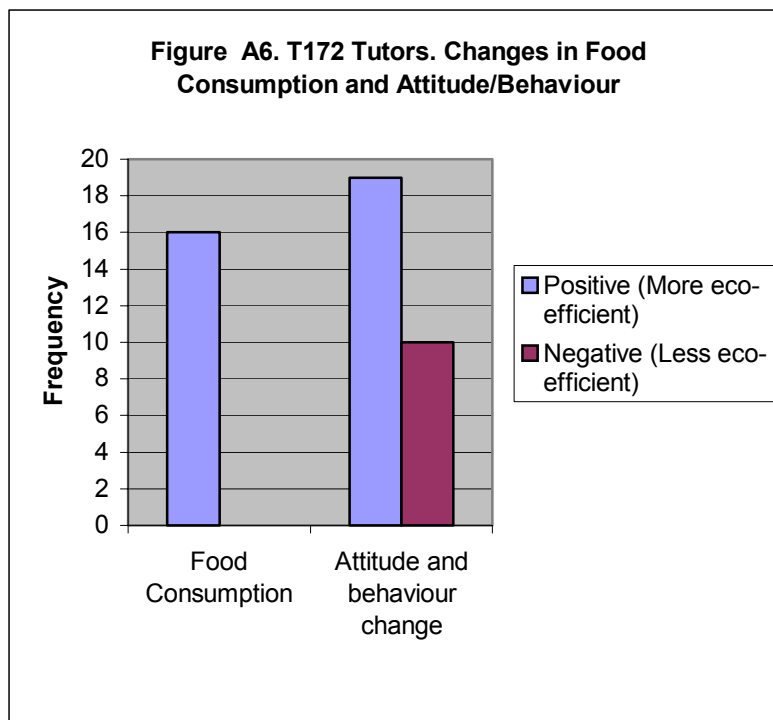
bought more organic produce.

Q25: Attitude change. Most of the 22 responses to this question were positive. 14 (63.64%) claimed to be more environmentally aware in general, while 4 (18.18%) were more aware of the potential for activities such as recycling.

Q26: Other Comments. There were 29 responses to this question. However, 6 (20.69%) believed the course generated more travel, and 4 (13.79%) also thought there was an excessive use of paper. Just one (3.45%) stated they travelled less.

Table A8: Changes in food consumption and attitudes as a result of taking the T172 course (frequencies)

T172 Tutors	Changes in food consumption (Q24)	Attitude and behaviour change (Q25 and Q26)
Positive (More eco-efficient)	16	19
Negative (Less eco-efficient)	0	10
Total	16	29



Environmentally positive changes in behaviour and attitudes from the T172 Tutors included:

"Increased low energy lighting and loft insulation. Investigating solar water heating and PV roof tiles."

"Much more aware of where food comes from. Try to buy local produce, only buy European wine."

" This course has helped me look at wider issues. Encouraged students to find out about local organisations and charities that work in environment."

2.5 Campus Students

This section addresses the responses from the full-time campus students to the questions concerning changes in behaviour and attitudes as a result of taking their courses. In common with the previous sections detailing the T171 and T172 students and Associate Lecturers the analysis codes the responses into three categories; positive, mixed and negative. The first two questions investigated changes in consumption patterns, the third concerned changes in attitudes, and the final question was a 'catch all'. These questions were only asked of students on those courses in which environmental issues were a major subject area. The majority of students were however, taking a course with an environmental component. (see Appendix 2 to the main report).

The questions were phrased as follows:

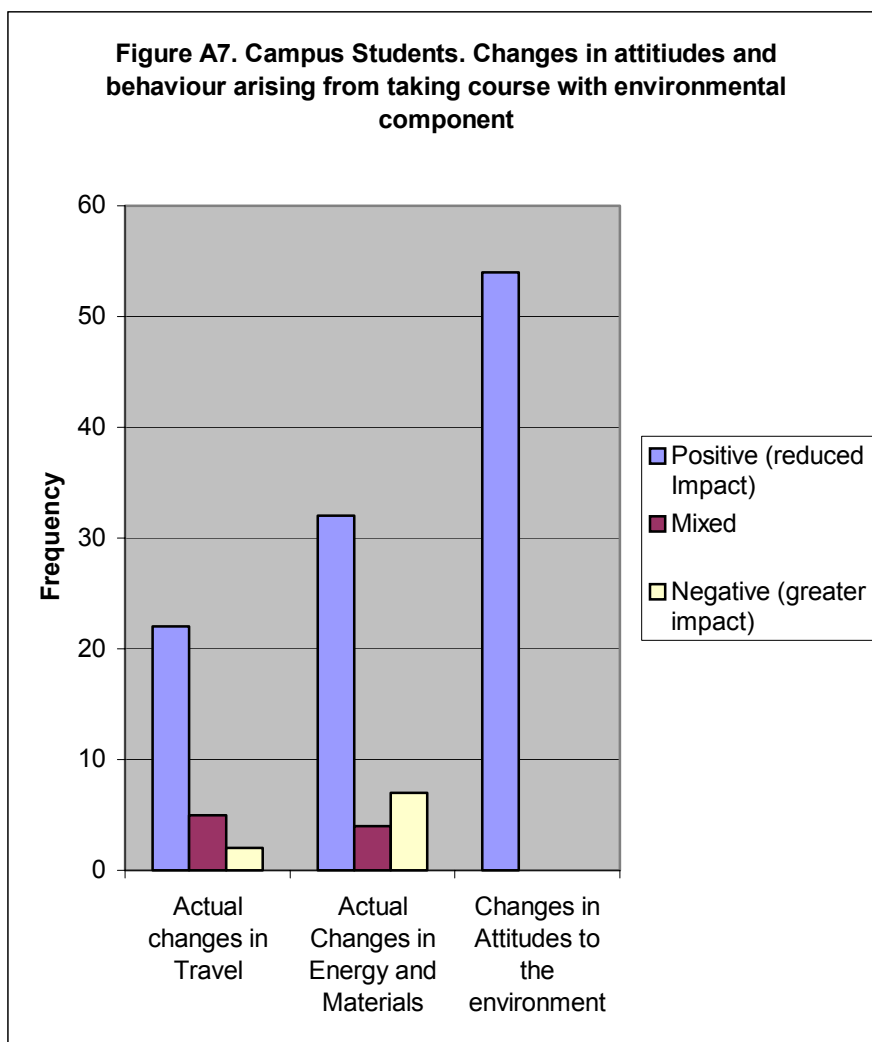
Table A9

Q23. As a result of taking the course, have your general patterns of travel changed in any way?
Q24. As a result of taking the course, have your general patterns of consumption of energy and materials changed in any way?
Q25. As a result of taking the course, have your <i>attitudes</i> towards the environment changed?
Q26. Please provide any other comments concerning the environmental effects of the course that you feel have not been included.

The general results from the first three questions are summarised in the following table.

Table A10 Campus students: Changes in behaviour and attitudes as a result of taking courses with a major environmental component (frequencies).

	Positive (more eco-efficient)	Mixed	Negative (less eco-efficient)	Total
Actual changes in Travel (Q23)	22	5	2	29
Actual changes in Energy and Materials (Q24)	32	4	7	43
Attitudes to Environment (Q25)	54	0	0	54



The following quotes from the campus students on environmental courses serve to illustrate each of the categories.

Positive	<i>“Cycle more often; huge fan of public transport.”</i> <i>“More attention to energy consumption and recycling.”</i> <i>“Concerned about food miles, and prefer to buy local produce.”</i>
Mixed	<i>“Walk more. Don’t use a car to travel to University, but I do for supermarket shopping.”</i> <i>“Regulated heating in the house. But extra heating needed when studying.”</i>
Negative	<i>“Travel more due to new contacts.”</i> <i>“Use more energy through doing the course.”</i>

2.5.1 Travel Behaviour

For question 23 (concerning changes in travel patterns), there were a total of 31 responses. Of these, five (16.13%) claimed that their travel had increased due to studying, while 25 (80.65%) believed their travel had reduced. Much of this reduction was associated with reduced income.

Most students were concerned about using public transport, or changing transport habits, such as increased cycling and walking, for example:

“I do more walking and biking. When I had a car, I tried to cut down on journeys and take other passengers”

These comments suggest a number of factors, not exclusively environmental, have an effect on student lifestyles. For example, there is already a strong cycling culture at one university, so it is unsurprising that students are prepared to use bicycles:

“I use a bicycle anyway”

The cost of motoring is often viewed as prohibitive. For example:

“Sold car to fund study”

“Car shares, but this also saves money”

Reduced car dependency is strongly associated with economic necessity. Student life can also produce rebound effects, as reduced car use in one activity (commuting to college) is compensated by increased travel for other purposes:

“I try to walk to the University, but I travel more often due to friends living further away.”

2.5.2 Household Consumption

Many campus students felt they were able to reduce energy and material demand, and several were actively engaged in recycling resources:

“More attention to energy consumption and recycling.”

“I put on an extra jersey rather than turn up the heating.”

“I use recycled materials for model making.”

“I dress up warm to reduce heating. Recycle everything, including clothes. I repair mechanical/electrical equipment where possible and I buy veg. from local shops.”

“When printing non-hand in work, I print on both sides of the paper.”

There was also more evidence of increased energy consumption due to use of computers, and associated heating and lighting:

“Increased energy used at night for work.”

“I use the computer more, and waste more paper.”

“I consume more energy and resources due to the quantity of information I need to gather.”

The majority of students that responded to questions 23 and 24 believed they were taking positive action regarding their travel as well as their energy and material consumption habits. The students of

those courses where there is an overt environmental component or focus were likely to express positive behaviour changes that they believed reduced their travel and household consumption. We did not ask these questions of those campus courses without an overt environmental element as it was considered unreasonable to expect those students to be exposed to environmental issues, or express concern.

2.5.3 Attitudes

There were 54 responses from students of campus courses with an environmental component to the question on attitude change. Of these, a total of 51 (94.4%) reported an increased awareness of environmental issues. Of these, 40 (74.1%) students claimed that they were more concerned about their environmental profile (at a cognitive level), while the other 11 (20.4%) were actively engaged in changing their behaviour patterns (e.g. increased recycling, more use of public transport). Although concern for the environment does not always translate into active behaviour changes, there is a suggestion that the initial process of attitude change has already begun. For students of environmental courses positive behavioural changes may follow, and could be a direct consequence of the course studied.

For example, students expressed changed attitudes such as:

“Concerned about global warming.”

“Concerned about food production and the effects of industry on the environment.”

“More aware of the difficulties of water management and the importance of water conservation.”

“Become more aware and informed. Concerned about sustainability and equity.”

There are examples of where active behaviour change has occurred:

“I volunteered for the Conservation Trust.”

“I don’t buy vegetables shipped from South Africa and Argentina.”

“I eat organic and fair trade food. No meat and I use environmentally friendly detergents.”

Although some of the non-environmental courses are not expected to demonstrate attitude change, it is of interest that the influence of the course lecturer may have an impact. For instance, one lecturer canvassed whose research interests include environmental design elicited the following response; *“Recycling is always considered when designing.”*

2.5.4 Other Comments

The final question, Q26, referred to any other comments. There were 10 responses from campus students. These mainly consisted of an increased awareness of issues such as recycling and public transport use. Of these, two students reported their studying had a positive effect due to reduced paper use and increased recycling, but five reported the reverse (more paper, increased energy consumption, and more computing). The overall impression was that students felt their courses may consider global issues, but failed to address the changes that could be made by an individual. Instead, they viewed institutional level changes as more significant. This, perhaps marked an important difference between the OU T172 course, with its approach on individual consumption, and other courses which may have looked more at institutional level actions.

Students also suggested there is a general apathy amongst students for recycling or that these processes are not supported at an institutional level.

For example:

“The course does highlight problems and policies internationally, but unless people are particularly concerned, I don’t think it initiates too much change among students. Course rarely suggests how individuals can make a difference.”

“Most young students on the course have a good idea of what is good and bad for the environment, but often too lazy to buy (low energy) light bulbs, recycle bottles. Often, facilities or regulations do not allow such recycling or conservation processes.”

3 Conclusions

The responses to the qualitative questions in our surveys show that the *curriculum* can have an important effect on student attitudes and behaviour towards the environment. This is of course the reason for all the emphasis on ‘greening the curriculum’ in higher education environmental policies and programmes. However, the study shows that not all the effects are wholly positive and there are also some negative effects, even for courses with environmental content.

This can be seen most clearly in comparing the effects on attitudes and behaviour of the two OU courses. T171: *You, your computer and the Net* is an introduction to computers and the Internet and has no overt environmental content. While T172: *Working with our environment* is an introductory technology and environmental studies course, that includes content on what individuals and households can do to reduce their environmental impact.

The effects of T172 on student and staff behaviour concerning both actual (i.e. claimed to have already taken place) and anticipated travel, consumption of energy, materials and food are almost universally environmentally positive. The responses ranged from installing low energy lamps to moving house to reduce commuting distances. Some of the behavioural effects of T171, however, are environmentally positive, but there are also mixed and negative effects on actual and anticipated travel and consumption behaviour. Many of these effects are to do with the content of the T171 course. Introducing students to computing and use of the Internet may have environmentally positive effects, such as a reduced need to travel for shopping and for accessing information, or enabling someone to work from home. But it may also have negative environmental effects such as making flight bookings or home shopping cheaper and easier and hence encouraging more air travel and consumption. Interesting negative ‘rebound effects’ were the amount of paper consumed in printing Web delivered course material and additional household heating during out of hours Internet access. The travel effects of T171 can also be mixed, such as another rebound effect – travel to informal student meetings – while at the same time reducing or eliminating the need to travel to formal course tutorials at study centres.

It is not possible to make such comparisons for the campus-based courses, as we only asked students and staff of the six courses that covered environmental issues as a *major* subject area to respond to questions concerning changes in attitudes and behaviour. What is apparent is that the changes claimed by students as a result of studying these environmental courses tend to be fairly generalised, such as using a bicycle for travel or recycling materials. Likewise these students might claim greater awareness of environmental issues such as climate change. The probable reason for the difference between the fairly generalised responses of students of these campus environmental courses and the more specific, and sometimes radical, responses those of the OU T172 *Working with our environment* course is that the campus students tend to be younger and living in a student culture, while the OU students were generally mature and with jobs and families. More importantly perhaps was the fact that at the beginning the T172 course contained information and practical exercises that required students to think how they might reduce their household environmental impacts. Only later did the course broaden into addressing environmental issues at national or international levels.

‘Greening the curriculum’ is therefore an important educational approach to environmental issues, but those attempting to tackle environmental issues through curriculum change should ensure that the course addresses the lifestyles of its students as well as teaching about environmental management and policies.