

CAN WE MAKE ENVIRONMENTAL CITIZENS?

A RANDOMISED CONTROL TRIAL OF THE EFFECTS OF A SCHOOL-BASED INTERVENTION ON THE ATTITUDES AND KNOWLEDGE OF YOUNG PEOPLE

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This paper reports the results of a school-based randomised control trial of 448 primary school students and their families in twenty-seven primary schools located in Vale Royal, North West England carried out between January and July 2008. The interventions were two types of class-based instruction on environmental issues, one long and the other short, which were designed to increase environmental awareness. Environmental attitudes and behaviours were measured by surveys completed before and after the interventions by the students in their classes and in their homes. The analysis reports school averages of the questionnaire responses, followed by regression analysis using robust clustered standard errors. The results show no statistically significant differences between schools in the intervention groups compared to the control group schools. The rising environmental awareness of the control group during the intervention may partly explain the positive results of existing non-experimental studies.

Recent years have seen an upsurge of interest in the question of how national and local governments can encourage behaviour change. Increasingly an effective response to some of the wicked issues in public policy (i.e., anti-social behaviour, alcohol misuse, drug use, etc) is traced to the task of promoting individual responsibility and the development of a more sophisticated understanding of the factors that encourage pro-social behaviour (e.g. Halpern et al. 2004; Lewis 2007). Behaviour-based interventions are associated with several benefits, including cost-effectiveness, a lower tax burden, citizen empowerment and improved levels of social capital. Within this broader debate is the question of how policy-makers can promote pro-environmental attitudes and behaviour. As others note, ‘everyday human behaviour matters a great deal for the environment and therefore also for policy-makers who design the instruments aimed at improving environmental quality and conserving natural resources’ (Berglund & Matti 2006, p.551). The promotion of pro-environmental attitudes and behaviour is a central policy goal in the UK, the achievement of which is linked specifically to increasing the contribution from individuals and communities (Defra 2008, p.3). Underpinning this debate is the idea of environmental citizenship which ‘makes demands on people to act differently for the sake of the environment’ (Bell 2005, pp.179-80; also Dobson 2003), and which has encouraged research on who becomes environmental citizens and how best to encourage this type of citizenship (e.g. Jagers, 2009). Numerous studies have focused on the question of how to move from traditional market-based incentives toward alternative means of promoting environmental citizenship and of encouraging citizens to act according to the public environmental good (e.g. Dobson & Bell, 2006). Like those wicked policy problems above, changing environmental behaviours such as recycling, litter and energy use and encouraging environmental citizenship, require

the active cooperation of citizens themselves and a firm understanding of what works in terms of interventions geared toward attitudinal and behaviour change.

One approach to promoting pro-environmentalism over the longer-term is to focus on improving the environmental attitudes and behaviour of young people. However, in contrast to the body of research on the environmental attitudes and behaviours of adults much less is known about the contents of early childhood environmental attitudes and behaviours (Evans et al. 2007, p.636; also Reid & Sa'di 1997, p.474). There is clear need for more research focused on young people's environmental attitudes and behaviours and the effects of interventions that are designed to encourage a more pro-environmental outlook. One type of intervention that is often used is the school-based environmental education programme. In recent years increased concern about environmental issues has been paralleled by a growth in the development of environmental education (Barraza & Walford 2002, p.171). There is now a large literature that stresses the ability of school-based educational interventions to exert positive effects on the environmental attitudes and behaviour of children (see below). Moreover, school-based interventions have an added attraction in that they may exert a diffusion effect in that participants might also influence the attitudes and behaviours of their households more generally. Yet to what extent do school-based environmental education programmes actually work? Research using observational data has difficulty making an inference because of the difficulty of isolating the effect of an intervention amongst many other factors. These methodological deficiencies in the existing literature can be addressed (in part at least) by utilizing the more rigorous evaluative approach of randomized control trials (RCTs) where one group with the intervention is compared to a randomly-allocated control group. In this paper we assess whether participating in a school-based

intervention improves the environmental attitudes and behaviour of schoolchildren, reporting a randomized control trial (RCT) to evaluate the impact of in-class environmental education initiatives on young people and their households. The paper is organised as follows: first, we present an overview of research on the environmental behaviour and attitudes of young people; second, we discuss participants, data and methods; third, we present our findings; and in the final section we draw some implications for the wider literature on environmental education and behaviour.

Children and the Environment

Existing research tells us that children generally hold positive attitudes toward the environment. Children are often able to distinguish between different kinds of environmental problems and understand the negative impact of mistreating the environment (Bonnett & Williams 1998; Cohen & Horm-Wingard 1993; Huang & Yore 2004; Kahn & Lourenco 2002; Kuhlemeier et al. 1999; Szagun & Pavlov 1995). Evans et al. (2007) assessed the environmental attitudes and values of 100 children aged 6-8 years via three game scenarios. Despite its limitations the study suggested that children held moderately high environmental attitudes, behaved in an ecologically responsible manner and were able to reliably report on environmental attitudes and ecological behaviours.¹ Similarly, findings from a survey of over 4,000 children (aged 11-16 years) from 179 middle and secondary schools in England and Wales revealed that 81 per cent of schoolchildren believed that it was important to learn about global issues at school and that they needed to understand global matters

in order to make choices about how they want to lead their lives (MORI 1998; cited in Scottish Executive 2003, p. 5).

One approach to promoting pro-environmentalism amongst children is via school-based environmental education programmes. Children rely heavily on schools and teachers as an important source of information about the environment (e.g. Huang & Yore 2004) and there is evidence to support the proposition that school-based interventions exert positive effects on the environmental knowledge, attitudes and intended behaviour of children (Hungerford & Volk 1990; Leeming et al. 1997; Loughland et al. 2003; for reviews see Rickinson 2001; Wagner 1997; Zelezny 1999).² Though generating useful insights, much of this research is non-experimental and thus lacks the extra rigour offered by a randomized control trial approach (e.g. Emmons, 1997; Mason & Santi, 1998; Park & Chang, 1998).³ Quasi-experimental studies have produced encouraging results. Research on the effects of environmental education interventions (whether school-based or outdoor residential courses) has produced statistically significant shifts in certain aspects of environmental attitudes and perception. Bogner (1998) investigated the effects of a five-day residential ecology programme on a sample of 351 secondary school students (aged 12-13 years). Participants worked in small groups and undertook a combination of cognitively biased and emotionally-orientated activities (e.g. locating and identifying animal tracks). One group received the treatment whilst a second group participated in an outdoor programme with no ecology focus and a third group did not participate in any programme. One month after the intervention Bogner reported significant gains in students' environmental knowledge and attitudes and also their willingness to plan and take action for the environment.⁴ Dettman-Easler and Pease (1999) evaluated the effects of a two to five-day residential programme in Midwest America on 697

students aged 10-12 years. The study reported significant differences in attitudes toward wildlife that were also significantly greater than those of a control group which received classroom instruction. The initial changes reported one week after the programme were still evident two to three months later. Utilizing a pretest/post-test design with an experimental group and control group, the study by Lindemann-Matthies (2005) evaluated the effects of an educational program in Switzerland on over 4,000 children aged 8-16 years old. Though findings indicate that the program had a positive effect on children's appreciation of local organisms, the study was neither able to control for the self-selection of teachers into the program nor the number and length of activities. Johnson and Manoli (2008) used the Model of Ecological Values to investigate the effects of the Sunship Earth program on the environmental perceptions of children aged 10-11 years. Though participation in the programme appeared to improve environmental perceptions, the authors noted a ceiling effect in that the children often started with pro-environmental perceptions thereby leaving little room for change.⁵ Some studies produce contradictory evidence, for example an evaluation of the effects of a four-day outdoor environmental education programme based on a sample of only 63 female secondary school students. Even though immediately after the course participants were significantly more concerned about the environment, students' perceptions actually declined to below the pre-course level a mere six weeks following the course. However, the proposition that environmental education programmes can exert positive effects is also buttressed by an alternative literature on civic education which demonstrates modest positive effects of instruction on citizenship, for example on political knowledge (Niemi & Junn, 1998). Citizenship education has been shown to help people understand their interests

as individuals and group members, and express 'enlightened self-interest' (Delli Carpini & Keeter 1996, pp.238-64).

Intergenerational Influence

There is also evidence to suggest that school-based interventions can exert a wider effect that extends beyond participants in the immediate school setting. Findings suggest that children act as environmental ambassadors by influencing their parents who though socialized in a less environmentally-friendly era still view their children as an important source of information (e.g. Ballantyne, Connell & Fien 1998; Duvall & Zint 2007; Vaughan et al. 2003). The study by Leeming et al. (1997: 40) indicates that participation in pro-environmental activities exerts a positive impact on the environmental attitudes of young people and their parents. Using a pre- and post-test comparison with non-participating classes the study found not only that participants showed a significant change in environmental attitudes but also 'strong evidence that children who participated in the...program influenced their parents to adopt more pro-environmental behaviours'.⁶ The study by Uzzell et al. (1994: 203; cited in Rickinson 2001) also suggested that children act as 'catalysts of environmental change' on the basis that the more the educational intervention promoted intergenerational discussion and socio-cognitive interaction the greater the impact on parents. Drawing on interviews with parents, research by Ballantyne et al. (1998: 6) similarly suggests that an energy education programme exerted a wider influence over the behaviour of parents. Particularly important in this respect was the role of homework activities (i.e., children conducting an electricity audit of their home) with 'four out of the five parents who had said they talked about the program at home, indicated it was initiated by the homework activities'. Yet there is also evidence to the contrary. Findings

produced by Evans et al. (2007) suggest that the attitudes and behaviours of children are seemingly unrelated to those of their parents.⁷ Set against this backdrop, in this study we also investigate whether school-based programmes exert a wider diffusion effect by examining whether children who participate in the intervention subsequently influence the environmental attitudes and reported behaviours of their parents. We do this by including in our study a homework activity that is undertaken collaboratively by parent and child both pre- and post-intervention (see below).

School-Based Randomized Trials (SBRTs)

Recent decades have seen an expansion of randomised controlled trials to evaluate public programmes (see Torgerson and Torgerson 2008). Trials in education are less common and tend to be done most in the USA. Typically, they involve either randomising the school or pupil or both to measure the impact of an intervention, such as a curriculum change. As in other fields they offer a robust way of evaluating school-based interventions, which are associated with several benefits such as providing services in a high-impact social environment, greater ecological validity than traditional approaches to service delivery, improved effectiveness and in areas such as mental health greater access to care (Evans 1999; also Cowen 1977; cited in Wagner, Tubman & Gil, 2004, p.108). As noted above, quasi-experimental studies also suggest that school-based interventions can assume an important role in efforts to promote pro-environmental attitudes and behaviour, as well as other areas.⁸ In terms of evaluation, randomized control trials (RCTs) are considered the gold standard of intervention research and are particularly suited to school-based interventions in that RCTs are able to handle a series of typical problems of observational studies (Wagner, Tubman & Gil, 2004, p.112).⁹ School-based randomized trials have been

used to evaluate the effects of interventions geared toward the resolution of a diverse range of problem behaviours, including physical violence, alcohol misuse, drug abuse and unsafe sexual practices (for an overview see Flay & Collins 2005). Such trials have also raised important implications for public policy. For example, one trial demonstrated the positive effects of an educational programme that was designed to reduce consumption of carbonated drinks in junior schools (James et al. 2004). Another revealed that students who were randomly allocated to receive an anti-smoking education programme had a slightly increased risk of smoking (Aveyard et al. 1999; cited in Torgerson & Torgerson, 2001, p.324).

Study site: Vale Royal, Cheshire

The setting for this study was 27 primary schools in the borough of Vale Royal which is located in Cheshire, North West England. The borough has a population of approximately 126,000. Based on the 2004 Indices of Deprivation Vale Royal is ranked 154th most deprived (out of 354 English districts) and so levels of deprivation in the borough are generally low. In terms of educational performance 67 per cent of schoolchildren in Vale Royal in the period 2006-07 achieved five A*-C grades, a figure that is higher than the national average (which is 60 per cent).¹⁰ Recent years have seen the local authority devote significant effort to improving recycling participation rates and raising environmental awareness amongst local residents. For example, in order to assess perceptions of local environmental quality in 2007-08 the council distributed surveys to all 53,000 households in the borough. Whilst not systematic the survey results suggest a local population that is pro-environmental in outlook and underscore the high-profile nature of the campaign. Over 80 per cent of respondents said that they had encountered attempts to promote recycling in the

borough over the previous six month period (and when asked where they had seen or heard such attempts more residents selected a local recycling newsletter than any other information source). Over 99 per cent considered recycling household waste important (i.e. 'very' or 'fairly' important) and 87 per cent agreed that they would recycle 'even if it requires additional effort'.¹¹ The effects of such campaigns are also reflected in the improved ranking of Vale Royal in national recycling performance tables (rising from 282nd to within the top 40 performing local authorities).

The intervention

Schools were randomly allocated into two treatment groups (long and short treatment groups) and a control group.¹² Schools allocated to the *long treatment group* received two in-class environmental education sessions. The sessions were delivered by a trained environmental officer from the council and so not those responsible for administering and supervising the evaluation instruments. In-class instruction sessions lasted one hour and were delivered one month apart. The sessions focused primarily (but not exclusively) on the issues of recycling, litter and climate change. Each session included interactive games, a short DVD and a question and answer session with the trained instructor. The DVD utilized animated characters (e.g. 'Binz') to educate children about recycling, litter and its effects and lasted approximately 20 minutes. Based on themes raised in the DVD, young people were then encouraged to answer questions from the instructor as well as participate in some interactive tasks in front of their peers (e.g. identifying litter and recyclable objects). Each child in the long treatment group received copies of the DVD, an activity booklet to be completed at home and a series of subsequent in-class activities with accompanying lesson plans for the teacher. Schools randomly allocated to the *short treatment group* received in-

class instruction but did not receive any additional resources or information beyond the two sessions. The control group received only pre- and post-intervention questionnaires with the intervention deferred. The duration of the programme from the delivery of baseline surveys through to the collection of post-surveys was approximately four months.¹³

Participants, instrument and measures

The study focused on children in the third year of primary school education (aged 7-9 years), an age at which young people experience significant intellectual and social developmental change (Piaget 1969; Barraza & Walford, 2002, p.175, Hess et al 2006). All schools in the borough were invited to participate in the trial. A member of the research team subsequently visited all schools to provide further information about the study and how the intervention and pre-/post-surveys would be delivered and administered. All schools agreed to participate in the programme and those allocated to the control group had the long intervention deferred to the following school year. The main outcome measures are obtained via pre- and post-surveys. Prior to the intervention an in-class survey was administered and completed by the student in-class. A second 'homework' survey was taken home with instructions that it was to be completed alongside parents/guardian. The homework survey was designed to elicit information about the environmental attitudes and reported behaviour of households. Following the intervention each student again received an in-class and homework survey (a period of 10-15 days was given for both in-class and homework surveys to be delivered and collected).

In order to assess the efficacy of the trial we need to identify the primary outcome measures. As an initial stage of analysis we conducted a factor analysis on the responses to a number of items designed to measure attitudes and reported behaviour. The items have four points with Strongly Agree coded '1' and Strongly Disagree '4' with a number of items reverse coded so that statements which reveal positive attitudes to the environment receive a higher score. The exploratory factor analysis is based on the classroom baseline survey but only includes children who responded to both baseline and post-test. Based on the Kaiser criterion (retention of factors with an eigenvalue greater than or equal to 1) we selected the first factor extracted to use as a basis for our measure. It included variables associated with individuals' personal responsibility for action.

- It takes too much effort to do things that help the environment
- Picking up litter in my area won't make a difference
- Human beings can find ways to fix things so I don't need to change behaviour
- It's too late to do anything about climate change – it's out of my control
- I don't need to pick up litter the council will pick it up

Based on the results of the factor analysis we might also have added an item 'People should be allowed to use their cars as much as they like even if it damages the environment'. However, this item had the weakest correlation with the others and does not fit well with the interpretation of the scale. From these items we calculated a simple additive index - ENVATT - with a possible range from five to 20, with high scores associated with positive environmental attitudes. The reliability of the scale was acceptable ($\alpha = 0.66$).

We also wanted to explore whether the intervention resulted in changes in reported behaviour. In the classroom survey we have 9 items that refer to behaviour which were recoded to dichotomous variables (see Appendix A). None of the correlations between the items is strong although approximately half are significant at the 5 per cent level (two-tailed). Further analysis suggested that there was little scope for the development of a reliable scale with none of the combinations of items that we tried producing an alpha above 0.5. Instead of developing a scale for these items we pick out the items that were most closely related to the intervention to analyse and which have the most concrete meaning to respondents. The items we chose to analyse are reported recycling behaviour, reducing water use, food waste and turning off lights and computers.

Analysis of classroom survey

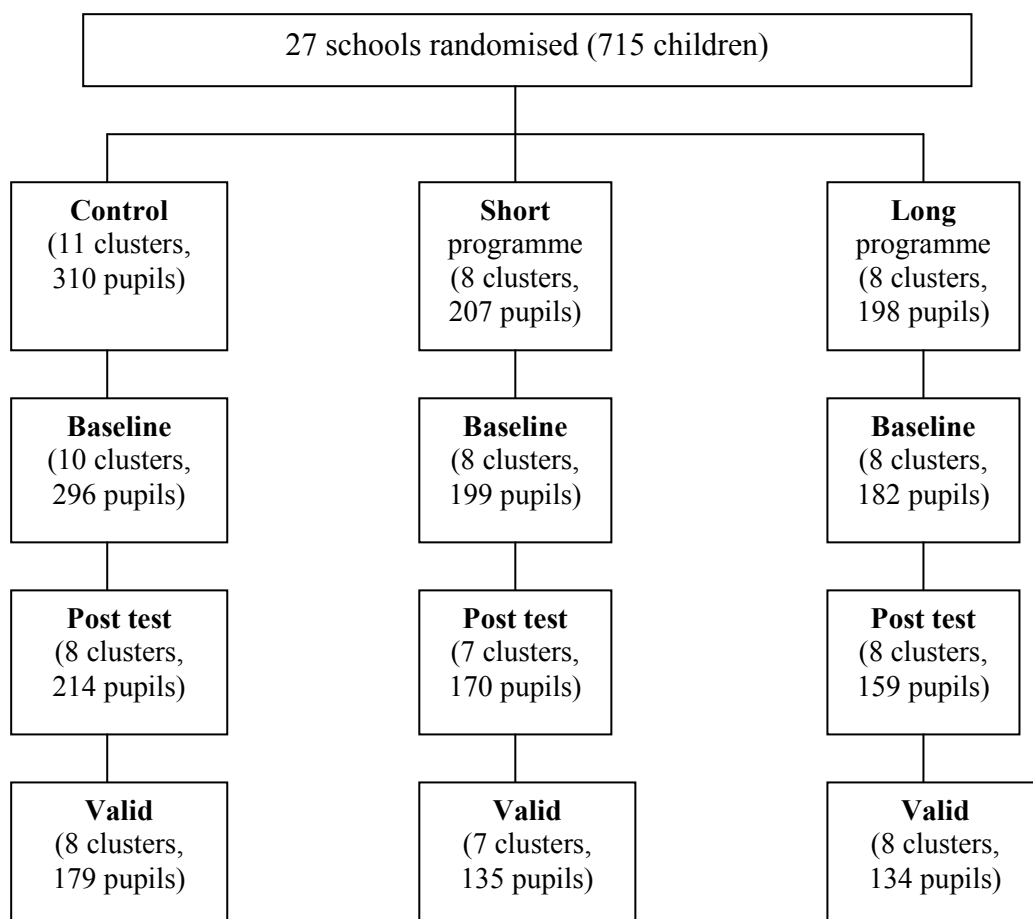
Randomisation and attrition

The local authority had limited capacity to deliver the programme so randomisation was designed to generate eight schools in each intervention group and the remainder in the control group: eight schools were allocated to a long treatment group; eight schools were allocated to a short treatment group; and 11 schools were allocated to the control group. We distributed schools across two phases: phase one began in January 2008 and ended in April 2008; phase two began in April 2008 and ended in July 2008. Finally, before randomisation the schools were stratified into high and low deprivation using the best match of the school catchment area to super output area. The randomisation was implemented in Microsoft Excel by one of the authors using the method suggested by Shadish et al. (2002, p. 313).

The in-class survey

Figure 1 presents the trial profile. Originally 27 schools were randomised and the clusters had an average of 26.5 pupils per class, with a slightly higher average in the control group (28.2) compared to the long intervention (24.8) and the short intervention (25.9). Over the period of any trial we would expect some attrition. Of the 715 pupils randomised there was a total of 448 valid responses (i.e. where a pupil completed *both* baseline and post-test surveys and their scores could be matched). Four of the schools did not provide any valid responses over the whole of the study (i.e. there were no individually matchable baseline and post-test scores). As a result three schools in the control group and one from the treatment group were lost. Overall, the valid response rate was 62.7%, slightly lower for the control group (57.7%) and higher for the short intervention (65.2%) and the long intervention (67.7%).

Figure 1 Flow Diagram of the Sequence of the Experiment (Schools)



In order to judge the quality of the trial we need to analyse whether the groups are similar on the baseline score and whether there is an attrition effect due to differential loss between groups. The mean scores at baseline of the three different experimental groups are reported in Table 1. In order to test whether the differences in baseline mean are significantly different from zero we need to take the effect of the clustering into account. We can do this in a number of ways but throughout this paper our approach is to use regression analysis with robust cluster standard errors clustered by school.¹⁴ In this case as our focus is on the effect of interventions relative to the control group, we regressed the baseline score on dummy variables for the short intervention and for the long intervention with control as reference category. If the coefficients for short and long were significantly different from zero we would have some evidence that the groups were not comparable. As reported in Table 2, in neither case was the coefficient of the dummy variable significantly different from zero at the five per cent level (two-tailed), however there is weak evidence ($p < .088$) that the group receiving the long intervention were more pro-environmental than the control group prior to the intervention.

Enter Table 1 about here

Enter Table 2 about here

The second aspect we need to investigate is whether there is differential attrition. To analyse attrition we only have data on those who completed the baseline (as opposed to those who were randomised but did not, for whatever reason, complete the first survey). Table 3 shows the baseline averages of control, short and long experimental

groups for those individuals who completed baseline but not the post-test. There is very little difference between the mean scores so we can be reasonably confident that there has been no differential attrition.

Insert Table 3 about here

Changing Children's Environmental attitudes

To analyse whether the long and short interventions had an effect on the environmental attitudes of children we regressed the post-test score for ENVATT on dummy variables for the short and long interventions and entered the baseline score as a covariate. The post-test means for ENVATT are reported in Table 1 (above). The results of the regression are reported below in Table 4.

Insert Table 4 about here

Table 4 provides little evidence of a difference between experimental groups on their post-test scores when the effect of the baseline score is controlled. In fact, including the baseline makes no difference to the substantive findings of the analysis. When the gender of the pupil was included it neither made a contribution to the explanatory power of the model nor made a substantive difference to the conclusion about the effects of short and long intervention.

Changing reported behaviour

Table 5 reports the baseline summary statistics for the reported behaviour items by experimental group. The first column reports the proportion of respondents by group

who report that they do recycle, try to reduce the amount of water use, reduce food waste and turn off lights and computers.

Insert Table 5 about here

To test the impact of the interventions we use logistic regression to model the post-test with the standard errors clustered by school, with dummy variables entered for short and long intervention and the baseline score as a covariate (Table 6 reports these models). Odds-ratios that are greater than one indicate that the intervention has had a positive effect relative to the control group, less than one indicate that the control group has had a more positive effect. However, unless the p-values are less than 0.05 we cannot be confident that there is any difference between groups at all. Looking the column for the short intervention in Table 6, four out of five odds-ratios are greater than one but none are significantly different from zero. On the long intervention, two out of five are in the expected direction but again none of the odds-ratios are significantly different from zero.

Enter Table 6 about here

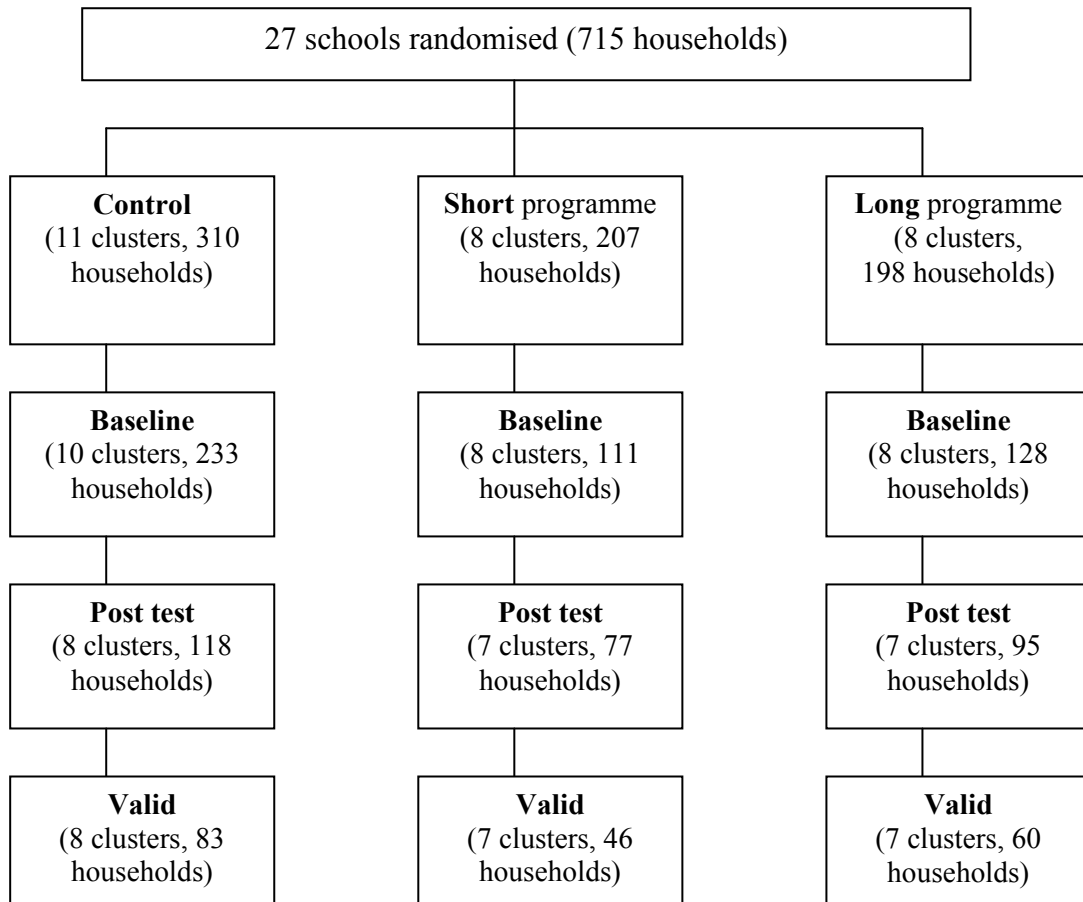
In summary, our data provides little evidence that the interventions have made a difference to the environmental attitudes and reported behaviours of the children who received them. There may be a number of possible explanations for these findings which we discuss in our concluding remarks.

Influencing Adults

The underlying theory behind an intergenerational diffusion effect is that children positively influence household decision-makers to become more pro-environmental. Our evidence so far does not provide support for the first link in that chain. When analysing the household survey we use the same scale to measure environmental attitudes as was used in the children's survey. We conducted a factor analysis on the questions on the adult survey and the items that loaded above 0.3 on the first factor extracted were exactly those in the scale developed from the children's survey (see above). An additive scale based on these items has an alpha score of 0.74. One of the items – 'we don't need to pick up litter because the council will clean it up' - has a lower inter-item test correlation than the other items but for the sake of consistency we retain it in the scale. As above, we examine whether the groups are the same at baseline and whether there has been differential attrition between groups over the duration of the study. In the case of the homework survey these questions are especially important as the valid response rate was lower than the in-class survey (see Figure 2).

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Figure 2 Flow Diagram (Households)



Summary statistics for the household ENVATT variable are presented in Table 7. Ordinary least squares regression with robust clustered standard errors was used to test for differences between the mean scores of intervention groups and the control group before the experiment in a similar manner to the classroom analysis described above. Neither the coefficient of the ‘short intervention’ dummy variable ($p = .20$) nor the ‘long intervention’ dummy variable ($p = .69$) were significantly different from zero.

Enter Table 7 about here

Table 8 provides information on attrition by experimental group. It reports the mean score on the ENVATT variable at baseline of those respondents who did not also complete a valid post-test. If these means are significantly different from each other then we would need to be concerned about the validity of the analysis.

Insert Table 8 about here

Changing Environmental Attitudes

The first stage of the analysis is to assess whether there are differences in the environmental attitudes of respondents in different groups at the end of the programme. We use the same analytical strategy as above to achieve this, modelling the post-test score for ENVATT whilst entering dummy variables for the two intervention groups, a covariate for baseline score and clustering the standard errors by school. The results of the model are reported in Table 9.

Enter Table 9 about here

We can see immediately from the summary statistics in Table 7 that the control group has the highest post-test mean and that it has increased on baseline whilst the two intervention groups have decreased from baseline. This is reflected in Table 9 with negative coefficients on the dummy variables for the short and the long intervention. Neither are statistically significant at the five per cent level (although the ‘long’ intervention is close).

Changing reported household behaviour

We also asked households about environmentally-friendly behaviour. The responses to many of these items were very close to 100 per cent reporting that they did in fact behave in an environmentally-friendly manner. For example, 75 out of 78 in the control group reported that they already recycled at baseline. The figure was 42 out of 44 in the long intervention and all 58 respondents from the short intervention group reported recycling. Similarly, very high rates of baseline pro-environmental behaviour were reported for turning off lights. In this section we pick out some of the questions where a lower proportion of households reported environmentally positive behaviour, namely an intention to fly less often, to use less water, to walk or cycle to school and to participate in a litter pick. The baseline summary statistics for the reported behaviour items by experimental group are reported in Table 10. The first column shows the proportion of respondents by group who report that they do recycle, try to reduce the amount of water use, reduce food waste and turn off lights and computers.

Enter Table 10 about here

To test whether any of these differences are statistically significant we use logistic regression to model the post-test scores with dummy variables entered for short and long intervention and the baseline score as a covariate, the standard errors clustered by school. Table 11 reports these models. Looking at the column for the short intervention (in Table 11), three out of four odds-ratios are greater than one but the only statistically significant odds-ratio is less than one (walk or cycle to school). A

similar pattern emerges for the long intervention where three odds-ratios are in the expected direction but none of them are statistically significant. The odds-ratio of the item referring to walking or cycling to school is less than one but this time it is not statistically significant.

Enter Table 11 about here

With the adult survey we had another question that asked specifically about which of eight types of waste households regularly recycled. As with the other questions about reported behaviour many of the answers were above 90 per cent at baseline (see Table 12). We picked out recycling of food waste, card and clothes as instances where the baseline score was not so high.

Enter Tables 12 and 13 about here

We use the same analytical strategy to test for differences between experimental groups as previously. The results of the logistic regressions are reported in Table 13, again with baseline score controlled for and standard errors clustered by school. None of the odds-ratios are significantly different from unity. As above, we find no evidence of an effect due to the intervention. The null findings reported in this section are unsurprising given that we found no effect with the children's survey. In our concluding remarks we turn to consider some of the reasons why this is the case.

Discussion

Environmental education programs are one mechanism through which national and local governments have sought to move beyond market-based incentives and promote environmental citizenship. The aim of the research was to evaluate the effects of a school-based environmental education program on the attitudes of young people. Based on the findings presented above, it does not appear that environmental education programs in the schools that we studied changed attitudes. Although there are small numbers in our sample, the estimated regression co-efficients also suggest there is no systematic effect to be found. However, this does not mean that any environmental program has no impact. It may be the case that a more intensive intervention over a longer time period might yield a more pronounced attitudinal change, or that the intervention may trigger long-term differences in young people's behaviour which at present remain un-identified.

All the experimental groups experienced an increase in pro-environmental attitudes and behaviour in the classroom survey (see Tables 1 and 5), suggesting a Hawthorne-type of effect in our study, whereby being surveyed by an external research organisation as part of a general project in conjunction with the local authority is enough to raise attitudes and intended behaviours. This may explain our negative findings: all three groups of children experienced an increase in pro-environmental attitudes possibly as a result of the overall experiment. What this highlights is that the particular intervention based on curricular material is not the crucial aspect of stimulating environment awareness. This may also be the reason that non-experimental studies have observed impacts as they were not able to distinguish between these two aspects of an intervention. In this sense, we regard our findings as

a valuable addition to knowledge, revealing that observational studies may have overestimated the effects of environmental education, which would be a suitable correction for academics and policy-makers alike. Of course, we would wish to be cautious in asserting this claim because of the limited geography of our students, the particular nature of the intervention and the relatively small number of schools we studied. Even though we made strenuous efforts to ensure the intervention was delivered effectively it may be the case that this particular one could have been done better. Nonetheless, we hope that our study will lead to other randomised control trials with larger numbers in order to assess this hypothesis in a wider setting. These findings need to be seen in the context of generally modest results from curricular interventions on citizenship and other attitudes at the school level. The key drivers of attitudes remain family, peer group and media influences, rather than short interventions delivered in the class room. Policy-makers need to be cautious about directing considerable resources toward one off interventions at the school level.

Appendix A: Questionnaire Items

Questionnaire Items for Behaviour Change Analysis:

Recycle more
Take part in litter picks
Walk or cycle to school instead of using a car
Cut down how much gas and electricity I use at home
Encourage my family to fly less often
Reduce the amount of water I use at home
Waste less food at home
Turn off lights when I'm not using them
Turn off my computer when I'm not using it

Respondents were offered three options:

- a. I'm already doing this and I will keep doing it
- b. I haven't thought about doing this
- c. I don't want to do this

For the purposes of analysis, those who answered 'a' were coded 1 those answering b or c were coded 0.

Table 1 ENVATT_{pre} summary statistics (classroom)

	Mean		s.d.		Obs
	Baseline	Post-test	Baseline	Post-test	
Control	15.35	16.51	2.94	3.04	170
Short	15.30	16.72	3.80	3.27	122
Long	16.53	16.70	3.08	3.10	129

Table 2. Regression of ENVATT_{pre} on experimental group (standard errors clustered by school)

	Coef.	s.e.	t	P> t
Short	-0.044	0.892	-0.05	0.961
Longer	1.180	0.660	1.79	0.088
Constant	15.347	0.394	38.93	0.000
R-squared = 0.03	F(2,22) = 1.74 Prob>F = 0.20	Obs = 421 Clusters = 23		

Table 3. Classroom attrition: ENVATT_{pre} by experimental group (respondents with baseline but no post-test)

	Mean	s.d.	Obs
Control	15.86	2.83	116
Short	15.76	3.25	59
Long	15.37	2.64	48

Table 4. Regression analysis of classroom ENVATT_{post} (standard errors clustered by School)

	Coef.	s.e.	t	P> t
Short	0.234	0.696	0.34	0.740
Longer	-0.297	0.538	-0.55	0.587
ENVATT _{pre}	0.414	0.053	7.81	0.000
Constant	10.153	1.097	9.25	0.000
R-squared = 0.187	F(3,22) = 26.70 Prob>F = 0.000	Obs = 421 Clusters =23		

Table 5. Baseline statistics for reported behaviour (classroom)

	<i>Proportion</i>		<i>s.d.</i>		<i>Obs</i>
	<i>Baseline</i>	<i>Post-test</i>	<i>Baseline</i>	<i>Post-test</i>	
<i>Recycle</i>					
Control	0.7966	0.8927	0.4037	0.3104	177
Short	0.8797	0.8647	0.3265	0.3434	133
Long	0.7594	0.8947	0.4291	0.3081	133
<i>Use less water</i>					
Control	0.5600	0.6457	0.4978	0.4797	175
Short	0.5317	0.6825	0.5010	0.4673	126
Long	0.5581	0.6124	0.4985	0.4891	129
<i>Waste less food</i>					
Control	0.5763	0.5819	0.4956	0.4946	177
Short	0.6250	0.6328	0.4860	0.4839	128
Long	0.5538	0.6000	0.4990	0.4918	130
<i>Turn off lights</i>					
Control	0.8693	0.8580	0.3380	0.3501	176
Short	0.8516	0.8906	0.3569	0.3133	128
Long	0.8333	0.8182	0.3741	0.3872	132
<i>Turn off computers</i>					
Control	0.7771	0.8057	0.4174	0.3968	175
Short	0.8062	0.8605	0.3968	0.3479	129
Long	0.8702	0.8092	0.3373	0.3945	131

Table 6. Models of reported behaviour (classroom): logistic regression coefficients and p-values (standard errors clustered by School, pre-test score entered as covariate)

	Short intervention		Long intervention	
	<i>odds-ratio</i>	<i>p-value</i>	<i>odds-ratio</i>	<i>p-value</i>
Recycle more	0.636	0.342	1.100	0.831
Reduce the amount of water used	1.209	0.576	0.864	0.643
Waste less food	1.198	0.598	1.102	0.756
Turn off lights	1.368	0.207	0.762	0.432
Turn off computer	1.451	0.211	0.878	0.679

Table 7. ENVATT_{pre} summary statistics (household survey)

	Mean		s.d.		Obs
	Baseline	Post-test	Baseline	Post-test	
Control	16.85	17.25	2.55	2.32	81
Short	17.31	16.86	1.91	2.11	59
Long	17.02	16.51	2.19	2.20	43

Table 8. ENVATT_{pre} attrition: respondents with baseline but no post-test by experimental group

	Mean	s.d.	Obs
Control	16.50	2.37	145
Short	17.10	2.39	68
Long	15.98	2.50	62

Table 9. Regression analysis of household ENVATT_{post} (standard errors clustered by School)

	<i>Coef.</i>	<i>s.e.</i>	<i>T</i>	<i>P> t </i>
<i>Short</i>	-0.506	0.293	-1.73	0.100
<i>Longer</i>	-0.782	0.384	-2.03	0.055
<i>ENVATT_{pre}</i>	0.272	0.052	5.24	0.000
<i>Constant</i>	12.65	0.946	13.38	10.682
<i>R-squared = 0.09</i>	<i>F(3,20) = 13.08</i> <i>Prob>F = 0.0001</i>	<i>Obs = 183</i> <i>Clusters = 21</i>		

Table 10. Baseline and post-test summary statistics for reported behaviour (household)

	<i>Proportion</i>		<i>s.d.</i>		<i>Obs</i>
	<i>Baseline</i>	<i>Post-test</i>	<i>Baseline</i>	<i>Post-test</i>	
<i>Try to fly less often</i>					
Control	0.5067	0.5867	0.5033	0.4957	75
Short	0.5088	0.5965	0.5043	0.4950	57
Long	0.5581	0.6512	0.5025	0.4822	43
<i>Reduce water usage</i>					
Control	0.7975	0.8228	0.4045	0.3843	79
Short	0.7895	0.8596	0.4113	0.3504	57
Long	0.7273	0.8182	0.4505	0.3902	44
<i>Walk or cycle to school</i>					
Control	0.5584	0.6364	0.4998	0.4842	77
Short	0.4828	0.4655	0.5041	0.5032	58
Long	0.4773	0.8409	0.5053	0.3700	44
<i>Take part in litter picks</i>					
Control	0.1026	0.0897	0.3054	0.2877	78
Short	0.1404	0.1754	0.3504	0.3837	44
Long	0.1364	0.1818	0.3471	0.3902	57

Table 11. Models of reported behaviour (household): logistic regression coefficients and p-values (standard errors clustered by School, pre-test score entered as covariate)

	Short intervention		Long intervention	
	odds-ratio	p-value	odds-ratio	p-value
Try to fly less often	1.052	0.912	1.251	0.526
Reduce water usage	1.346	0.694	1.058	0.914
Walk or cycle to school	0.347	0.024	0.253	0.062
Take part in litter picks	2.258	0.292	2.464	0.132

Table 12. Baseline and post-test summary statistics for types of recycling (household)

	<i>Proportion</i>		<i>s.d.</i>		<i>Obs</i>
	<i>Baseline</i>	<i>Post-test</i>	<i>Baseline</i>	<i>Post-test</i>	
<i>Regularly recycle food waste</i>					
Control	0.3291	0.3418	0.4729	0.4773	79
Short	0.3860	0.4211	0.4911	0.4981	57
Long	0.500	0.500	0.5061	0.5061	42
<i>Regularly recycle card</i>					
Control	0.7215	0.7468	0.4511	0.4376	79
Short	0.6667	0.7544	0.4756	0.4343	57
Long	0.6429	0.6667	0.4850	0.4771	42
<i>Regularly recycle clothes</i>					
Control	0.7848	0.8734	0.4136	0.3346	79
Short	0.7719	0.8772	0.4233	0.3311	57
Long	0.7381	0.7619	0.4450	0.4311	42

**Table 13. Logistic regression: do you regularly recycle... (household)
(standard errors clustered by School, pre-test score entered as covariate)**

	<i>Short intervention</i>		<i>Long intervention</i>	
	<i>odds-ratio</i>	<i>p-value</i>	<i>odds-ratio</i>	<i>p-value</i>
Food waste	1.347	0.493	1.424	0.620
Card	1.213	0.625	0.757	0.610
Clothes	1.067	0.892	0.472	0.081

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¹ The study by Evans et al. (2007) relied on a sample of children who were primarily from well-educated and affluent families residing in small towns and rural areas. Also, parents self-selected into the research project thus resulting in a likely selection bias toward more pro-environmental families.

² Though for an alternative view see Reid and Sa'di (1997, p.478).

³ One such example is the study by Bradley et al. (1999) which evaluated a ten-week environmental science course on 475 high school students across 18 schools. Though findings suggested that participation exerted positive effects on environmental knowledge and attitudes the research was not based on comparison with a control group.

⁴ A later investigation by Bogner (1999) into the effects of a conservation education programme in secondary schools in Switzerland similarly found positive effects.

⁵ In terms of design, and as the authors note, the study focused on low and middle SES schools and the control group came from one of the two treatment schools and not both.

⁶ Leeming et al. (1997) evaluated a programme designed to support teachers to undertake a series of in-class activities during a school year, such as recycling items and planting trees. Participating classes engaged in a minimum of eight environmentally relevant activities. Improved environmental attitudes were not matched in respect to environmental knowledge which did not significantly alter. The parents of the participants also displayed significantly more pro-environmental behaviors after their children's activities than did parents of the control group.

⁷ One possible reason suggested by Evans et al. (2007) concerns the young ages of the sample (6-8 years). As children mature it might be that environmental attitudes and behaviours begin to converge.

⁸ The effectiveness of school-based interventions has also been demonstrated in other areas such as the reduction of prejudice (e.g. Aboud & Fenwick, 1999).

⁹ On the utility of randomized clinical trial methodology see for example T.D. Cook and D.T. Campbell (1979) *Quasi-Experimentation: Design and Analysis for Field Settings* (Boston: Houghton Mifflin Company); D.J. Torgerson and C.J. Torgerson (2008) *Designing Randomised Trials in Health, Education and the Social Sciences* (Basingstoke: Palgrave Macmillan).

¹⁰ This data has been collected from the Department of Health (2008) *Health Profile for Vale Royal 2006*. Department of Health. Available online: <http://www.apho.org.uk/resource/item.aspx?RID=52243> (accessed September 20 2008).

¹¹ In May 2006 Vale Royal Borough Council launched the 'SMYLE' campaign ('Supporting My Local Environment') which aimed to improve residents' environmental awareness. As part of the SMYLE campaign, in December 2006 (prior to our intervention) all local residents were sent a SMYLE newsletter which introduced the campaign and encouraged residents to make five environmental pledges: (i) I will reduce the impact my actions have on the environment by ensuring I do not commit environmental crimes, (ii) I will reduce the impact my waste has on the environment by reducing, reusing and recycling as much as possible, (iii) I will help improve the quality of my local environment by supporting community action and reporting environmental crime, (iv) I will reduce the amount of energy I use in the home, (v) I will make better travel choices to reduce my impact on the environment. Through a second 'Recycle for Cheshire' campaign (also introduced in 2006) the council focused on improving recycling participation rates amongst local residents and delivered surveys to all households. The survey results were provided to the research team by Vale Royal Borough Council. The first survey (May 2005) had a response rate of 3 per cent whilst the second survey (June 2006) had a response rate of 4 per cent. In addition to those statistics cited in-text (and though not systematic) it is worth noting in addition: 97 per cent of respondents considered having a 'clean, safe and green local environment' to be important; 74 per cent of respondents said they were satisfied with local environmental quality; 33 per cent said they had seen a reduction in litter over the past six months and 28 per cent had seen a reduction in graffiti since the commencement of the campaign.

¹² Details of the randomisation procedure are provided in a later section.

¹³ Further information about the intervention, including a description by the trained officer, is available in a policy report submitted to the North West Improvement Network (NWIN) and which is available from the lead author.

¹⁴ Alternative methods were investigated including multi-level modelling (Green and Vavreck, 2008). We also investigated different ways of specifying the dependent variable for example, by dichotomising and using a logistic regression, using an ordered probit, and an interval regression to account for potential censoring. The general null findings were reproduced by different methods. However, there is little evidence of a consistent pattern of association and we believe this finding is adequately captured by the results reported here.