Impact of an Environmental Education Program on Students' and Parents' Attitudes, Motivation, and Behaviours

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Abstract
Changes in sixth grade students' and their parents' environmental knowledge, attitudes, motivation, and behaviours following an environmental education program (EEP) over a school year were investigated. Results indicated that at the end of the school year, children who were part of the EEP group engaged in ecological behaviours less for extrinsic motives than did children who were part of a control group. Parents of children in the EEP group were significantly more dissatisfied with local environmental conditions compared to parents of children in the control group. No other significant differences between groups were observed for other measured child and parental variables. Recommendations are presented to guide future studies evaluating an EEP.

Previous research findings suggest that formal education on environmental issues and participation in environmental activities are promising venues to foster ecological knowledge, attitudes, and behaviours in children (for a review see Leeming, Dwyer, Porter, & Cobern, 1993). For example, Ramsey and Hungerford (1989) observed that the implementation of a formal environmental education program (EEP) in classrooms did enhance knowledge of ecological issues and strategies as well as favour perceptions of self-efficacy. Leeming, Porter, Dwyer, Cobern, and Oliver (1997) observed that the addition of a minimum of eight ecological activities within an educational setting was sufficient to enhance verbal and actual ecological commitment in children.

While the effects of formal EEP and those of ecological activities have been investigated separately, the above findings suggest that the combined impact of a formal educational program and ecological activities in an EEP could potentially be more effective in bringing about desired changes in children's ecological attitudes and behaviours. Recent developments in a Canadian school curriculum rendered possible the investigation of an EEP incorporating both a formal curriculum and ecological activities. Le projet des écoles vertes Brundtland [Brundtland Green School Project] is a formal EEP offered in primary grade schools on a voluntary basis. To obtain the status of a Brundtland Green School, schools must agree to implement at least three of the following four steps: (a) the school's administration must reduce, reuse or recycle rubbish by visible and measurable means; (b) ecological issues are taught in all subjects; (c) the school assumes the costs related to securing ecological services (e.g., battery recycling) or implementing ecological actions (e.g., composting); and (d) implement an ecological club headed by children, the mandate of which is to inform the school population on environmental issues and encourage the use of ecological strategies (e.g., recycling or composting lunch leftovers). Failure to meet these steps results in the withdrawal of the status.

Our first goal was to replicate and extend past studies by investigating changes in Canadian students' ecological attitudes, motivation and behaviours following an eight-month exposure to an EEP. Our second goal was to explore the possible influence of children, exposed to this
higher levels of self-determination reflect higher levels of commitment. Within the motivational domain, self-determined subtypes of motives have been found to be significantly associated with the occurrence of ecological behaviours in adult populations. Specifically, self-determined adults tended to engage more frequently in ecological behaviours perceived as difficult or demanding in terms of time, energy, and personal resources (e.g., bringing toxic products to specialized recycling centres versus curb-side recycling; Green-Demers, Pelletier, & Ménard, 1997). In addition, adults who participate in activities for intrinsic motives tend to show greater persistence in the absence of external sources of regulation (i.e., constant reinforcement; de Young, 1996). The investigation of ecological motivation in juvenile and adult populations was therefore judged to be an interesting venue to further our understanding of an EEP’s impact.

With the above considerations in mind, we formulated the following hypotheses. At the end of the school year, we anticipated that children enrolled in schools endorsing an EEP and their parents, when compared to children enrolled in schools offering a regular curriculum and their parents, would: (a) be less satisfied with environmental conditions; (b) attribute more importance to environmental issues; (c) be more self-determined in performing ecological behaviours; and (d) perform more frequently ecological behaviours (e.g., recycle, seek information).

METHOD
Participants
Participants came from four schools located in Western Quebec, Canada. Surveyed schools were from the adjacent communities of Hull, Aylmer, and Buckingham. All Grade 6 classrooms from each school participated. A first group of five classes were from schools endorsing the Brundtland Green School Project. All these children were exposed for the first time to a structured ecological program within an academic setting. A second group of six classes constituted the control group. These children were also enrolled in sixth grade but in schools lacking a formal or applied ecological program.

A total of 184 children completed the two waves of data collection. The response rate of the children in the experimental group was 62% and in the control group was 52% (complete questionnaire package). Within the experimental condition, there were 39 girls and 46 boys ranging from 10 to 13 years of age (mean age of 11; SD = 0.5). The majority of these children spoke French at home (98%). Within the control condition, there were 49 girls and 50 boys between 10 and 12 years of age (mean age of 11; SD = 0.5). These children also spoke mainly French at home (96%).

A total of 131 parents completed the two waves of
Brundtland Green School Program

Several scales used in the parents' and children's questionnaire package have been validated within university and general populations (satisfaction and motivation). Other measuring instruments have been extensively used in field studies (competence, importance, and behaviours; for a review see Pelletier, in press). To meet the requirements of this study, the number of items per subscale was reduced to three in order to prevent participant fatigue and favour questionnaire completion. The choice of items was dictated by consistently elevated item-total correlations with respective factors observed in previous independent factor analyses (Pelletier, Green-Demers, & Béland, 1997). All scales in the parents' questionnaire were answered in their original 7-point Likert scale. Children's scales were slightly altered to assist responding. The original 7-point scale was replaced by a 5-point scale. This decision was based on extensive work conducted by Harter with elementary level populations (e.g., Harter, 1992) and our own pilot testing of the scale. Following pretesting, some words used in the children's questionnaire were replaced with simpler terms to accommodate the vocabulary level of children.

In general, parents' and children's questionnaire packages contained identical items. The exception was the ecological behaviour scale. Questionnaires were administered in French-Canadian. A summary table of the scales used is presented in Table 1. Examples of items provided in the text represent English translations of the original French-Canadian version of the items.

Ecological Knowledge Scale was developed specifically for this study. Items were based on de Young (1986). The scale contained 15 questions following a multiple-choice data collection. The response rate of parents in the experimental group was 46% and in the control group was 39% (complete questionnaire package). Within the experimental condition, 52 questionnaires were completed by women and 13 by men. Mean age of respondents was 39 years (SD = 4). A great proportion of these parents spoke French at home (91%). Within the control condition, 49 women and 17 men had complete questionnaire packages. Mean age of respondents was of 39 years (SD = 4). These parents also spoke mainly French at home (97%). Parents in both groups were found to be comparable in terms of income level, number of residents per household (M = 4, SD = 1), ecological club membership (eg., 5% in the experimental group, 6% in the control group), and access to recycling programs both at home and at work (eg., 89% in the experimental group, 91% in the control group).

Brundtland Green School Program

Qualitative data obtained from teachers at Time 2 indicated that EEP schools provided greater integration of ecological topics across academic subjects (3-4 subjects compared to 1 in the control group) and more weekly hours devoted to ecological themes (5 hours compared to 1 hour). In addition to the regular Grade 6 natural sciences curriculum taught to control children, children in the experimental group were taught the basics of an eco-system, endangered species, and ways to respect/proTECT the ecology (i.e., ecological recipes). The applied component was also more varied and done throughout the school year in both experimental schools (e.g., recycling, composting, ecological club). Within the control group, environmental issues were periodically covered and remained confined to the natural sciences curriculum. The only ecological activity during the school year consisted of a campaign to clean up the school yard. There was no recycling in the control schools.

Implication of the administration in experimental schools was also visible. Specifically, schools assumed the costs related to securing ecological services and actions (recycling and composting). In both experimental schools, large recycling bins were visibly positioned in halls and at the front entrance. Measures of energy conservation were also taken and re-enforced in collaboration with children (e.g., turning off lights in unused classrooms; using mechanical pencil sharpeners). Measures of refuse reduction were also implemented. Children were encouraged to make use of re-usable containers in their lunch boxes. A committee of children was formed to recycle any containers thrown away at lunch and to prepare leftovers for composting. A committee of children and teachers was also responsible for informing the student population of possible environmentally friendly behaviours by means of poster campaigns (e.g., campaign for lesser-known recyclable goods such as batteries; alternative lunch containers).

Procedure

Children and their parents answered a first questionnaire package early in the school year (Time 1). Participants answered the same questionnaire towards the end of the school year (Time 2). At Time 1, researchers informed children as to the goals of the study and what their participation would entail. The week prior to data collection, children were then invited to bring home a questionnaire for their parents and a letter requesting parental consent for the child's participation in the study. Parental consent was obtained for both waves of data collection. Teachers remained in the classroom while students completed the questionnaire. Children were assured that participation was voluntary and that their answers would remain confidential. The researcher read aloud instructions and individual items. The same procedure was repeated at Time 2.

Questionnaire packages

Parents in both groups were found to be comparable in terms of income level, number of residents per household (M = 4, SD = 1), ecological club membership (eg., 5% in the experimental group, 6% in the control group), and access to recycling programs both at home and at work (eg., 89% in the experimental group, 91% in the control group).
TABLE 1
Description of Scales Used in the Questionnaires

<table>
<thead>
<tr>
<th>Scale</th>
<th>Source</th>
<th>Items</th>
<th>Alpha T1</th>
<th>Alpha T2</th>
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<tr>
<td><strong>Parents</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Ecological knowledge</td>
<td>de Young, 1986</td>
<td>15</td>
<td></td>
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</tr>
<tr>
<td>Environmental attitudes</td>
<td>Pelletier et al., 1996</td>
<td>3</td>
<td>.88</td>
<td>.86</td>
</tr>
<tr>
<td>Perceived importance</td>
<td>Pelletier et al., 1997</td>
<td>3</td>
<td>.74</td>
<td>.77</td>
</tr>
<tr>
<td>Perceived competence</td>
<td>Pelletier et al., 1997</td>
<td>2</td>
<td>.75</td>
<td>.80</td>
</tr>
<tr>
<td>Motivation towards the environment</td>
<td>Pelletier et al., 1997</td>
<td>3</td>
<td>.90</td>
<td>.91</td>
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<tr>
<td>Intrinsic motivation</td>
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<tr>
<td>Integrated regulation</td>
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<td>Identified regulation</td>
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<td>Introjected regulation</td>
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<tr>
<td>External regulation</td>
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<td>Amotivation</td>
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<tr>
<td>Environmental behaviour</td>
<td>Pelletier et al., 1997</td>
<td>26</td>
<td>.74</td>
<td>.75</td>
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<tr>
<td><strong>Children</strong></td>
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<tr>
<td>Environmental attitudes</td>
<td>Pelletier et al., 1996</td>
<td>3</td>
<td>.77</td>
<td>.76</td>
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<tr>
<td>Perceived importance</td>
<td>Pelletier et al., 1997</td>
<td>3</td>
<td>.76</td>
<td>.81</td>
</tr>
<tr>
<td>Perceived competence</td>
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<td>3</td>
<td>.74</td>
<td>.72</td>
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<tr>
<td>Motivation towards the environment</td>
<td>Pelletier et al., 1997</td>
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<td>Intrinsic motivation</td>
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<td>Amotivation</td>
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<tr>
<td>Environmental behaviour</td>
<td>Pelletier et al., 1997</td>
<td>14</td>
<td>.83</td>
<td>.86</td>
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</table>

Participants were instructed to choose one of four possible answers for each question. Areas of knowledge assessed included ecological issues (e.g., endangered species, health problems, and nuclear energy; 8 items) and ecological strategies (e.g., recycling, composting; 7 items). Special effort was expended to broadly sample the domain of environmental knowledge. Accordingly, questions were chosen for their simplicity, relevance, and past media coverage.

**Attitudes Towards the Environment Scale** combined in one section items assessing level of environmental satisfaction (e.g., Environmental conditions in my neighbourhood are satisfactory), perceived importance of environmental issues (e.g., I'm worried about the environmental situation), and perceived competence in performing ecological behaviours (e.g., I feel capable of doing things for the environment). In the context of the present study, only the subscale measuring level of satisfaction toward the state of the environment was included. This was done to keep parents' and children's questionnaire packages comparable.

**Motivation Towards the Environment Scale** is a self-report measure assessing participants' perceived reasons for engaging in environmental behaviours based on Deci and Ryan's typology (1985). Parents answered items measuring intrinsic motivation (e.g., Because I take pleasure in mastering new ways to help), integrated regulation (e.g., Because it's an integral part of life), identified regulation (e.g., Because it's the way I've chosen to contribute), introjected regulation (e.g., Because I feel bad when I do nothing for the environment), external regulation (e.g., Because others will be upset if I didn't), and amotivation (e.g., I don't really know, I can't see what I'm getting out of it).

Children answered items measuring four subtypes of motivation: intrinsic motivation, identified regulation, external regulation, and amotivation. The integrated and introjected regulation subscales were omitted from the questionnaire for several reasons. Exclusion of items measuring integrated regulation was based on findings that this type of motive is not prevalent until adulthood (Vallerand, 1997). Exclusion of items measuring introjected regulation was based on the non-necessity of this type of motive for computational purposes of the self-determination index (SDI). As computation of the SDI requires an even number of subscales, past researchers have sometimes not included introjected motives in scale validation studies (e.g., Guay & Vallerand, 1995).

**Frequency of Environmental Behaviours Scale** measured...
parents' frequency of: (a) waste management (e.g., Do you bring toxic products to specialized recycling centres?); (b) energy conservation (e.g., In winter, do you lower the house temperature at night?); (c) purchasing environmentally friendly products (e.g., Do you buy biodegradable products?); (d) mode of transportation to work (e.g., Do you cycle to work?); and (e) membership in ecological organizations. The small sample size in the present study required the use of a composite score in analyses.

In terms of children's environmental behaviours, two categories were assessed: waste management (e.g., I ask for reusable containers in my lunch box) and recycling/reusing (e.g., I ask my parents to buy recycled toilet paper). A third category, information seeking, was developed specifically for this study (e.g., I ask my parents for environmental information). The use of several possible sources of ecological information was measured, including parents, teachers, television, books (other than for school assignments), and school work on the ecology.

Demographic information was obtained from parents to identify the characteristics of the sample. Participants were asked to identify their gender, age, language spoken at home, whether they were students or workers, number of persons living in the household, family income, place of residence, and access to a recycling program at home.

RESULTS
A series of multivariate analyses of covariance (MANCOVA) were performed to determine the existence of a differential impact of the Brundtland Green School Project curriculum compared to the regular school curriculum. Given the voluntary nature of the program and the nonrandom assignment of teachers to the experimental conditions, the use of MANCOVA was preferred as a means to control for possible a priori differences between the experimental and control classrooms (Reichardt, 1979). Accordingly, Time 1 scores were used as covariates in analyses. Results should therefore reflect the effects of the experimental conditions. For all analyses, the independent variable was the experimental condition. Inclusion of variables into one analysis was also limited to avoid decreased power of the procedure to detect significance (Stevens, 1992). Analyses were therefore conducted separately on children's and parents' ecological knowledge/attitudes (satisfaction, importance, and competence), motivational subtypes, and behaviours.

Results of analyses conducted on children variables suggested a significant effect for group membership on motivational subtypes at the multivariate level (Wilke's $F (4,164) = 2.56, p < .05, \eta^2 = .06$). Subsequent univariate $F$-tests indicated that the multivariate effect was mainly due to differences in levels of external regulation ($stepdown F (1,164) = 8.22, p < .01, \eta^2 = .05$). Examination of means indicated that at Time 2, children in the experimental group engaged in ecological behaviours less for extrinsic motives (adjusted $M = 4.28$) than children in the control group (adjusted $M = 5.16$). However, results failed to reveal significant differences between experimental conditions on ecological knowledge, satisfaction, importance, competence, remaining motivational subtypes, and behaviours.

In terms of parental variables, results indicated a significant effect for group membership at the multivariate level on ecological knowledge and attitudes (Wilke's $F (4,109) = 2.82, p < .05, \eta^2 = .09$). Subsequent univariate $F$-tests suggested that the multivariate effect was mainly due to differences in level of satisfaction ($stepdown F (1,111) = 9.89, p < .05, \eta^2 = .08$). Examination of means indicated that at Time 2, parents in the experimental group (adjusted $M = 12.68$) reported lower levels of ecological satisfaction compared to parents of children in the control group (adjusted $M = 14.48$). No significant differences between the experimental and control groups were found in terms of ecological knowledge, competence, importance, motivational subtypes, and behaviours.

DISCUSSION
On the surface, our findings suggest that the impact of the Brundtland Green School Project on children and their parents is relatively limited. These findings are not in contrast with results of similar studies. Both Sutherland and Ham (1992) and Leeming and colleagues (1997) reported weak effects of an EEP on children and parents. In the present study, it can be argued that the empirical evidence of diminished extrinsic motivation reported by these children may be an important marker of motivational change. Repetition of ecological information may have served as a powerful motivational stimulant or, alternatively, served to maintain levels of motivation. Sustained commitment levels were also observed by Leeming and colleagues (1997) in similarly aged children. In addition, past research has found consistent associations between level of self-determination, higher frequencies of behaviours and enduring ecological behaviours (e.g., Green-Demers et al., 1997). Externally regulated motives have been linked not only to infrequent ecologi-
cal behaviours but also to diminished frequency of ecological behaviours with increased behavioural difficulty (Green-Demers et al., 1997). Likewise, heightened levels of dissatisfaction reported by parents in the experimental group can be an important precursor of ecological actions. Past studies have successfully demonstrated positive associations between information, dissatisfaction with environmental conditions, self-determination, and ecological behaviours (e.g., Green-Demers et al., 1997; Pelletier, in press; Pelletier et al., 1997).

Several explanations may partly explain the absence of a wider range of significant differences between experimental conditions for children and their parents. First, the issue of adequate statistical power is important. Statistical power was determined by means of Cohen's (1988) power tables. In accordance with past conventions, the alpha level was set at .05. Past studies in the domain of environmental psychology have generally yielded a medium effect size \(d = .30\). In the present study, the minimum number of cases per group in children analyses was observed to be 77. Given this sample size and the anticipated medium effect size, statistical power was found to be approximately .96. The minimum number of cases per group in the parental analyses was observed to be 45. Given this sample size and the anticipated medium effect size, statistical power was found to be .80. Ideally, a larger number of people could have been included in the study. In this case, this was not possible as this particular program was new in the province of Quebec. This prevented us from obtaining a greater initial pool of participants. As the popularity of this program increases, greater numbers of participants could be more easily obtained.

Second, an absence of differences between children's ecological attitudes at the end of the school year may have resulted from the recent exposure of children in the control group to a teaching module on pollution and the proper use of soil. Although teachers indicated that these issues had been superficially covered, this brief overview may have been sufficient to effect changes in the control group similar to those observed in the experimental group of children.

Third, parental self-selection may have resulted in greater participation of adults representing a higher proportion of ecologically oriented persons. This possibility remains despite evidence that both groups of parents were comparable in terms of socio-economic status, gender, access to recycling programs, and membership in ecological organizations. In the present case, self-selection may have served to bias the results in favour of the null hypotheses. Given these considerations, the finding of some significant differences between the experimental and control groups of parents are, therefore, that much more revealing. As for children, a self-selection bias is less probable. The choice of schools attended by children was an administrative decision of the educational board determined by residential criteria.

Fourth, the absence of a large EEP effect may be partly explained by the program's short length. Ecological awareness and concern in children seem to emerge around the sixth grade (e.g., Evans, Jacobs, & Fraser, 1982). Findings from past studies have established that continued exposure to an EEP may be important to stimulate or sustain ecological attitudes in children (Hungerford & Volk, 1990; Leeming et al., 1997). Over the past 25 years, studies investigating ecological concern have shown its gradual awakening in the general population. Taken together, the above considerations suggest that significant changes in ecological attitudes, motivation, and behaviours may occur over a longer period of exposure. If this is the case, then a proper investigation of emerging ecological attitudes and motivation in children and their parents should be longitudinal to allow for a more fine-grained analysis of the time-course of change. The use of a within-subject design would also control for possible a priori individual differences in attitude, motivation, and behaviour.

Future studies assessing an EEP should evaluate participants' future behavioural intentions. This could provide valuable information particularly in instances demanding substantial investment of money or time before their actual implementation (e.g., buying an energy-efficient furnace or car; planning to compost). Intentions to act are important to consider because with intentions comes an increased probability of action (e.g., Hamid & Cheng, 1995). At another level, measures of teachers' level of personal commitment to the ecological cause and their level of involvement in the program's implementation should also be done. Hungerford and Volk (1990) observed a significant association between continued environmental implication of former EEP students and highly environmentally committed teachers. These findings suggest that interested teachers can successfully communicate greater enthusiasm in the environmental cause to their students. In our own study, teachers more directly affected by pollution (e.g., asthmatic) appeared to be more committed to the implementation of the full Brundtland Green School Program in their classroom. Thus, one key component of an EEP appears to be the messenger.

In sum, continued investigation of the impact of an EEP is particularly important. As future decision-makers, children will have to deal with the coming environmental challenges. As an added benefit of environmental education, children may in turn serve as agents to motivate behavioural changes in their parents. Today's adults are the stewards of natural resources and, consequently, will determine the quality of the environment inherited by...
future generations. To wait for today's children to grow up may do little to address immediate and pressing environmental problems. It is difficult to envision a better means than a well-devised EEP to educate and empower people in successfully preventing or resolving environmental problems.

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References


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