

Understanding Primary School Students' Beliefs Regarding the Adoption of Pro-Environmental Behaviors

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Abstract—Environmental education is the key to enhancing or changing students' ways of thinking and acting in order to create an environmentally robust future for all. The present study investigates the beliefs of 812 primary school students, which merit consideration when developing educational interventions. Results of multiple regression analyses reveal that educational interventions should focus on promoting students' feelings of control over pro-environmental behaviors (PEB). For example, schools could provide recycling bins on the premises. Furthermore, it is critical to develop positive attitudes in students by stressing the various benefits of PEB for keeping our planet clean and protecting wildlife. Unfortunately, our results indicate that students believe that PEB is boring and annoying. Suggestions are offered for making PEB more interesting and relevant. Further research is needed to test the effectiveness of interventions based on the present results.

Keywords—Pro-environmental behaviors, primary school students, theory of planned behavior, beliefs, educational interventions.

I. INTRODUCTION

CREATING an environmentally robust future is thought to require global education efforts [1]. Thus, human behaviors must be changed, because technical efficiency gains resulting from energy-efficient appliances and home insulation, among others, tend to be overtaken by consumption growth [2], [3]. In order to change lifestyles and behavioral patterns, teachers must recognize that simply transmitting knowledge is not enough [4]. Previous studies indicate that having accurate information is not a guarantee of wise judgment, and it often appears to be quite irrelevant for decision making [5], [6]. In order to better understand, predict, and eventually change behaviors, psychosocial theories may help identify the selection and sequence of critical cognitive, emotional, and motivational states that precede enacted behaviors. These identified dynamics could in turn suggest targets for behavior change interventions [7].

The main aim of the present study was to investigate the factors that explain primary school students' intention to adopt pro-environmental behaviors (PEB; e.g., recycling, or switching off electronic devices when not in use) and their actual PEB a few months later. A better understanding of these factors could help in designing appropriate educational interventions. The theoretical framework for this study is the

theory of planned behavior (TPB; [8], [9]), which has been successfully applied in studies examining various types of sustainable environmental behaviors such as travel mode choice [10], [11], household recycling [12], [13], and general pro-environmental behaviors [14]-[16].

However, to our knowledge, TPB has not been applied to investigate PEB in primary school students. A special feature of TPB is that it allows identifying beliefs specific to a given population. Once these beliefs are assessed, they can be supported or challenged, and the population can be informed in order to foster beliefs that support desired behaviors [5], in our case, PEB.

A. The Theory of Planned Behavior

According to TPB (see Fig. 1), the most immediate determinant of primary school students' PEB is individual intention to perform these behaviors, in other words, the cognitive representation of the individual's readiness to perform PEB. The students' intentions in turn should increase to the extent that they (a) have a favorable attitude towards PEB, (b) perceive that they have control over the adoption of PEB, (c) think that significant others are supportive of them (i.e., injunctive norms), and (d) engages in PEB (i.e., descriptive norms). Attitudes towards a given behavior are assumed to be based on behavioral beliefs, which are an individual's beliefs about the likely consequences of performing that behavior [17], [8]. When primary school students believe that behaving in an environmentally responsible manner produces mainly positive outcomes, their attitude towards these behaviors will be favorable. Conversely, if they believe that behaving pro-environmentally has mainly negative consequences, their attitude will be unfavorable. Similarly, injunctive norms are based on beliefs about what particular referents (e.g., parents, teacher, close friends) think the individual ought to do, whereas descriptive norms are based on beliefs about what these referents themselves do [18]. Finally, the overall level of perceived control depends on control beliefs, which in this case are beliefs about factors that can either facilitate or impede PEB. Regarding the control factor, it is important to note that intention is expected to result in overt behaviors only to the extent that the children have actual control over the performance of these behaviors. However, in many applications of TPB, it is difficult or impossible to identify all the factors that actually influence control over the adoption of a given behavior. Consequently, investigators typically use perceived control as a proxy for

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actual control, under the assumption that perceived control reflects actual control reasonably well [19].

B. The Hypotheses of the Present Study

In the present study, we hypothesize that attitude, injunctive norms, descriptive norms, and perceived control predict primary school students' intentions to engage in PEB. Second, intentions and perceived control predicts primary school students' actual behaviors (3 to 4 months later).

Finally, and most importantly, we explore the underpinnings of the major predictors according to TPB, namely behavioral, normative (injunctive and descriptive), and control beliefs. Beliefs play an important role in the development of educational interventions, because they are considered to be the ultimate psychological determinants of behavior [20]. In other words, to bring about changes in behavior, or at least in intention to perform a given behavior, the beliefs that underlie the attitude, social norms, and perceived control constructs must be altered. Recommendations for considering specific beliefs in educational interventions are given. To achieve our research objectives, we used multiple regression analysis.

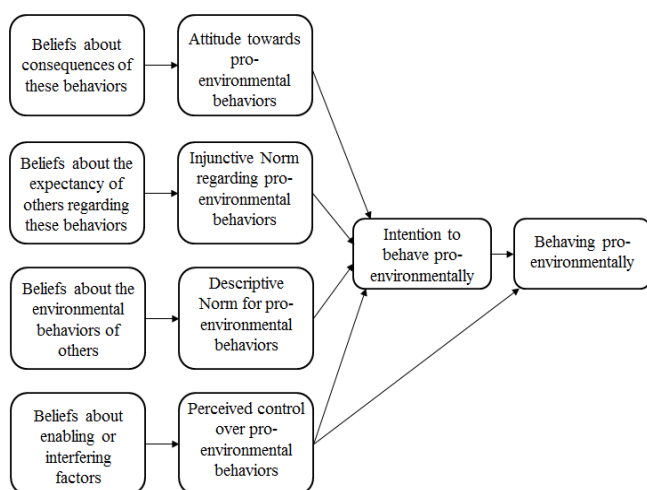


Fig. 1 The theory of planned behavior

II. PILOT STUDY

As recommended by [21], we conducted a pilot study using an open-ended questionnaire to determine the most salient beliefs about PEB. The questionnaire contained examples of PEB followed by open-ended questions. Primary school students were asked to indicate (a) perceived advantages and disadvantages of performing PEB in the coming year, (b) perceived facilitators for or barriers to PEB, and (c) individuals or groups that could encourage or discourage them from PEB in the coming year. The pilot questionnaire was administered to a sample of 116 primary school students (59 females, 57 males; age range 9–13 years, $M = 10.66$, $SD = 0.89$) attending five primary schools in Luxembourg. The students answered the questions in class in the presence of their teacher and the researchers. A content analysis of the responses allowed determining the most salient beliefs. To

increase the validity of the content analysis, two researchers examined the responses independently. Spearman's rank correlation coefficient (ρ) and the intraclass correlation coefficient (ICC, one-way average random measures model) were used to verify inter-researcher consistency in response ranking and frequency, respectively. The results showed that the two researchers agreed on the most frequently elicited advantages (Spearman's $\rho = .96$, $p < .001$; ICC = .96, $p < .001$) and disadvantages (Spearman's $\rho = .93$, $p < .001$; ICC = .98, $p < .001$), the most significant people or groups (Spearman's $\rho = .92$, $p < .001$; ICC = .90, $p < .001$), and the most frequently elicited facilitators (Spearman's $\rho = .74$, $p < .01$; ICC = .88, $p < .001$) and barriers (Spearman's $\rho = .98$, $p < .01$; ICC = .81, $p < .05$). The most frequently elicited beliefs were used as the basis for the quantitative measures of beliefs (i.e., behavioral, normative, and control beliefs) in the main study.

III. MAIN STUDY

A. Participants

Data for this study were drawn from a one school year longitudinal study. The first questionnaire in the main study was administered during the first trimester of the school year, from October to December 2012 (Session 1). The second questionnaire, to assess actual PEB, was administered during the third and last trimester of the school year, from April to June 2013 (Session 2). The participants who completed the questionnaire at both times comprised 812 primary school students (409 females, 403 males) recruited from 14 primary schools in Luxembourg and aged from 10 to 13 years at Session 1 ($M = 10.95$, $SD = 0.73$). The students completed anonymous self-report questionnaires addressing PEB during 50-minute classroom sessions. Two research assistants were present to support the students.

B. Questionnaire

The questionnaire assessed TPB constructs. According to language preference, participants could respond to either a German or French version of the questionnaire. To establish as far as possible equivalent questionnaire versions across the two languages, a team-based approach was used, including multiple revisions and back-translation. Moreover, the developed questionnaires were pretested in a sample of 107 primary school students (50 girls, 57 boys, mainly aged 9–13 years; 83 completed the German and 24 the French version), the questionnaires were then adapted based on the respondents' questions and feedback.

Attitude:

Attitude was measured with a common stem statement: "For me, performing pro-environmental behaviors on a regular basis during the next year would be..." Eight items were rated on six-point semantic differential scales (Cronbach's $\alpha = .85$), for example, (a) annoying to pleasant, (b) useless to useful, and (c) uncool to cool.

Behavioral Beliefs:

A list of ten potential behavioral outcomes was presented to the students, who rated the likelihood that adopting PEB would produce each of the outcomes on a six-point scale ranging from 1 (*no, not at all*) to 6 (*yes, really*). Examples included, "I would help protect animals," "I would help protect our natural environment," and "It would be boring."

Subjective Norms:

Three questions assessed injunctive norms (Cronbach's $\alpha = .76$) and three items assessed descriptive norms (Cronbach's $\alpha = .82$). An example for injunctive norms is, "In general, people who are close to me expect me to adopt pro-environmental behaviors on a regular basis next year." An example for descriptive norms is, "People I admire will perform pro-environmental behaviors regularly next year." Students rated the items on a six-point Likert scale ranging from 1 (*no, not at all*) to 6 (*yes, really*).

Normative Beliefs:

To measure beliefs about the expectations (injunctive norms) and behaviors (descriptive norms) of significant others, the students were asked to indicate: (1) to what extent they thought that certain significant others (e.g., parents, friends, teachers, classmates) expected them to adopt PEB, and (2) whether or not they thought these significant others would adopt these behaviors next year. The items were rated on a six-point Likert scale ranging from 1 (*no, not at all*) to 6 (*yes, really*).

Perceived Behavioral Control (PBC):

PBC was measured with two items (Cronbach's $\alpha = .63$) rated on a six-point scale. For example, "For me, performing pro-environmental behaviors regularly next year would be..." 1 (*very difficult*) to 6 (*very easy*).

Control Beliefs:

The questionnaire contained ten items addressing control factors, including the presence of recycling bins at home and at school, or getting examples and explanations about PEB at school. Participants rated the likelihood of these factors occurring (i.e., "I think that the following situations will occur next year") on a six-point Likert scale ranging from 1 (*no, not at all*) to 6 (*yes, really*).

Intention:

The intention to perform PEB was assessed with four items (Cronbach's $\alpha = .92$). Sample items are, "I want to perform pro-environmental behaviors regularly next year," and "I will perform pro-environmental behaviors regularly next year." Responses were rated on a six-point Likert scale ranging from 1 (*no, not at all*) to 6 (*yes, really*).

Behavior:

Twelve questions assessed actual behaviors at Session 2 (Cronbach's $\alpha = .67$), and were rated on a five-point Likert scale ranging from 0 (*never*) to 5 (*always*). Sample items are, "I leave the tap on while I brush my teeth," "At school, I put

my garbage into the correct recycling bin," and "I forget to switch off the lights when I leave my room for dinner." The stem statement preceding the behavioral items asked the participants to rate their performance on each behavior since last Christmas.

C. Statistical Analysis

In a first step, we tested the traditional TPB model and included only the direct measures (not the belief-based measures) of attitude, injunctive norms, descriptive norms, and PBC. The aim was to identify significant predictors of PEB intention and the corresponding behaviors.

In a second step, the individual contribution of each belief to predict its respective construct was investigated, for example, the power of each behavioral belief to predict attitude and the power of each control belief to predict PBC.

IV. RESULTS

Participants reported high intention to regularly perform PEB ($M = 4.63$, $SD = 1.01$), a positive attitude ($M = 4.70$, $SD = .763$), relatively high perceived social pressure (injunctive norms: $M = 4.51$, $SD = 1.17$; descriptive norms: $M = 4.64$, $SD = 1.02$), and PBC ($M = 4.45$, $SD = 1.04$). At Session 2, participants reported behaving pro-environmentally "regularly" to "often" on average ($M = 2.73$, $SD = 0.55$).

A. Multiple Regression Analyses

In a first step, two multiple regression analyses were performed to test whether attitude, injunctive norms, descriptive norms, and PBC explained primary school students' intention to engage in PEB, and whether their intention and PBC could explain their behaviors at Session 2. The results suggest that the students' intention to adopt PEB is a positive function of attitude towards PEB ($\beta = .342$, $p < .001$), perceived control over PEB ($\beta = .335$, $p < .001$), perceived injunctive norms ($\beta = .160$, $p < .001$), and perceived descriptive norms ($\beta = .101$, $p < .001$). Overall, the model accounted for 52% of the variance in intention to perform PEB. Moreover, intention ($\beta = .249$, $p < .001$) and perceived control ($\beta = .117$, $p < .01$) explained 11% of the students' PEB at Session 2.

In a second step, four multiple regression analyses were performed to test whether (1) behavioral beliefs explained the students' attitude, (2) injunctive beliefs explained injunctive norms, (3) descriptive beliefs explained descriptive norms, and (4) control beliefs explained perceived behavioral control.

The examination of specific behavioral beliefs revealed that of the 10 salient beliefs identified in the pilot study, seven had a significant effect on students' attitude toward PEB. Table I shows that the following beliefs were positively related to attitude: "I would save energy," "I would help protect animals," "I would help protect our natural environment," "I would help keep our planet clean," and "It would be good for the children of the future" whereas the following beliefs had a negative impact on their attitude: "It would be boring," and "It would be annoying." This set of behavioral beliefs predicted 34.4% of the variance in attitude.

When the beliefs underlying perceived social pressure (i.e., perceived injunctive and descriptive norms; see Table II) were analyzed, it appears that the mother's behavior as well as her opinions had a particularly strong impact on the child's perceived social norms. Moreover, the opinions and behaviors of close friends, the family in general, and classmates were influential. Injunctive beliefs predicted 28% of the variance in injunctive norms, and descriptive beliefs predicted 32% of the variance in descriptive norms.

TABLE I
 BEHAVIORAL BELIEFS EXPLAINING STUDENTS' ATTITUDE

Behavioral beliefs	β	<i>p</i>
1. I would save water	.051	.084
2. I would help protect animals	.134	.000
3. I would save energy	.138	.000
4. It would be annoying	-.113	.000
5. I would help protect our natural environment	.087	.017
6. I would help keep our planet clean	.086	.014
7. It would take too much time	-.050	.138
8. I would help protect the trees	.028	.449
9. It would be boring	-.224	.000
10. It would be good for the children of the future	.081	.006

Control beliefs predicted 18.7% of the variance in PBC. Control beliefs and their betas are reported in Table III. The significantly related control beliefs are: "If my parents help me adopt pro-environmental behaviors," "If I learn how to print on both sides of a sheet of paper," "If there are recycling bins at my school," and "If we have recycling bins at home."

TABLE II
 NORMATIVE BELIEFS EXPLAINING STUDENTS' SOCIAL PRESSURE

	<i>Injunctive beliefs</i>		<i>Descriptive beliefs</i>	
	β	<i>p</i>	β	<i>p</i>
1. Father	.007	.879	-.038	.435
2. Mother	.206	.000	.396	.000
3. Teacher	.015	.691	-.024	.571
4. Close friends	.176	.000	.106	.019
5. Family	.138	.002	.124	.011
6. Classmates	.123	.003	.082	.056

TABLE III
 CONTROL BELIEFS EXPLAINING STUDENTS' PERCEIVED BEHAVIORAL CONTROL (PBC)

Behavioral beliefs	β	<i>p</i>
1. If my parents help me adopt PEB	.273	.000
2. If I have a list of all the behaviors that I should perform	.004	.917
3. If I get explanations and examples of PEB at school	.012	.749
4. If there are fun recycling bins (e.g., bins saying "thank you") in which I can put my trash	.026	.487
5. If there are stickers on the trash bins that clearly say what I should put in it	.027	.466
6. If people around me teach me how to behave pro-environmentally	.041	.303
7. If I learn how to print on both sides of a sheet of paper	.101	.004
8. If we have recycling bins at home (e.g., a bin for glass items, a bin for plastic items)	.080	.025
9. If there are trash bins outside where I usually play	.038	.280
10. If there are recycling bins at my school (e.g., a bin for glass items, a bin for plastic items)	.092	.011

V. DISCUSSION

Drawing on TPB, we were able to account for 59% of primary school students' intention to perform pro-environmental behaviors (PEB), as well as 11% of their actual behavior three to four months later. Students' intention was most strongly determined by attitude and feelings of control followed by the opinions and behaviors of significant others. These results suggest that educational interventions should particularly target attitude and control factors. Moreover, control played a significant role in explaining students' actual PEB a few months later.

According to [17], beliefs are the ultimate psychological determinants of intentions and behaviors. Therefore, to develop interventions designed to alter the intentions and behaviors of primary school students, we need to know which beliefs are salient [22].

The results on control beliefs suggest that, to encourage students to adopt PEB, teachers and social psychologists should consider explaining to students how to print documents on both sides of a sheet of paper, as well as to providing recycling bins at school. Moreover, parents should be informed on how to support their children and encouraged to provide recycling bins at home.

With respect to attitude, or more precisely behavioral beliefs, the more that children are convinced that environmentally friendly behaviors will help save energy, keep the planet clean, and protect wildlife and the natural environment, the greater their intention to adopt these behaviors. Teachers could assign situational exercises, for example, to demonstrate how we use paper in our daily life. They could encourage their students to engage in such issues and to consider different action plans. Children could be asked questions such as, "How do you use paper every day?" "What could you do to use less paper?" "How is paper produced?" and "What is the difference between regular and recycled paper?" In subsequent sessions, teachers could motivate their students to reflect on what happens as a result of these actions, for instance, "By using less paper or recycled paper, how much could you help keep our planet clean?"

In addition, based on the students' behavioral beliefs that performing PEB would be boring and annoying, we may conclude that it would be important for teachers to involve their students in developing and modelling interesting, exciting, or fun sustainable practices that would make them less boring. For example, students could design and build new recycling bins, or teachers could explain the water cleaning process, take their students to visit a sewage plant, and have them build their own water filter with a plastic bottle and stones.

Finally, educational efforts should include the family, parents, and friends as far as possible. The results of this study indicate that the more those students believe that these people approve of them performing these behaviors, the more they will intend to adopt them. Moreover, the more pro-environmentally these people behave, the more that students will adopt PEB.

VI. CONCLUSION

The results of this study support the idea that TPB serves as a useful framework for developing promising avenues for school-based interventions to promote pro-environmental behaviors (PEB) in children. Our results suggest that increasing students' feelings of control over the performance of PEB is strongly associated with higher intention to adopt them. The recommendations of this study could help teachers plan more effective and targeted interventions. Further research is needed to test the effectiveness of interventions based on the present results.

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