Reducing marine debris pollution by changing household behavior through children education

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Abstract

This paper aims at evaluating the direct and indirect effects of an educational program on students and parent's knowledge, attitudes and practices (KAP) regarding consumption and disposal of plastics. The program takes the form of an environmental education module with value-laded content, targeting 15 matched pairs of primary schools, as part of their subjects. The intervention is an adaptation of the content and curricula embedded in the National Oceanic and Atmospheric Administration (NOOA) marine debris program. The contents are reinforced with messages, activities and homework appealing to personal norms, being the latter designed to invoke parent's attention indirectly. The program is implemented in partnership with the Biobío regional office of the Ministry of the Environment of the Government of Chile (MMA), targeting schools participating in the sustainable school program, led by this institution. To account for the behavior of children and parents at home before and after the intervention, the experimental design also consists of the implementation of ex-ante and ex-post surveys. This allows us to control for observable characteristics at the individual level, to understand households' dynamics in relation with consumption and disposal of plastic, and to investigate to which extent households' knowledge, attitudes and practices regarding marine plastic pollution problem, and other environmental problems and environmentally friendly practices are affected in response to the program. We expect that a program of this sort may have a largest impact on behavior, compared with the provision of environmental education alone.

Key words: environmental education, plastic debris, intergenerational learning, randomized control trial, spillovers.

JEL classification: I21, Q53, D10, C93

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1. Introduction

Marine debris is a global issue that negatively impacts oceans, wildlife and potentially humans. One important contributor to marine debris is the use of single-use or "disposable" plastics. This means that one avenue for addressing the problem is by changing consumer behavior (Alpizar, et al. 2019). There are many ways to change behavior, including using monetary incentives such as taxes and bans. Individual behavior also depends on non-monetary incentives, such as available information, norms and nudges. This means that information and education can also explain behavior and change behavior (Hartley et al. 2015; Hoang and Kato, 2016; Owens, 2018; Hartley et al. 2018). Environmental education could not only provide information on the importance of changing behavior, but also strengthening/contributing to the emergence of personal norms, which has shown to generate long-lasting changes in pro-environmental behavior (Viscusi et al., 2011; Huber et al., 2018), even in other domains than the targeted (Carlsson et al., 2018).

Changing behavior and strengthening/emerging of personal norms might also affect behavior of other individuals (Jaime and Carlsson, 2018; Fafchamps and Vicente, 2013; Godlonton and Thornton, 2012; Duflo and Saez, 2003). In the case of education of children, the two most obvious interactions would be those between classmates (Card, 2013; Carrell and Hoekstra 2010; Zimmerman, 2003) and between children and parents (Whitbeck and Gecas, 1988). In the case of children and parents, most focus has been on studying the relationship between parents and children's behavior and preferences, with the implicit assumption that parents affect children (Varcoe et al., 2010; Davis-Kean, 2005; Axinn and Thornton, 1993). However, in the case of education of children, the direction of the effect could be the very opposite, where the knowledge learned by children could challenge the values and beliefs of their parents (Duvall and Zint, 2007). In particular, environmental education programs directed to children may promote transfer of environmental knowledge, attitudes and behavior to adults (Lawson et al, 2018; Williams et al, 2017; Boudet et al, 2016; Maddox et al., 2011; Leeming et al., 1997).

This paper aims at evaluating the direct and indirect effects of an educational program on students' and parents' knowledge, attitudes and practices (hereinafter KAP) regarding consumption and disposal of plastics. The program takes the form of an environmental education module, which is implemented in Southern Chile. The intervention is an adaptation of the content and curricula embedded in the National Oceanic and Atmospheric Administration (NOOA) marine debris program to a matched sample of primary schools, as part of their subjects. The contents were reinforced with messages, activities and homework appealing to personal norms, being the latter designed to invoke parents' attention indirectly. We do expect that a program of this sort may have a largest impact on behavior, compared with the provision of environmental education alone. It is also expected that schools that are more environmental committed, and those located in coastal areas will be more responsive to the program. Finally, we expect that parents that are more involved in the education of their children exhibit changes in behavior.

This paper contributes to the literature in a number of aspects. Firstly, this is the first attempt of augmenting environmental education with appealing to personal norms in a medium-run intervention. Secondly, our experimental design allows: (1) to exploit the observed characteristics of schools (i.e., coastal versus non-coastal towns, low-versus high-income schools, private versus public schools, and level of environmental commitment of schools), (2) to identify a cleaner treatment effect by using a set of schools with similar characteristics as contrafactual, as opposed

to previous studies, (3) to gather information on students' involvement in the program. Thirdly, although there is evidence of the significant effects of implementing the NOOA package in the US and other developed countries, this is the first attempt of applying this program in the context of an emerging economy. This is especially important because the use and demand for plastic is expected to increase drastically as a country gets richer. Fourthly, this paper contributes to the existent yet very limited evidence of transmission of environmental friendly behavior from children to parents, with a special focus on the use and reduce of plastic.

2. Research design

Hypotheses
This project has the following hypothesis:

- o The educational program directly affects children's knowledge, attitudes and practices regarding consumption and disposal of plastic.
- o The educational program targeting children has indirect effects on parents'/guardians' knowledge, attitudes and practices regarding consumption and disposal of plastic.
- o The magnitude of the effect on children is determined by observable socioeconomic characteristics and past behavior.
- o The magnitude of the effect on parents is determined by observable socioeconomic characteristics and past parent's behavior in relation to their children's education.

Basic methodological framework
This project consists of a randomized field experiment targeting a sample of schools participating in the sustainable school program that is led by the Ministry of Environment of the Government of Chile (MMA, by its Spanish acronym). Because of the heterogeneity in the Chilean school system, the program will be applied to a matched sample of schools (i.e. pair of schools with similar characteristics will be regarded as treatment and controls), based on observables characteristics of the schools.

Intervention
The experiment involves the provision of an environmental education program with value-laden content. The program consists of the implementation of the contents embedded in the educators' guide to marine debris, designed by the North American Marine Environment Protection Association (NAMEPA) in partnership with the National Oceanic and Atmospheric Administration (NOAA). This guide is based on NOOA's turning the tide on trash: A learning guide on marine debris (NOAA, 2015). We target students attending all fourth grades in the treated schools, and therefore the program include the three modules devoted to grades K-5 on this guide. Each module is covered in two lessons, and the activities are customized to the Chilean context when necessary (e.g., endangered species, locations, etc.). The lessons take place in the classroom, and the contents are taught by a certified teacher and a support team that keep detailed records of the lecture, that allow us to explore mediators that could potentially affect the delivery of the message (i.e. attendance, attitudes, participation, etc.). The duration of each lesson is two times 45

minutes, which are administered biweekly, with in total 6 lessons.[1] Because the program aims at both a direct and a spillover effect, the lessons are coupled with homework and activities that involve the parents (e.g., counting the number of single-use plastic in the home, counting and sorting the number of single-use plastic that are used during a week, etc.). The value-laden content of the environmental education program consists of personal normative messages in the lecture material and the activities, which are designed to be shown to parents indirectly (e.g., school art and craft projects). This has been proved to generate a larger impact on plastic consumption and waste separation by making salient that both the cause and consequence of marine plastic pollution problem has its root in the individual behavior. This opposes to information provided alone which is shown to have a shorter effect (Xu et al., 2018; Willman, 2015; Jakovcevic et al., 2014; Convery et al., 2007).

3. Data

Sample
The study takes place in the Biobío Region (Chile). We focus on this region because it has the highest participation in the sustainable school program in the country. Since the intervention is conducted in partnership with the MMA, our target population consists of schools that participate in the sustainable school program. In this region, there are 205 schools participating in this program, from which only 105 could be matched with at least one other school.[2] Therefore, this will be our population of interest. Due to budgetary constraints and the limitation of administrating this program to a larger sample of schools in terms of human resources needed, we select a sample of 30 schools. Moreover, we focus on all fourth grade students in each school. Based on previous records from the Ministry of Education, in 2017, the average number of students and fourth grades in the selected schools were 25 and 2, respectively, which yields a total of 1,330 students.

Data collection and processing
To account for the behavior of children and parents at home before and after the intervention, the experimental design also consists of the implementation of *ex-ante* and *ex-post* surveys. This allows us to control for observable characteristics at the individual level, to understand households' dynamics in relation with consumption and disposal of plastic, and to investigate to which extent households' knowledge, attitudes and practices regarding marine plastic pollution problem and other environmental problems and environmentally friendly practices are affected in response to the program. Because we focus on direct and spillover effects of the program, these surveys are administered to both children and parents. The survey instrument consists of 3 modules: (1) knowledge, (2) attitudes and perceptions, (3) practices and actions. Both survey instruments are identical, except for an additional module included in the parents/guardians questionnaire. This module is intended to measure general involvement in children education. The survey questionnaire is presented in Appendix A.

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[1] Because of heterogeneity among schools, it could be the case that the program is delayed due to contextual situations. To ensure that the objectives of the program are accomplished in the targeted schools, we will administer additional lessons whenever necessary.

[2] There were 100 schools that cannot be matched based on the certification status, and some of them were not also comparable based on the socio-economic status.

For data collection purposes, we contact schools in our sample by means of official letters signed by the regional representative of the MMA, which is also the head of the sustainable school program. Letters will be delivered personally and meeting will be set with schools' principals to inform the details of the program. While children information will be elicited in the classroom by a team of enumerators, parents/guardians information will be elicited through the communication portfolio, which is the official communication tool between parents and teachers. It is worth mentioning, however, that parents' involvement is voluntary and we can expect non-responses from parents.

Variations from the intended sample size
We do expect all selected schools to participate in the program. However, there could be the case that principals refuse to participate, especially in the case of control that may not see any benefit from the program, and private schools that are typically less open to outside influences. In such cases, we propose to replace the selected school with the most similar one, based on the observable characteristics that are used as selection criteria. Unfortunately, because parents' participation is voluntary, we have to reduce non-responses from parents/guardians by constantly nudging teachers to remind parents to answer the surveys. Notwithstanding these strategies, we expect a larger number of children responses, compared with parents. There could also be non-responses from children due to absence from class around the time of the ex-post survey. To minimize non-responses from children, we will continue to visit schools after the program.

Assignment to treatment
In the Chilean setting there is an extensive heterogeneity among schools, and these characteristics may affect the actual knowledge, attitudes and actions towards the use of plastics and the subsequent contribution to marine plastic pollution. We take these characteristics into account as part of the experimental design by generating a matched sample of schools based on the following observables: (*i*) coastal versus non-coastal towns, (*ii*) low- versus high-income schools, (*iii*) public versus private schools, and (*iv*) low- and high-level of environmental commitment of schools, based on their performance in the sustainable school program. This scheme allows us to generate a subset of schools that are comparable in the baseline. From our population of 105 schools, we randomly select 15 matched pairs of schools, being 15 schools assigned to the treatment group and 15 schools assigned to the control group, respectively.[3] The distribution of the schools is presented in Table B1, in Appendix B.

Pilot data
To evaluate the understanding of the survey instrument, we conduct a pilot study with 6 children from different socioeconomic background. Children were asked to answer all the questions and provide feedback of their understanding. Then, we reformulated the questions based on the feedback provided

Balancing checks
We will perform tests of difference in means to evaluate the balance of the outcome of interest in the pre-treatment period. Because our unit of analysis is the individual, but the randomization was conducted at the school level, we will conduct this analysis not only on the total sample of

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[3] Although the number of schools that were comparable on the selected characteristics was significantly larger than the current sample size, the high costs of implementing the program prevented us from increasing the sample size.

children/parents but also on the subsamples of individuals belonging to low/high level of school certification, coastal/noncoastal towns, and public/private schools. We will also perform tests of difference in means based on parents/guardians observable characteristics available in the questionnaire (e.g. parents/guardians education, household income, family size, among others). We will also rely on schools' secondary information from official records whenever possible. In case of unbalancing, we propose using propensity score methods to generate sample weights that allows us to have a suitable control group.

We are also aware that there could be potential sample selection problems due to attrition. In such cases, we propose to conduct a similar approach to find a suitable control group. We expect that attrition will mainly come from parents, and therefore balancing will be based on parents/guardians characteristics.

4. Empirical analysis

Homogenous treatment effects
The empirical strategy is based on reduced form specifications. The estimate of interest is the Average Treatment Effect (ATE) in the population of children/parents enrolled in schools participating in the program. The ATE is the expected effect of the treatment on a randomly drawn individual from the population and is defined as $\alpha = \mathrm{E}[y_{it}^1 - y_{it}^0]$, where y_{it}^1 and y_{it}^0 are the potential outcomes for children/parent i's behavior (KAP) regarding plastic consumption and disposal before and after the intervention if the school was targeted or was not targeted by the campaign, respectively (Wooldridge, 2010; Blundell and Costa, 2009). We are interested in two main effects: (1) *Direct effects* of the program on children's behavior, and (2) *indirect effects* of the program on parents' behavior. The specification consists of the difference-in-differences estimator, in which the outcome is given by:

$$y_{it} = \alpha T_i P_{it} + \beta P_{it} + v_i + \varepsilon_{it}, \tag{1}$$

where: y_{it} denotes children/parents i's outcome of interest in period t; T_i is a treatment status indicator that is equal to 1 if the school was targeted by the program, and 0 otherwise; P_{it} is a post-treatment indicator that is equal to 1 after the intervention, and 0 otherwise; v_i are children/parents fixed effects; and ε_{it} is the error term. The direct effect of the campaign is consistently estimated by the parameter α. This equation is estimated by using a standard fixed effects estimator (OLS) and standard errors are clustered at the children/household level.

The analysis above assumes that there are not statistically significant differences between treatment and control units. In case of unbalancing, we propose using propensity scores as sampling weights to address this problem. Equation (1) will then be estimated by means of weighted regressions.

Heterogeneous treatment effects
Heterogeneous treatment effects in children behavior will operate through schools' characteristics (e.g., public/private, coastal/non-coastal, high certification/low certification, etc.). In contrast, heterogeneous treatment effects in parents/guardians behavior will be based on parents' characteristics (e.g., parents' involvement in the education of their children, etc.). We focus on these covariates as we expect they are the core mediators of the effect of education at school on

our outcomes of interest. Parents' interaction with the school and quality of the educational experience –as picked up by the monitors– are other mediators.

We will also explore the effects of potential unexpected situations affecting both treatment and control schools. Overall, this analysis will be exploratory, and will aim at shedding light on the main results.

Outcomes of interest
Based on the KAP module, we have three main outcome of interest: knowledge, attitudes and practices. *Knowledge* about plastic pollution problem is measured as the percentage of correct answers from a list of 11 questions. *Attitudes* regarding plastic pollution problem and disposal of plastic are proxied by an index comprising 6 questions. Finally, *practices* include a series of actions carried out by individuals, covering different levels along the plastic impact pathway (i.e., consumption and disposal of plastic), as suggested by Alpizar et al (2019). The outcomes of interest in terms of consumption are: (i) An index of plastic composition of children's school lunch box, and (*ii)* an index of intensity of plastic use in the household on a daily base. Similarly, in terms of disposal we define the following outcomes: *(i)* waste separation, and *(ii)* an index of frequency of plastic waste separation and disposal.

An intervention of this sort could lead to either weak or strong effects. A *weak effect* can be understood as a change in the individual's knowledge/attitudes that may not necessarily translate into changes in behavior. In contrast, a *strong effect* will necessarily imply a change in behavior, which operates through actions and practices.

Robustness checks
Because the program targets the whole population of children on each grade, estimates correspond to the intention to treat. There could be the case, however, that children accept the program differently, receiving different levels of the treatment based on their attendance, participation in the lectures and general attitude. To take account of this behavior, we propose to generate an individual measure of children involvement in the program to estimate continuous treatment effects.

We will also perform an exploratory analysis to evaluate the role of the personal norms as the value-laded component of the campaign. We expect that weak effects may only be attributed to the information embedded in the lessons, whereas strong effects may be the result of the value-laded component of the campaign.

Statistical power
Despite the treatment assignment was made at the school level, because the program is targeted to the students in the selected schools, children and parents will be our units of analysis. Moreover, because we will measure children's and parent's behavior before and after the implementation of the program, we should take this information into account to determine the minimum detectable effect of the intervention.

Because previous measures of knowledge and attitudes regarding plastic pollution problem are unknown, we focus on actions and practices. We use information from the Chilean National Survey of the Environment carried out in 2018. This survey only contains partial information of

plastic disposal practices, however. These figures indicate that, in the Biobio region, 43.9% of individuals separate plastic recipients for recycling, with a standard deviation of 49.66%. Assuming a statistical power of 80% and without repetition, the minimum detectable effect for our total sample of 1,320 students is 7%.

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Appendix A – (Questionnaire children)

Part I. General information

School		School (ID)	
Grade		Town	
Student (ID)		Parent/guardian (ID)	

Part II. Knowledge

Please, mark the alternative that you believe is correct.

1. Which of these activities can lead to trash in the ocean?
    a. Throwing a gum wrapper out of a car window
    b. Accidentally leaving sand toys on the beach
    c. Wind blowing trash out of a full trash bin
    d. All of the above

2. Who is in charge of keeping trash out of the ocean?
    a. The municipality
    b. Beach visitors
    c. Trash collectors
    d. Everyone

3. Marine debris is…
    a. An animal that lives in the deepest part of the ocean
    b. Any kind of trash that ends up in the ocean
    c. A small plant that floats on the surface of the ocean
    d. The seaweed that washes onto the beach

4. What is the main cause of marine debris in the ocean?
    a. Land-based waste such as littering
    b. Ships dumping trash into the ocean
    c. Tsunamis, hurricanes and tornados (storms) blowing debris into the ocean
    d. All the above

5. What/who is affected by marine debris?
    a. Food we eat
    b. People
    c. Plants and animals in the ocean
    d. All the above

6. Trash from which region can end up in the ocean?
    a. Santiago
    b. Valparaíso
    c. Bio-Bio
    d. Every region

7. Which of these is NOT a result of marine debris?
   a. A seagull getting tangled in fishing line
   b. A person stepping on broken glass on the beach
   c. A sea lion eating a plastic bag
   d. All the above

8. The "Great Pacific Garbage Patch" is most like…
   a. A floating island of trash you can see from space
   b. A plastic soup
   c. A place for ships to take their trash
   d. All of the above

9. What is the meaning of waste degradation?
   a. Natural process that takes a material/product reintegrates nature
   b. Waste recycling
   c. Waste agglomeration
   d. An increase in waste

10. How long does it take a plastic bag to degrade?
    a. 10 years
    b. 150 years
    c. 1000 years
    d. 1 year

11. True or False?
    ____ Marine debris is too small to damage boats.
    ____ The foam cups used to keep hot drinks hot and cold drinks cold are made out of plastic.
    ____ The ocean is always downstream.
    ____ The plastic floats through the ocean
    ____ Animal life is safe from marine pollution
    ____ A banana peel takes only 2-10 days to degrade.

Part III. Attitudes/Perceptions
Respond each question clearly and honestly

12. In a 1-5 scale, please indicate to which extent the following environmental problems affect your commune. [1= do not affect; 5= affect a lot]

Climate change	
Trash (inland)	
Trash (ocean)	
Air pollution	
Water pollution	
Acoustic pollution	
Lack of trees and green areas	
Droughts	
Abandoned dogs	

13. How important it is for you not to use plastic bags and straws? Mark with X just one alternative

Very important	
Important	
Not important	
I am not interested in the topic	

14. Mark with an X how you feel regarding the following statement:

	It cannot be avoided	Somehow avoidable	Completely avoidable
To which extent plastic pollution can be avoided?			

15. Have you ever seen trash in the ocean/beach? Yes _____ No _____

	It does not worried me	It worries me to some extent	It worries me a lot
How do you feel about it?			

16. Are there trash/plastic waste in your surroundings (i.e., inland or marine)? Yes ____ No ____

	Not worried at all	Somehow worried	Very worried
Are you worried about it?			

17. Have you ever seen a relative/friend/neighbor throwing away waste/littering? Yes ___ No __

	It does not affect me	It affects me to some extent	It affects me a lot
How does it affect your daily life?			

Part IV Practices/Actions

18. Do you separate your residues to recycle? Yes ____ No____

If your answer is NO, mark with X why

I do not have time	
I do not have space	
I do not have help	
I am not interested	
I do ot how to do it	
Other (which?):	

19. Mark with X all types of plastic you use frequently.

Plastic straws	
Disposables plastic containers for food	
Plastic bags	
Disposable plastic cups	
Disposable plastic cattering	
I do not use them	
Oher (which?):	

20. Mark with X how you carry your snack/lunch to the school

Juice	Box with straw		Resuable container without straw	
Milk	Box with straw		Resuable container without straw	
Fruit	Plastic bag		Resuable container or paper bag	
Yogurt	Plastic container		Resuable container	
Sandwish	Plastic bag		Resuable container or paper bag	
Cokies	Plastic container		Resuable container or paper bag	

21. Mark with X the actions that you do frequently in a daily base.

	Never	Rarely	Sometimes	Frequently	Always
Refuse plastic straws with drinks					
Avoid buying drinks to take away in plastic cups					
Avoid buying fruit and vegetables wrapped in plastic					
Avoid buying plastic bottles and prefer using reusable bottles.					
Avoid using plastic bags and take reusable bags to buy in supermarkets and shops					
Separate plastic garbage (plastic containers, plastic bottles, etc.)					
Take plastic material to special container for recycling					
Participate in groups to help recycling and environment					

22. Mark with X. When I am outside my home:

Acctions	Yes	No
Do I litter on the street?		
Do I pick up garbage that is on the street?		

23. Mark with X. Do you know if some of your neighbors/friends carry out actions to recycle and protect the environment?

Yes		¿Who?
No		

24. Mark with X.

Do you have some information on the marine plastic pollution problem?	Yes	No
How did you inform about? (brief answer) (home, school, friends, news, tv, internet, etc.)		

25. If your previous answer is YES, respond the following question:

Did this information have an effect on your behavior to adopt actions and reduce garbage?	Yes	No
Did this information have an effect on your behavior to adopt recycling habits?	Yes	No

26. How willing are you to contribute in good causes without receiving something in return? Select just ONE value, where 1 means "I am not willing" y 10 means "I am very willing".

I am not willing   I am very willing

1	2	3	4	5	6	7	8	9	10

Appendix A – (Questionnaire Parents)

Part I. General information

School		School (ID)	
Grade		Town	
Student (ID)		Parent/guardian (ID)	

1. What is your relationship with the student?

Parent	
Step-parent	
Sibling	
Grandparent	
Other: relative	
Other: non-relative	

2. Year of birth _____

3. Including the student, how many persons live in the same dwelling?

2 persons		7 persons	
3 persons		8 persons	
4 persons		9 persons	
5 persons		10 persons of more	
6 persons			

4. Which relatives/family members share the dwelling with the student? [Please mark all that apply]

Mother	
Father	
Siblings	
Grandparents	
Aunt/uncle	
Causins	
Niece/nephew	
Other: who?	

5. On an average month, which of the following ranges had better represent the family income of the students' household? [Please mark only one alternative]

Between $ 100.001 and $ 200.000		Between $ 1.000.001 and $ 1.200.000	
Between $ 200.001 and $ 300.000		Between $ 1.200.001 and $ 1.400.000	
Between $ 300.001 and $ 400.000		Between $ 1.400.001 and $ 1.600.000	
Between $ 400.001 and $ 500.000		Between $ 1.600.001 and $ 1.800.000	

Between $ 500.001 and $ 600.000		Between $ 1.800.001 and $ 2.000.000	
Between $ 600.001 and $ 800.000		Between $ 2.000.001 and $ 2.200.000	
Between $ 800.001 and $ 1.000.000		More than $ 2.200.000	

6. What is the highest level of education obtained by the mother (or the stepmother) of the student?

No formal education		3rd year, high school	
1st grade, elementary school		4th year, high school	
2nd grade, elementary school		4th or 5th year, (technical high school)	
3rd grade, elementary school		Incomplete college technical education	
4th grade, elementary school		Complete college technical education	
5th grade, elementary school		Incomplete college education	
6th grade, elementary school		Complete college education	
7° grade, elementary school		Master degree	
8° grade, elementary school		PhD degree	
1st year, high school		Does not know/does not remember	
2nd year, high school			

7. What is the highest level of education obtained by the father (or the stepfather) of the student?

No formal education		3rd year, high school	
1st grade, elementary school		4th year, high school	
2nd grade, elementary school		4th or 5th year, (technical high school)	
3rd grade, elementary school		Incomplete college technical education	
4th grade, elementary school		Complete college technical education	
5th grade, elementary school		Incomplete college education	
6th grade, elementary school		Complete college education	
7° grade, elementary school		Master degree	
8° grade, elementary school		PhD degree	
1st year, high school		Does not know/does not remember	
2nd year, high school			

8. Are you member of the board of the parents' association? Yes _____   No _____

9. Do you know the students' school schedule? Yes _____   No _____

10. Please mark with an X all that apply

	Always	Very often	Some times	Hardly ever	Never
Do you attend to parents/guardian school meetings?					
Are you familiar with the dates where the children's test/exams take place?					
Do you help the children to study at home?					
Are you familiar with the children's homework?					
Do you help the children to make his/her homework?					
Do you participate in the children's school activities to which parents/guardians are invited?					

Part II. Knowledge
Please, mark the alternative that you believe is correct.

11. Which of these activities can lead to trash in the ocean?
    a. Throwing a gum wrapper out of a car window
    b. Accidentally leaving sand toys on the beach
    c. Wind blowing trash out of a full trash bin
    d. All of the above

12. Who is in charge of keeping trash out of the ocean?
    a. The municipality
    b. Beach visitors
    c. Trash collectors
    d. Everyone

13. Marine debris is…
    a. An animal that lives in the deepest part of the ocean
    b. Any kind of trash that ends up in the ocean
    c. A small plant that floats on the surface of the ocean
    d. The seaweed that washes onto the beach

14. What is the main cause of marine debris in the ocean?
    a. Land-based waste such as littering
    b. Ships dumping trash into the ocean
    c. Tsunamis, hurricanes and tornados (storms) blowing debris into the ocean
    d. All the above

15. What/who is affected by marine debris?
    a. Food we eat
    b. People
    c. Plants and animals in the ocean
    d. All the above

16. Trash from which region can end up in the ocean?
    a. Santiago
    b. Valparaíso
    c. Bio-Bio
    d. Every region

17. Which of these is NOT a result of marine debris?
    a. A seagull getting tangled in fishing line
    b. A person stepping on broken glass on the beach
    c. A sea lion eating a plastic bag
    d. All the above

18. The "Great Pacific Garbage Patch" is most like…
    a. A floating island of trash you can see from space
    b. A plastic soup
    c. A place for ships to take their trash
    d. All of the above

19. What is the meaning of waste degradation?
    a. Natural process that takes a material/product reintegrates nature
    b. Waste recycling
    c. Waste agglomeration
    d. An increase in waste

20. How long does it take a plastic bag to degrade?
    a. 10 years
    b. 150 years
    c. 1000 years
    d. 1 year

21. True or False?
    ____ Marine debris is too small to damage boats.
    ____ The foam cups used to keep hot drinks hot and cold drinks cold are made out of plastic.
    ____ The ocean is always downstream.
    ____ The plastic floats through the ocean
    ____ Animal life is safe from marine pollution
    ____ A banana peel takes only 2-10 days to degrade.

Part III. Attitudes/Perceptions
Respond each question clearly and honestly

22. In a 1-5 scale, please indicate to which extent the following environmental problems affect
   your commune. [1= do not affect; 5= affect a lot]

Climate change	
Trash (inland)	
Trash (ocean)	
Air pollution	
Water pollution	
Acoustic pollution	
Lack of trees and green areas	
Droughts	
Abandoned dogs	

23. How important it is for you not to use plastic bags and straws?
Mark with X just one alternative

Very important	
Important	
Not important	
I am not interested in the topic	

24. Mark with an X how you feel regarding the following statement:

	It cannot be avoided	Somehow avoidable	Completely avoidable
To which extent plastic pollution can be avoided?			

25. Have you ever seen trash in the ocean/beach? Yes _____ No _____

	It does not worried me	It worries me to some extent	It worries me a lot
How do you feel about it?			

26. Are there trash/plastic waste in your surroundings (i.e., inland or marine)? Yes ____ No ____

	Not worried at all	Somehow worried	Very worried
Are you worried about it?			

27. Have you ever seen a relative/friend/neighbor throwing away waste/littering? Yes __ No __

	It does not affect me	It affects me to some extent	It affects me a lot
How does it affect your daily life?			

28. In a 1-5 scale, how worry are you regarding the following problems related with the use of plastics [1= do not worried at all – 5= very worried]

The use of oil to produce plastic and its contribution to climate change	
Plastic do not degrade easily and end up in landfills	
Much of the plastic cannot be recycled	
Plastic waste affecting animal life	
Plastic waste affecting human life	
Marine pollution	

Part IV. Practices/Actions

29. ¿Do you separate your residues to recycle? Yes _____ No_____

If your answer is NO, mark with X why

I do not have time	
I do not have space	
I do not have help	
I am not interested	
I do ot how to do it	
Other (which?):	

30. Mark with X all types of plastic you use frequently.

Plastic straws	
Disposables plastic containers for food	
Plastic bags	
Disposable plastic cups	
Disposable plastic cattering	
I do not use them	
Oher (which?):	

31. Mark with X how you wrap your children snack/lunch for the school

Juice	Box with straw		Resuable container without straw	
Milk	Box with straw		Resuable container without straw	
Fruit	Plastic bag		Resuable container or paper bag	
Yogurt	Plastic container		Resuable container	
Sandwish	Plastic bag		Resuable container or paper bag	
Cokies	Plastic container		Resuable container or paper bag	

32. Mark with X the actions that you do frequently in a daily base.

	Never	Rarely	Sometimes	Frequently	Always
Refuse plastic straws with drinks					
Avoid buying drinks to take away in plastic cups					
Avoid buying fruit and vegetables wrapped in plastic					
Avoid buying plastic bottles and prefer using reusable bottles.					
Avoid using plastic bags and take reusable bags to buy in supermarkets and shops					
Separate plastic garbage (plastic containers, plastic bottles, etc.)					
Take plastic material to special container for recycling					
Participate in groups to help recycling and environment					

33. Mark with X. When I am outside my home:

Acctions	Yes	No
Do I litter on the street?		
Do I pick up garbage that is on the street?		

34. Mark with X. Do you know if some of your neighbors/friends carry out actions to recycle and protect the environment?

Yes		Who?
No		

35. Mark with X.

Do you have some information on the marine plastic pollution problem?	Yes	No
How did you inform about? (brief answer) (home, school, friends, news, tv, internet, etc.)		

36. If your previous answer is YES, respond the following question:

Did this information have an effect on your behavior to adopt actions and reduce garbage?	Yes	No
Did this information have an effect on your behavior to adopt recycling habits?	Yes	No

37. Could you indicate to what extent you agree or disagree with the following statements regarding waste management?

	Completely disagree	Disagree	Indifferent	Agree	Completely agree
The government should charge higher taxes to the industries that generate more waste.					
The municipality should charge a fine to people that litter.					
People must pay for their waste.					
If we do not recycle, we will have important environmental consequences in the future.					
Waste management is a shared responsibility between government and our communities.					

38. How important are the following factors to increase recycling?

	Very little important	Little important	Indiferente	Important	Very important
More information about how to recycle.					
To get money for recycling.					
To have more room at home for storage.					
To have more time to separate.					
To improve collection services for recycling.					
Local government in charge of recycling.					
To have more information and commitment of the environmental benefits of recycling					
To know your friend are doing recycling.					

39. ¿How willing are you to contribute in good causes without receiving something in return? Select just ONE value, where 1 means "I am not willing" y 10 means "I am very willing".

I am not willing   I am very willing

1	2	3	4	5	6	7	8	9	10

40. Compared with others, are you a person that, in general, willing to give up something today to get larger benefits in the future? Select only ONE value, where 1 means "I am not willing" and 10 means "I am willing".

I am not willing   I am willing

1	2	3	4	5	6	7	8	9	10

Table B1. Treatment and control schools (Matched sample)

	No. schools	School type	No. schools	Socio-economic status	No. schools	Certification status	No. schools	Selected schools
Coastal	86	Public	76	Low - Medium/low	68	Basic	18	2
						Excellence	13	2
				Medium	8	Basic	2	2
						Excellence	4	2
		Subsidized private	7	Medium	3	Excellence	2	2
				High	2	Excellence	2	2
		Private	3	High	2	Excellence	2	2
Non-coastal	119	Public	104	Low	41	Medium	9	2
						Excellence	31	2
				Medium	15	Medium	3	2
						Excellence	11	2
		Subsidized private	13	Low-Medium/low	5	Medium	2	2
						Excellence	2	2
				High	2	Excellence	2	2
		Private	2	High	2	Excellence	2	2
Total	205		205		148		105	30

Source: Own elaboration based on the records from the sustainable school program. Secretary of the Ministry of the Environment of the Government of Chile, Bio-Bio Region, Chile (2018).