

Chapter 10

School Factors and Students' Willingness to Act Pro-environmentally in the Future



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10.1 Introduction

Environmental degradation requires sustained actions to generate awareness that the human species is an integral part of the environment (Núñez Tobar et al., 2023). As early as 1987, the Brundtland report (World Commission on Environment and Development, 1987) identified the challenges regarding resource depletion and pollution, coupled with poverty and hunger, in the path towards countries' economic development (Keeble, 1988).

The notion of sustainable development is a conceptual tool which may shape strategies to face environmental impacts related to economic development. This may be accomplished through reducing consumption, reusing products, and recycling waste, after creating consciousness among the population (Escario et al., 2020), as a way to safeguard the environment for future generations. Furthermore, sustainable development emphasizes the crucial role of education in empowering individuals and societies to take responsibility for shaping their future (Walid & Luetz, 2018). As such, school systems are viewed as an important vehicle to promote mental models regarding the relationship between humans and their environment, and they may offer opportunities to lead a change in mentality that considers humans not as mere users of the environment, but as part of interconnected ecological systems (Carr, 2016).

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Education for sustainable development (ESD) entails an action-oriented pedagogy, which instills in students the understanding that knowledge and skills need to be accompanied by actions to transform reality (González-Salamanca et al., 2020). However, to date, much of the research agenda has focused on how effective schools promote sustainability consciousness (see, for example, Berglund et al., 2014; Boeve-de Pauw et al., 2015; Olsson et al., 2016), instead of focusing on engagement into either present or future actions. Although bibliometrics analysis of ESD attests to a noticeable growth in publications since the Brundtland report of 1987 to the present (Grosbeck et al., 2019), research exploring students' willingness to act pro-environmentally and its relation to school practices remains scarce (Verhelst et al., 2021). Moreover, contemporary educational effectiveness research regarding the implementation of ESD in schools highlights the need to address two aspects: (a) incorporating students' perceptions of relevant ESD teaching practices, and (b) employing an action-oriented focus (Isac et al., 2022; Sass et al., 2023; Sinakou et al., 2019).

The present chapter aims to bridge this latter gap. Making use of International Civic and Citizenship Education Study (ICCS) 2016 data from the International Association for the Evaluation of Educational Achievement (IEA), it looks into different school factors that may influence students' willingness to protect the environment. Essentially, it focuses on learning opportunities relevant to ESD. The study focuses on opportunities to learn (OTL) in schools according to different informants. Firstly, principals report on pro-environmental actions within the school, activities related to environmental sustainability, and the promotion of respect for and safeguarding of the environment. Secondly, the study analyzes students' perspectives on their OTL how to protect the environment at school, as well as the openness of classroom discussions. Finally, the study examines teachers' perceived preparedness to teach about the environment and their opportunities for training in this area.

There are two foreseeable limitations to the present study. On the one hand, the outcome variable is a single item in ICCS 2016, a feature that may limit the variability when measuring students' future intended personal efforts to protect the environment. Therefore, the present study only covers a single focus on students' intention to take action to protect the environment in the future, that contrasts with the full array of components related to action competence as a desired learning outcome of ESD. Additionally, the results constrain our capacity to make causal claims for two reasons. On the one hand, the results originate from an observational design study with a cross-sectional design of data collected in 2016. On the other hand, the methods used, along with the sampling design, do not necessarily warrant the proposition of causal inferences. Consequently, the interpretation of these results should be approached with caution.

10.2 The Role of Schools in Promoting the Protection of the Environment

Schools can offer students relevant ESD learning opportunities. The general idea behind OTL became popular from Carroll's conceptual model (Carroll, 1989), which consists of the idea that a student would learn content, as long as they are exposed to it for enough time (Schmidt et al., 2015). A broader interpretation of what learning opportunities may entail includes curricular coverage in schools, varying instructional quality, and teaching practices, among other relevant attributes of the learning environment of schools (Sandoval-Hernández, 2010). Within the ESD school effectiveness literature we found that students' action competence and their environmental consciousness vary according to the school they are in and are conditional to their school's practices (Berglund et al., 2014; Boeve-de Pauw et al., 2015; Coertjens et al., 2010; List et al., 2020; Olsson et al., 2016; Sass et al., 2022). For a specific example, we reviewed studies on school programs devoted to encouraging recycling behaviors among students. In school programs that aim to promote recycling behaviors, schools have found that teaching and engaging students in recycling activities lead to improvements in their environmental knowledge, particularly in waste management and recycling, as well as in their attitudes and actual engagement in recycling behaviors (Cheang et al., 2019; Goldman et al., 2018). As such, in the present study, we inquire if schools that implement sustainable practices and promote pro-environmental awareness are also more likely to have students with higher willingness to act pro-environmentally. For these purposes, we use indicators generated from the school database using both principal and teacher responses, as well as the student database, using student responses.

For schools to implement ESD teaching practices requires teachers who feel confident to include ESD within their practices and are previously trained for such a purpose (Isac et al., 2022). However, pre-service teacher training on ESD might not be consistent for teachers (Evans et al., 2017), and even though pre-service training may help teachers to gain knowledge of Sustainable Developmental Goals, this might not be enough to alter their teaching practices (García-González et al., 2020). For example, teachers feel less prepared to include ESD content in their teaching when there is a lack of available examples and they feel they lack sufficient expertise on sustainable development (Borg et al., 2012). Nevertheless, the longitudinal study by Boeve-de Pauw et al. (2022) showed that comprehensive training provided through an on-the-job ESD professional development program can enhance teachers' ESD teaching practices in the classroom. Moreover, Olsson et al. (2022) provide longitudinal evidence that, when teachers do include ESD practices in their teaching, students' knowledge regarding sustainability and their willingness to act increase as expected. Although the present study is cross-sectional in design, we include teachers' indicators of their training relative to the environment and

environmental sustainability, and teachers' self-reports on readiness to teach ESD topics. We expect that students in schools with a higher proportion of teachers trained to teach ESD topics, are more willing to protect the environment in contrast to their peers, taught in schools with no trained teachers. Moreover, we also compare students' responses, conditional to the proportion of teachers who feel prepared to teach about the environment and environmental sustainability at their schools. We assume that students attending schools where teachers may feel more prepared to teach ESD-related topics, are more willing to act for the protection of the environment, in comparison to their peers.

Within the action competence model, pluralism is described as an ESD teaching practice that involves deliberative exercises with students, encouraging students to take different perspectives before making an informed choice on how to react to an ESD problem (Sass et al., 2023). This teaching practice is aimed at developing critical thinking, complex problem solving and collaborative decision-making among students (Isac et al., 2022). ESD school effectiveness studies have shown that when students were exposed to these practices, they improved their sustainability consciousness and action competence in terms of knowledge, as well as willingness to act (Boeve-de Pauw et al., 2015; Olsson et al., 2022). In the present study we use the measure of open classroom discussion from ICCS 2016 (Knowles et al., 2018), as an indicator of pluralistic ESD teaching practices, where controversial issues are discussed in the classroom, guided by the teachers, promoting facts and controversies to be understood and remembered by the students (Carrasco & Pavón Mediano, 2021). Considering the previous literature on ESD effectiveness, we expect students exposed to open classroom discussion are more willing to protect the environment, in contrast to their peers who are less exposed to such a teaching practice.

Informed by applications of theories of planned behavior on the promotion of pro-environmental behavior among high-school students (see, for example, de Leeuw et al., 2015), in the present study we also include student covariates as control variables, besides students' gender, immigrant background, parents' education and number of books at home (see Chap. 9), to look into the relationships between different learning opportunities students get and their willingness to act. Under an expanded version of models of planned behavior applied to pro-environmental behavior, previous studies have included past behavior, social norms, and environmental awareness, among other factors (Yuriev et al., 2020). In the current study, we selected the following covariates: (a) students' current behavior (participation in an environmental action group or organization); (b) pro-environmental social norms endorsement (prescriptive norms for "Taking part in activities to protect the environment" and "Making personal efforts to protect natural resources"); and (c) knowledge about different threats to the environment (pollution, water shortage, and climate change).

10.3 Analysis and Results

In the present study, we use a series of ordinal logit models (Rabe-Hesketh & Skrondal, 2012) to assess the relationship of all selected factors. We inquire if different OTL at school and teacher preparation contribute to students' willingness to act pro-environmentally. In the following section, we first describe how students' future willingness to protect the environment is related to the learning opportunities that schools provide,¹ controlling for students' current behavior, norms endorsement, and awareness of global threats.

10.3.1 Model Sequence

In the following section we report first on the overall model fit, by comparing the null model with models including covariates. We used a likelihood ratio test to assess the model and a subsequent model including a larger set of covariates and test their contribution to account for students' willingness to protect the environment (Masyn, 2014). We fitted a model including all student factors (current behavior, norms endorsement, threat awareness) (M8) in addition to the selected variables from Chap. 9 (M7). We then fitted a model with all OTL reported by school principals, teachers, and students (M9). We then proceeded to fit a model to assess teachers' readiness and previous teacher training regarding ESD (M10). Finally, we fitted a model with all country fixed effects (M11). This latter model is informative of any large differences between countries² in relation to the previously selected factors. We present the estimates of these fitted models in Tables 10.1 and 10.2.

10.3.2 Model Fit

Our selected variables fitted the observed data well, in comparison to the null model ($LRT(23) = 13,346.04, p < 0.001$). The saturated model (M10) with all the covariates of interest accounted for 22% of variance of students' willingness to make personal efforts to protect the environment, while 6% of additional variance was accounted for by country differences ($R^2_{M11} = 28\%$).

¹In the present section, Hong Kong SAR and North Rhine-Westphalia are not included in the analysis. These two educational systems did not include teacher survey data and were therefore excluded from pooled modeling. However, these were included in the figures per covariate expected proportion of response when data was available.

²The term "countries" is sometimes used in this chapter to refer to both countries and benchmarking participants, for ease of reading.

Table 10.1 Population average estimates for ordinal logits of students' willingness to act pro-environmentally by student covariates

Parameter	Variables	M8		M9		M10		M11	
		E	P<	E	P<	E	P<	E	P<
β_1	Parent education (university)	0.01		-0.01		-0.01		0.08	**
		(0.02)		(0.02)		(0.02)		(0.02)	
β_2	Books at home (100 or more)	0.18	***	0.15	***	0.16	***	0.28	***
		(0.02)		(0.02)		(0.02)		(0.02)	
β_3	Gender (girls)	0.42	***	0.35	***	0.35	***	0.39	***
		(0.02)		(0.02)		(0.02)		(0.02)	
β_4	Immigrant (yes)	-0.20	***	-0.23	***	-0.20	***	0.07	
		(0.04)		(0.04)		(0.04)		(0.04)	
β_5	Parent education * books at home	0.21	***	0.21	***	0.20	***	0.16	***
		(0.04)		(0.04)		(0.04)		(0.04)	
β_6	Parent education * gender	0.03		0.04		0.03		0.03	
		(0.04)		(0.04)		(0.04)		(0.04)	
β_7	Books at home * gender	0.19	***	0.22	***	0.22	***	0.26	***
		(0.04)		(0.04)		(0.04)		(0.04)	
β_8	Current behavior	0.60	***	0.55	***	0.54	***	0.44	***
		(0.02)		(0.02)		(0.02)		(0.02)	
β_9	Prescriptive norms regarding taking part in pro-environmental activities	0.95	***	0.88	***	0.88	***	0.80	***
		(0.03)		(0.03)		(0.03)		(0.03)	
β_{10}	Prescriptive norms regarding pro-environmental individual actions	1.19	***	1.12	***	1.12	***	0.96	***
		(0.04)		(0.04)		(0.04)		(0.04)	
β_{11}	Threat awareness regarding pollution	0.52	***	0.46	***	0.46	***	0.48	***
		(0.03)		(0.03)		(0.03)		(0.03)	
β_{12}	Threat awareness regarding water shortages	0.36	***	0.33	***	0.33	***	0.23	***
		(0.02)		(0.02)		(0.02)		(0.02)	
β_{13}	Threat awareness regarding climate change	0.24	***	0.22	***	0.22	***	0.26	***
		(0.02)		(0.02)		(0.02)		(0.02)	

Notes: E = Unstandardized estimates are included with their accompanying standard error in parenthesis in the following row. Model 11 displays all estimates while including the country fixed effects (not shown). P < are *** = $p < 0.001$, ** = $p < 0.01$, * = $p < 0.05$

10.3.3 Student Covariates

The selected student covariates of current behavior, norms endorsement, and awareness of environmental threats accounted for an additional portion of the variance, as compared to a model that only included inequality factors (students' gender,

Table 10.2 Population average estimates for ordinal logits of students' willingness to act pro-environmentally, by OTL indicators

Parameter	Variable	M9		M10		M11	
		E	P<	E	P<	E	P<
β_{14}	Schools' likelihood of implementing pro-environment practices	0.01 (0.02)		0.02 (0.02)		0.02 (0.01)	
β_{15}	Students' exposure to activities related to environmental sustainability	-0.01 (0.03)		-0.01 (0.03)		-0.02 (0.02)	
β_{16}	Schools' likelihood of implementing pro-environment awareness activities	0.00 (0.03)		-0.01 (0.03)		0.01 (0.02)	
β_{17}	Schools promote respect for and safeguard of the environment	-0.01 (0.03)		-0.01 (0.03)		-0.01 (0.02)	
β_{18w}	Opportunities to learn how to protect the environment (w)	0.55 (0.02)	***	0.55 (0.02)	***	0.59 (0.02)	***
β_{18b}	Opportunities to learn how to protect the environment (b)	0.85 (0.11)	***	0.86 (0.11)	***	0.93 (0.08)	***
β_{19w}	Open classroom discussion (w)	0.14 (0.01)	***	0.14 (0.01)	***	0.16 (0.01)	***
β_{19b}	Open classroom discussion (b)	0.27 (0.05)	***	0.28 (0.05)	***	0.28 (0.03)	***
β_{20}	Teacher readiness to teach about the environment and environmental sustainability			-0.20 (0.07)	**	-0.10 (0.04)	*
β_{21}	Teacher trained to teach about the environment and environmental sustainability			0.37 (0.04)	***	0.03 (0.03)	
	<i>Thresholds</i>						
τ_1	1 vs 2, 3, 4	-3.47 (0.03)	***	-3.26 (0.04)	***	-3.54 (0.06)	***
τ_2	1, 2 vs 3, 4	-1.66 (0.02)	***	-1.46 (0.03)	***	-1.70 (0.05)	***
τ_3	1, 2, 3 vs 4	0.58 (0.01)	***	0.80 (0.03)	***	0.67 (0.05)	***

Notes: E = Unstandardized estimates are included with their accompanying standard error in parenthesis in the following row. Model 11 displayed all estimates while including the country fixed effects (not shown). P < are *** = $p < 0.001$, ** = $p < 0.01$, * = $p < 0.05$
 (w) Within school centered
 (b) Means score centered at the country mean

parents' education, number of books at home, and immigration background) ($R^2_{M7} = 3\%$, $R^2_{M8} = 19\%$, $LRT(6) = 9749.53$, $p < 0.00$). All these covariates presented positive results in relation to students' willingness to help the environment. For example, students that considered "Making personal efforts to protect natural resources" as very and quite important to be considered a good adult citizen, which is a prescriptive social norm endorsement, were also more willing to make personal efforts to help the environment (M11: E = 0.96 *** , OR = 2.60).

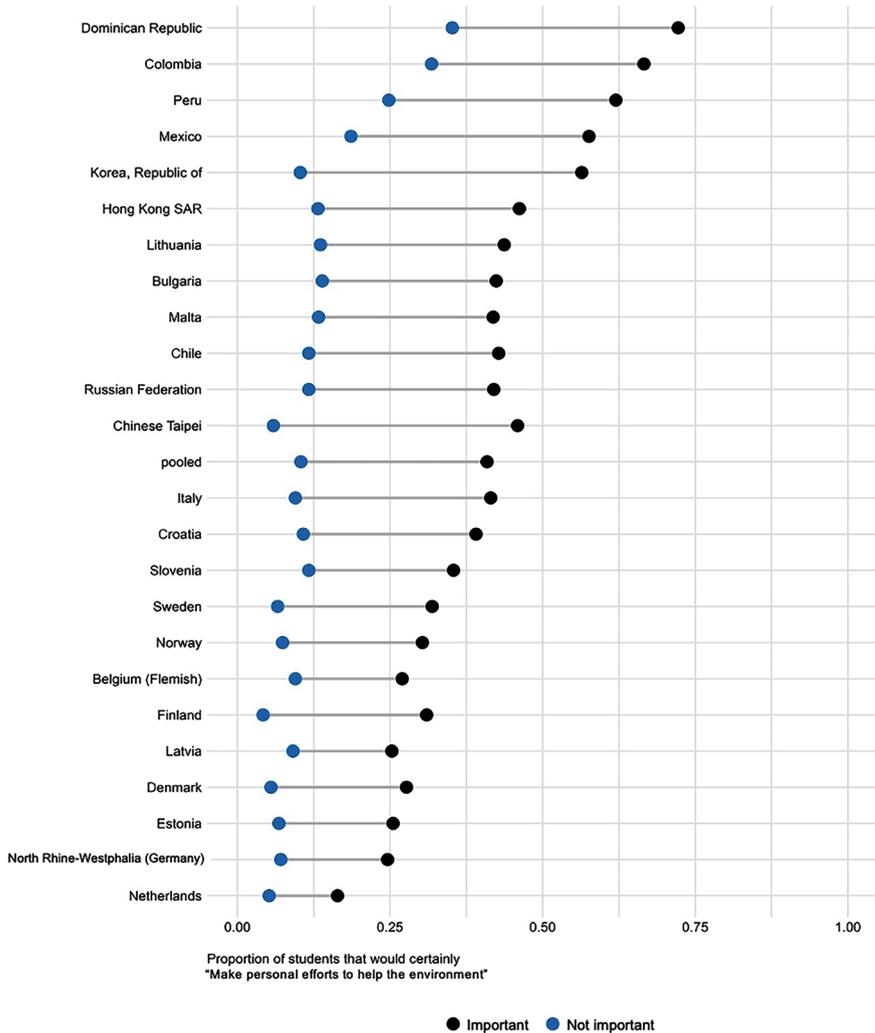


Fig. 10.1 Willingness to act pro-environmentally among students who considered it important to make personal efforts to protect natural resources in order to be considered a good citizen

To illustrate this latter result, we present Fig. 10.1. In the pooled sample, we found that only 10% of students who did not endorse this social norm could be expected to certainly be willing to engage in personal efforts to act pro-environmentally. In contrast, we can expect that 40% of students show a higher willingness to act pro-environmentally when they also considered it important to protect the environment for good citizenry. This positive result was observed across all participating countries in the study. Hence, social norms endorsement related to environmental sustainability is positively related to students’ intention to behave pro-environmentally.

10.3.4 *Opportunities to Learn at School*

To assess the overall relationship between the school context and students' willingness to act pro-environmentally we fitted a multilevel ordinal logit model, without accounting for countries' fixed effects. The intra-class correlation for school membership was 12%, while its median odds ratio was 1.92 (CI95% [1.83, 2.02]) (see Merlo et al., 2006). Thus, when comparing the odds of responses of two students chosen randomly from different schools and comparing their willingness to act pro-environmentally one would exceed the second by almost twice the size, half of the time (Rabe-Hesketh & Skrondal, 2012, p. 596). Retrieving the same estimate while accounting for country differences, this estimate was 1.46 (CI95% [1.39, 1.53]). Conversions of odds ratio to standardized mean differences suggested that odds ratios of 1.6 are similar to a Cohen's *d* of 0.2 (Chen et al., 2010). Therefore, a non-ignorable portion of the students' willingness to act pro-environmentally varied due to the school students attended.

The previous exercise provided a general sense of the relationship between school context and students' willingness to act pro-environmentally. However, it did not inform us regarding what observed school attributes may account for this variability between students. Comparing the model that included different observed indicators of OTL at school (M9) to the student covariates model (M8), we found that OTL indicators accounted for an additional 3% of variance among students ($R^2_{M8} = 19\%$, $R^2_{M9} = 22\%$, $LRT(8) = 1795.39$, $p < 0.00$). We present the estimates of these models in Table 10.2. Across all eight OTL indicators we selected, only those generated with students' responses presented positive relations to students' willingness to act pro-environmentally between schools. With the fitted models, we found that students in schools where they have learned how to protect the environment to a large extent, indicated they were more willing to make personal efforts to act pro-environmentally later in life (M11: $E = 0.93$ ***, $OR = 2.50$). Likewise, students in schools with a higher open classroom discussion climate also presented higher levels of willingness to act pro-environmentally (M11: $E = 0.28$ ***, $OR = 1.30$).

We use Figs. 10.2 and 10.3 to illustrate the obtained results of these two school factors for the pooled sample, and for each participating country. In the pooled sample, we found that a high proportion of students presented a high willingness to act pro-environmentally (75%) in schools where they had learned how to protect the environment to a large extent. According to the results, only 38% of students present a high willingness to act pro-environmentally in schools where they have learned how to protect the environment to a lesser extent. This large difference in proportions of students with high pro-environmental intentions varied between countries by 15–55% across all countries with the exception of Slovenia, where we did not see this pattern of results.

Open classroom discussion is a factor that positively relates to the willingness to act pro-environmentally in the future. The results show that the willingness to act pro-environmentally of students in schools with one standard deviation above the

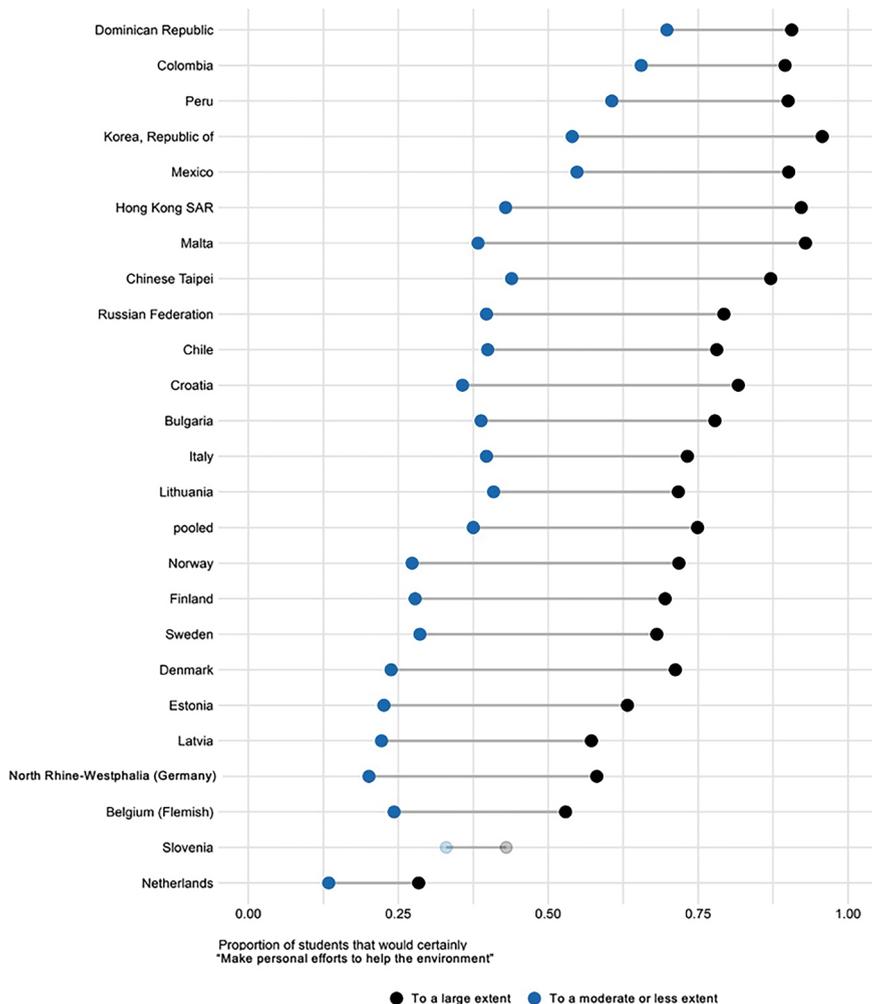


Fig. 10.2 Willingness to act pro-environmentally among students by learning opportunities at school as reported by the students

mean on open classroom discussion increases between 7% and 35%. In the pooled sample, for example, the model expects that 38% of students present a high willingness to act pro-environmentally when exposed to average levels of classroom discussion. In contrast, we expect that more than half of the students (52%) present a high willingness to act pro-environmentally if they are exposed to levels of open classroom discussion one standard deviation higher than the average.

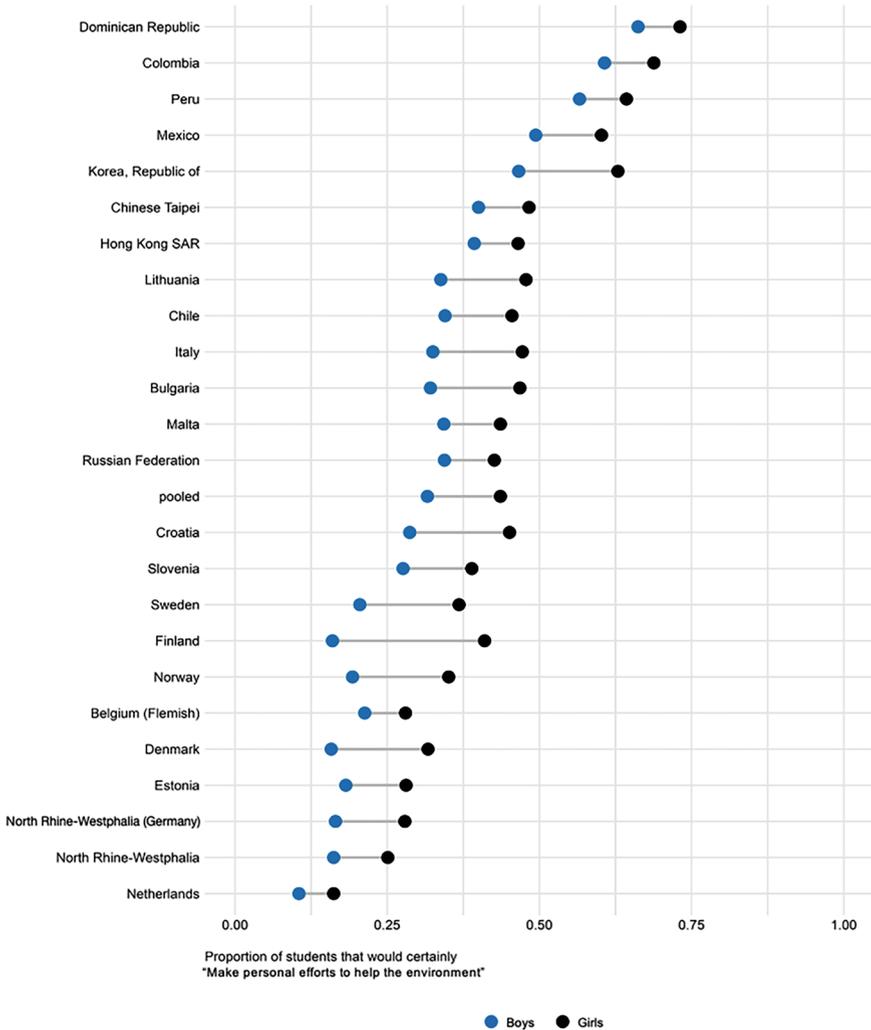


Fig. 10.3 Willingness to act pro-environmentally among students by learning opportunities at school through open classroom discussion as reported by the students

10.3.5 Teacher Readiness and Preparedness

In Model 10, we included two indicators of teacher readiness and preparedness to teach about topics regarding the environment and environmental sustainability. These two additional indicators accounted for a small proportion of additional accounted variance, of about 0.4% ($R^2_{M9} = 21.6\%$, $R^2_{M10} = 22.0\%$, $LRT(2) = 280.90$, $p < 0.00$). We observed a paradoxical effect, i.e., students in schools where all of their teachers felt prepared to teach about topics regarding the environment and

environmental sustainability showed lower willingness to act pro-environmentally in the future (M10, $E = -0.20^{**}$, $OR = 0.82$). In terms of teacher preparation, we observed that, in the pooled sample, students in schools where all their teachers had been trained to teach about environment and environmental sustainability topics, showed a higher willingness to act pro-environmentally in comparison to their peers (M10, $E = 0.37^{***}$, $OR = 1.40$). This latter estimate became non-significant once we included the country fixed effects (M11, $E = 0.03$, $OR = 1.00$). We interpreted this latter result as a sign of substantial variability between countries regarding the proportion of trained teachers per country. To illustrate this result, we include Fig. 10.4. In this figure we found that the obtained result in the pooled sample was not the norm between countries. The general positive result was evident in Malta, the Russian Federation, and Norway; while this relationship appeared to be close to null in the rest of the countries.

The results of the models suggest that teaching practices and action-oriented educational approaches are associated with students' intentions to make efforts to protect the environment in the future. The adjusted models include the entire sample of participating countries, where we find that there is both country and school variability in the results. As a consequence, it is worth including some discussion on country and school differences. Students' willingness to make personal efforts to help the environment varies between schools, and the intra class correlation, close to 10%, is similar to that found by Sass et al. (2022).

The findings on OTL are aligned with those on school effectiveness within the ESD literature. It is important to note that the positive results for OTL factors appear when we use students' responses to build the OTL variables. Hence, it is important to retrieve information of school ESD practices and ESD teaching practices with the students as informants (Isac et al., 2022; Sass et al., 2023; Sinakou et al., 2019).

Among observed school attributes, having been taught how to protect the environment is the OTL activity with the highest magnitude of influence to promote future efforts to care for the environment among students. This OTL, however, also shows variability across countries and between schools. Figure 10.2 shows the proportion of students in the school that have received moderate, small or no OTL how to protect the environment in comparison to students declaring they have been taught these topics to a large extent. The differences by country in both the dependent variable and the most important OTL predictor suggest that there are contextual differences that must be taken into account when carrying out comparative studies on how schools inspire engagement for protecting the environment in the future. Furthermore, this finding may also reflect how much external national factors influence awareness and influence on intentions to act pro-environmentally.

Open classroom discussion appears as an effective teaching practice to promote students' pro-environmental intentions. We interpreted this OTL factor as a pluralistic ESD practice (Boeve-de Pauw et al., 2015; Olsson et al., 2022), in line with ESD effectiveness literature (Isac et al., 2022; Sass et al., 2023). This teaching practice is highly recognized as an effective teaching practice with many positive

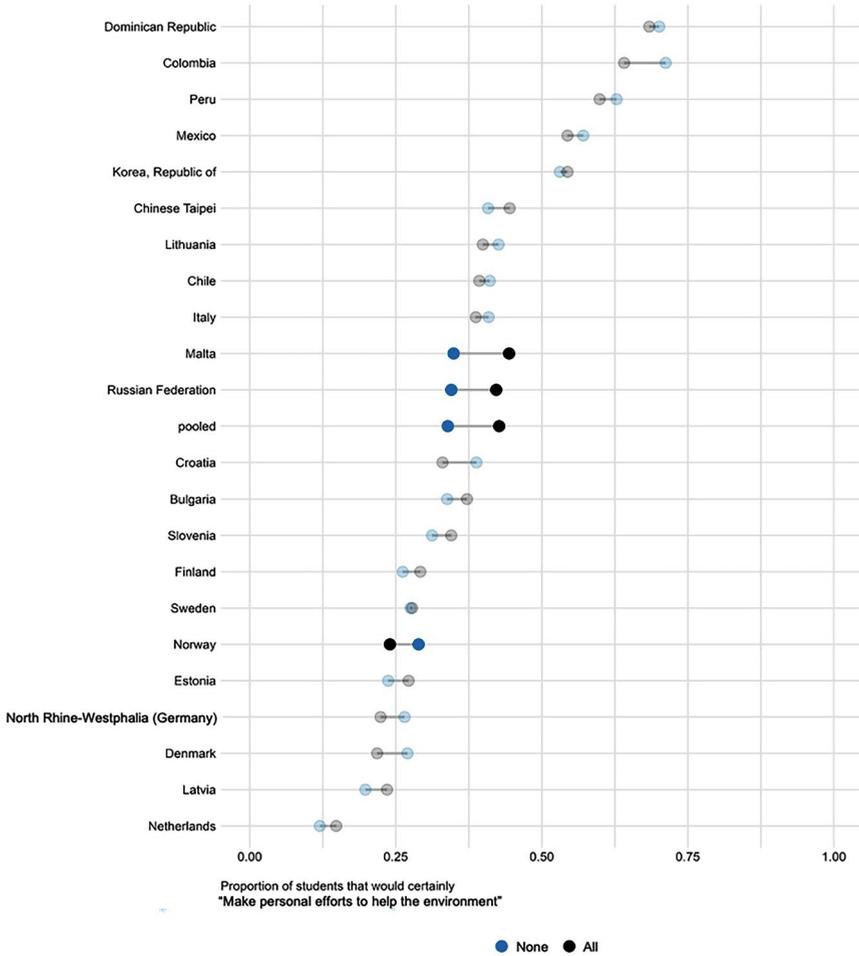


Fig. 10.4 Willingness to act pro-environmentally among students by proportion of teachers trained on the environment and environmental sustainability
 Note: In North Rhine-Westphalia (Germany), estimates not accurately estimated

returns in civic education (Knowles et al., 2018), which also presents positive returns on students' pro-environmental intentions.

As for teacher readiness or sense of preparedness, this presents a paradoxically negative effect in the fitted models. Although we naively expected a positive result for this factor, the cautious warning by Boeve-de Pauw et al. (2022) regarding using measures of teachers' self-efficacy as a proxy of teacher practices is well founded. Furthermore, this seems to be consistent across countries, as shown in Fig. 10.4.

10.4 Discussion

Protecting the environment is crucial for ensuring sustainability, as highlighted by the international efforts of the Sustainable Development Goals Agenda for 2030. Educating young people to equip them for protecting the environment in the future entails both multidimensional and international efforts. As seen in the literature review, contextual factors shaping the ways of living in countries with different economic situations may influence the way in which the population approach care for the environment and, therefore, the intergenerational socialization of perspectives on the relationship between human life and the environment.

School and teacher action-oriented practices which engage students in caring for the environment, are promising avenues to motivate students' willingness to act pro-environmentally in the future. These types of practices are well defined within an OTL framework, in which students participate in school activities that teach them how to care for the environment through practice. Therefore, being exposed to teaching regarding how to protect the environment and experiencing open classroom discussion (a pluralistic ESD practice) are robust predictors of students' engagement in future actions to protect the environment.

Research results therefore suggest that school and teacher practices are important ways of leveraging the engagement of students in future actions to protect the environment. However, the potential of such variables may be shaped by the contextual conditions of countries and schools within each country. This finding poses the question of how ESD may blend perspectives on teaching about the environment and teaching for the environment.

Future research may delve into the relationship between country differences in protecting the environment, the prevailing notions on the value that society assigns to environmental protection, as well as the "common sense" local cultural shared meanings on what is the role of humans in the environment and vice versa. This may shed light on the way that cultural and historical differences may be related to differential results when developing comparative studies on education for sustainability.

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