

**Nature vs. Nurture: Studying the Influence of Formal Environmental Education Received
from Ages 4-18 on the Interpretation of Environmental Consciousness for Domestic
Undergraduate Students of Dalhousie University's Studley Campus**

Gabrielle Barton, Freddy Chandler-Baas, Lorel MacLellan, & Quinn Vikedal

Department of Earth and Environmental Sciences, Dalhousie University

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Dr. Caroline Franklin

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Abstract

Our study's purpose was to investigate the relationship between environmental education prior to post-secondary education and current participation in sustainable behaviour and or beliefs. The issue of protecting our environment is both extremely complicated and important in ensuring a sustainable future for coming generations. Finding the most effective method to convey the importance of sustainable actions to individuals and organizations is invaluable in the fight against climate change. In order to investigate if prior education played a significant factor in domestic Dalhousie undergraduate students' participation in sustainable behaviour we circulated self-reported surveys that used Likert scale and closed and open-ended questions (Appendix A). With the help of our many Dalhousie department administrators, and the use of social media as a tool we circulated the survey and began collecting data. This data was catalogued and converted into two separate scores ranked out of 100. These scores measured sustainable behavior/values or BVScore and environmental education or EdScore/ that was quantitatively analyzed against patterns found in the data. Similarly, qualitative analysis was used to find patterns in long-answer responses and determine if they had any correlation to either score. Once analyzed the data shows significantly higher EdScores in Ontario and British Columbia compared to Nova Scotia. The data also show a decrease in the number of outdoor experiences as respondents moved into higher level grades. Limitations to this study were high, limiting the number of statistically significant trends we were able to pull from the data. Despite lacking statistical significance this study provides valuable information to be used in development of future studies.

Key Words

Behaviour; Dalhousie University; Domestic; Education; Environment; Environmental Consciousness; Student; Survey; Sustainability; Undergraduate

Introduction

Background Information

Sustainability, climate change, and further environmental topics have become increasingly prominent and relevant in everyday discourse. Environmental issues affect all global citizens yet not all global citizens have committed to believing in the effects that these issues pose on us as a population. This skepticism can arise from various domains, including political beliefs, education, geographic location, socio-economic class, outdoor experiences, and upbringing. However, scientific research has continuously supported the existence of profound consequences experienced by the surrounding environment due to anthropocentric actions – emphasizing the importance of urgently adapting our lifestyles to combat these circumstances. Respectively, it is becoming increasingly important for all to be equipped with a minimum of basic literacy in environmental and sustainable issues. While opinions on the weight that everyday actions can possess in issues such as climate change are varied, it remains indisputable that consciously employing a sustainable lifestyle invokes positive outcomes, for both individuals and the environment.

The overarching perspectives, opinions, values, and behaviors of all individuals are heavily impacted by their family, community, language, and culture. For many, a big part of their community was their school. In Canada, children start attending school around the age of five until they are approximately 18. While slight differences in educational pathways from province to province exist, generally most individuals attend school starting in grade primary (kindergarten) up until grade twelve at the end of secondary school. Interestingly, a good portion of the Canadian population lacks college or university credentials, with only 57.5 percent of the population in 2021 having wither university or college credentials (Statistics Canada, 2022). This only emphasizes the need for quality and impactful learning in primary and secondary formal education settings. Since non-post-secondary schools (primary and secondary) represent media through which a great deal of formal knowledge is passed to virtually the entire population at an age where they are receptive to it, they are a good place to begin investigating the efficacy of environmental education. Early childhood education is crucial in development as children are constantly learning even from infancy. These experiences will shape who they become as a person seriously affecting the development of critical thinking, moral code, and problem-solving

skills (Institute of Medicine (U.S.) et al., 2015). Early childhood has been found to be a crucial time for the development of environmental literacy (Ardoin and Bowers, 2020). Education later in life is equally as important but affects different areas of development as stated by Steinberg and Morris (2001) such as complex decision-making, forming individual values and beliefs, risk assessment, and emotional intelligence.

Research Design

Environmental Education has been shown to impact people's behaviour, attitudes, intentions, and perceptions surrounding environmental issues (Van De Wetering et al, 2022). Given the extreme prevalence of environmental issues both currently and prospectively, it will be critical to have a level of literacy for environmental issues within the public as well as academia. Provided that most adult Canadians don't pursue post-secondary education, our rationale lies within a desire to investigate the degree to which environmental education is promoted and addressed in primary and secondary schools. Additionally, upon being informed of the strong affiliation between knowledge acquired in childhood and expressed adulthood behaviours, we became fascinated in analyzing possible connections between environmental education received and environmentally conscious behaviours exhibited. Here, the term *environmentally conscious* can be defined as a heightened awareness of one's actions and the potential threats they could pose to the surrounding environment and therefore actively adopting a lifestyle where adverse impacts toward the environment are minimized to the furthest extent.

Dalhousie University Studley Campus has a wide variety of domestic undergraduate students, with interests in different academic disciplines and from varied backgrounds across the country. Understanding their background in environmental subjects in their prior education as well as their environmental values and behaviours can give insight into how environmental education across the country has an influence on the population. Using the research question "*To what extent does the quantity of formal environmental education during schooling prior to post-secondary impact how domestic undergraduate students at Dalhousie University approach and interpret environmental consciousness?*". In which, the term *environmental education* encompasses learning that incorporates either environmentally conscious or sustainable perspectives. We hypothesized direct proportionality between environmental education and environmental consciousness. Where, our objectives were analyzing this potential relationship

and quantifying it – if possible. Finally, the significance of our study encompasses contributing to a small area of knowledge – as few comparable studies have been conducted in Canada. In this, we hope to highlight the overall importance of environmental education, evaluate the nation's ability in its implementation and address any areas for potential improvements.

Methods

Sample and Survey

Our population for this was all domestic Dalhousie University undergrad students totalling approximately 12,320 (Dalhousie). To better represent our population, we used self-reported surveys to maximize the amount of data we could collect using limited time. These surveys collected data through questions that included long-answer, Likert-style, yes or no, and select all formats (Appendix A). Data will be collected and compared in three categories, Background, Education, Environmental Values and Behaviour. Primary education questions included background information such as the province of study as well as questions relating to the prevalence of various environmental topics in primary school. Environmental Behaviours refer to concrete actions taken by participants to that are environmentally beneficial. The behaviour section contained various behaviours that might be beneficial to the environment and asked respondents to rate their level of participation. These levels of participation in order of lowest to highest were: Never, Rarely, Sometimes, Often, and Always. Environmental Values refers to thoughts and attitudes that a participant might possess that indicate they are conscious of global environmental challenges. For this section, questions were posed as a Likert style statement in reference to an environmental issue or topic and the respondent was asked to indicate their level of agreement with the statement (Strongly Disagree, Disagree, Neutral, Agree, Strongly Disagree).

The survey was distributed utilizing non-probabilistic sampling techniques such as the snowball and quota method. Surveys and promotional material were emailed out to 29 different department administrators within Dalhousie with the ask to encourage completion of the survey by undergrads in their own department. We received 15 response emails confirming they would share the survey with students using a variety of methods. Some departments emailed the survey

to each individual student, some shared surveys with professors and asked them to speak about it in class, and some posted the material to webpages used by students. In addition to this, each of the researchers shared it directly within their respective social and academic circles. Lastly, each researcher shared the material via social media to their respective friends and followers.

The survey was open from March 13-21, 2024, and was approved by the Dalhousie University Earth and Environmental Sciences research ethics committee.

Quantitative Data Analysis

After the closure of our survey, we deleted 18 incomplete survey responses. This was due to a lack of consent, eligibility, or the respondents did not answer the necessary questions to carry out the respective analysis. Some respondents gave enough information to perform one test but not enough for another. In this case, we considered their responses only for tests in which they gave relevant information for but not for the tests where they did not.

Respondents were assigned scores to measure their level of environmental education. These scores were calculated by adding one point for every environmental topic they had learned about at each level of education. One point was also added if the respondent reported that they had received outdoor experiences as a part of their education at that level. These point totals for Primary and Secondary Education were combined and taken as a percentage of total possible points. This score is referred to as EdScore.

Respondents were also assigned a score based on their responses about their environmental behaviours and values. These scores for environmental behaviours were calculated based on the extent to which a respondent reported engaging in various environmental behaviours. The model for scoring is as follows: Never=1, Rarely=2, Sometimes=3, Often=4, Always=5. The scores for environmental values were calculated based on the level that the respondent agreed with each statement. The model for scoring is as follows: Strongly Disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly Agree=5. The scores for environmental behaviours and values were added together and taken as a percentage of total possible points. This value is referred to as BVScore.

Respondents were further categorized as having received outdoor experiences as a part of their education in primary school (OE1+) or not (OE1-). They were also categorized as having

received outdoor experiences as a part of their education in secondary school (OE2+) or not (OE2-).

The statistical tests were carried out using R for permutations and regressions and Microsoft Excel for ANOVA and t-tests. Firstly, we ran a correlation and regression analysis to determine if there was a relationship between the respondents' EdScore and their behaviour and value score BVScore. Second, we ran a permutation test to determine if there was a difference in mean BVScore between OE1+ and OE1-. We also ran a permutation test to determine if there was a difference in mean BVScore between OE2+ and OE2-. A permutation test was chosen for this because the data for BVScore did not meet the normal distribution assumption for a t-test, so a non-parametric test was required. We also did a chi-squared test to determine if there was a difference in the proportion of outdoor experiences between primary and secondary education. In addition, we ran an Analysis of Variance to determine if there was a significant difference in EdScore between different provinces ($n \geq 10$). These provinces were Ontario, Nova Scotia, and British Columbia. We then performed multiple Student t-tests to determine if there was a significant difference in mean EdScore between individual provinces.

Qualitative Data Analysis

We used five different long-answer questions to collect further data on education and its impacts on both primary and secondary school. The responses were then organized and coded using a mix of priori and posteriori methods. Due to high variability and lack of detail overarching themes were hard to extract from data giving us a limited number of codes.

The first long-answer question asked the respondent to elaborate on their experience with the outdoor experiences facilitated by formal schooling between ages 4-12. One a priori code was used "field trips" and denoted responses that mentioned field trips that took students away from their schools. Posteriori codes used consisted of "outdoor activities", "protected areas", and "service". Responses coded with outdoor activities represent responses mentioning outdoor activities that happened on school property. The code "protected areas" was used to denote responses that spoke about visiting protected areas such as provincial or national parks, conservation areas, rehabilitation centers, education centers, or wildlife parks. Lastly the code "service" was used to denote responses that included acts of service performed for the community or for organisms this included raising salmon fry, litter collection, community

gardens, or caring for animals. Codes used for this question could be used simultaneously to represent responses that included multiple themes. In addition to the codes representing multiple responses, there were other mentioned topics that could impact environmental education. The additional topics mentioned included competitions, having teachers with strong views related to sustainable practices, and outdoor classrooms. However, these topics were not included as official codes because they represented only one or two responses.

Our second long-answer question asked respondents to describe environmental education at ages 4-12 in a few words. Prior codes used for this question consisted of “lacking”, “thorough”, and “experience-based” to quantify the quantity and type of environmental education. The codes lacking and thorough were used to denote low and high levels of environmental education quality. A third code was added a posteriori titled “basic”, this code represented responses that landed somewhere in the middle of lacking and thorough. Responses lacked detail which created barriers in denoting distinct levels of satisfaction, this is the reasoning behind why we only used three levels of satisfaction in coding responses. Other a posteriori codes used consisted of “singular”, “recycling/waste”, and “encouraged” but occurred significantly less than “thorough”, “basic”, and “lacking”. Singular was used to denote responses where environmental education was only looked at from one perspective or from one subject view instead of holistically. “Recycling/waste” was added due to the large number of responses that specifically mention learning about recycling or littering. Finally, we used the code “encouraged” to code responses where students felt they were encouraged to further their environmental education outside the classroom.

The third long-answer question is the same as the first asking to describe outdoor experiences, but for the age range of 13-18 this time. Codes used were similar to those used in the 4-12 age range with a priori codes “field trips”, “outdoor activities”, and “service” as well as additional a posteriori codes of “not required” and “integrated”. The code “protected areas” was removed from the 13-18 range because it did not represent a sufficient number of responses. The code “integrated” was used to denote responses where environmental education was integrated into multiple subjects and “not required” was used for classes that were not required to graduate. Outdoor experiences were described as “not required” specifically seven times but assumptions can be made about the majority of outdoor experiences being optional as they are not included in

any core curriculums. Similarly to the 4-12 age range version of this question, high variability and lack of detail created barriers in extracting broad themes that represented multiple responses. There were many singular mentions of topics such as specific programs, outdoor sample collection, and camping in various forms.

Our fourth long-answer question was the equivalent of question two asking students to describe the quantity of environmental education received, but for the age group of 13-18 this time. This question used the same scale for measuring quantity (lacking, basic, and thorough) and a similar system of description codes replacing “recycling/waste” with “not required”. This change was implemented to better reflect the difference in responses between the two age groups. In addition to this change, one other a posteriori code was used to denote responses that felt environmental education was integrated into several subjects under the title “integrated”. Following suit of the above questions there were many singular mentions of activities that could be important in determining the relationship between education and behaviour later in life, but because they only represented singular responses they were not included as official codes.

For our fifth and final long-answer question, we asked respondents to further explain their response of yes to the question “Has any form of education you received changed your stance on environmental issues?”. This question was coded entirely posteriori and consisted of six different codes. “Awareness” denoted responses where awareness of issues was a turning point or impactful enough to shift the respondent's mindset about sustainable issues. “Solidified” was used for responses that fell within the theme of education not exactly “changing” their stance but most certainly solidifying respondents' views in some way. “Difference” represented responses where individuals felt the education they received convinced them to make a difference in their own lives and encourage others to do so as well. The code “specific practices” was used for responses that mentioned specific unsustainable practices such as clear-cutting, or waste dumping in oceans being a pivotal point in changing their opinions. In addition to these codes “primary” was also used for responses that specifically mentioned education prior to university having a large impact on the development of personal beliefs and values. Similarly, to all other questions, responses were widely varied and had many themes not included as codes, due to them representing a small percentage of responses. The excluded themes are important to acknowledge and record to aid development of future studies. Examples from these responses

included politicized discourse, having mentors, family background, and use of concrete examples.

Results

We collected 118 responses. Only 91 of them contained viable responses to generate both a BVScore and EdScore. 96 contained viable information to generate both an EdScore and information about the presence of outdoor experiences in the respondent's previous education. The data for BVScores was heavily left-skewed (Figure 1).

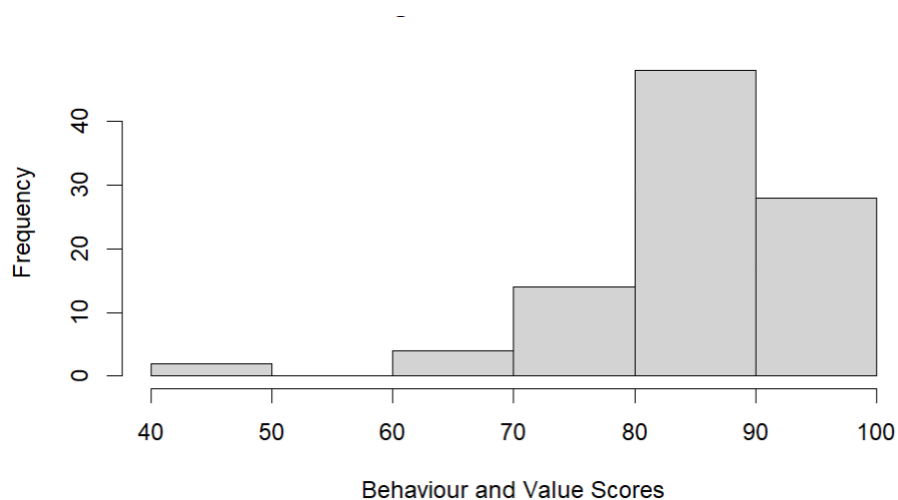


Figure 1: Distribution of BVScores. Data was collected from survey results. BVScore represents the extent to which the respondent practices environmentally friendly behaviours and holds environmentally friendly values.

There was not any significant evidence for a relationship between EdScore and BVScore (Figure 2). The correlation coefficient of the model was $R^2 = 0.2976$ ($n = 91$) indicating no significant relationship. This dataset also failed to meet the normality and homoscedasticity assumptions for a linear regression. This indicates that there is no significant relationship between EdScore and BVScore.

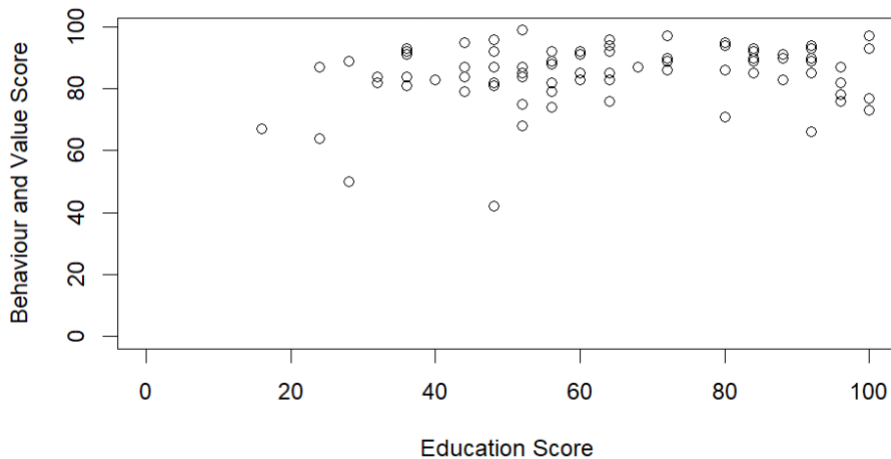


Figure 2: Scatterplot of EdScore vs. BVScore of respondents (n=91). Data collected from our survey. EdScore reflects the extent to which the respondent received formal environmental education. BVScore represents the extent to which the respondent practices environmentally friendly behaviours and holds environmentally friendly values. EdScore is plotted on the x-axis and BVScore is plotted on the y-axis.

The presence or lack of outdoor experiences within formal education did not have any apparent effect on EdScore. A permutation test to determine a difference in mean EdScore between OE1+ and OE1- (Figure 3) found that there was no significant difference in means ($p=0.91$, $n=96$). In addition, a permutation test to determine a difference in mean EdScore between OE2+ and OE2- (Figure 4) found that there was no significant difference in means ($p=0.38$, $n=96$). We did, however, find that there was a significant decrease in the proportion of outdoor experiences in formal education from primary to secondary school at $\alpha=0.01$ ($X^2_1=16.568$, $p<0.01$).

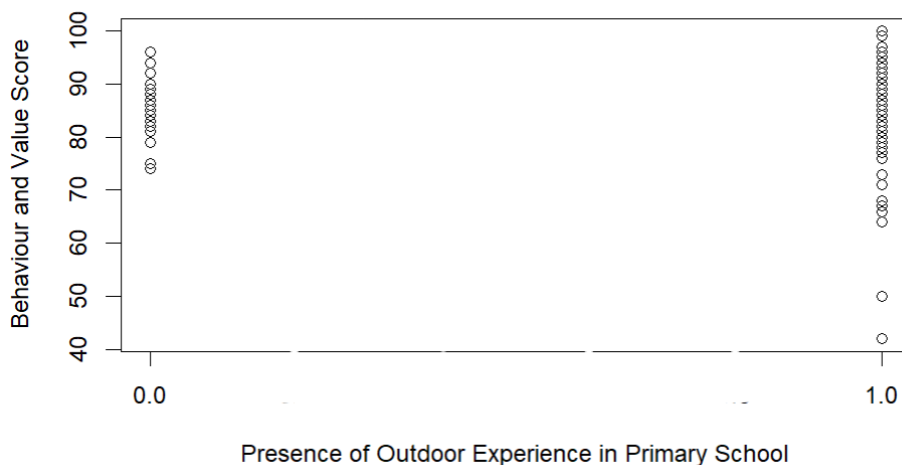


Figure 3: BVScore vs. Presence of Outdoor Experiences in Primary School (n=96). Data collected from survey results. BVScore is plotted on the y-axis. Presence of Outdoor Experience is plotted on the x-axis. BVScore represents the extent to which the respondent practices environmentally friendly behaviours and holds environmentally friendly values. A score of zero on the x-axis represents that the respondent reported no presence of outdoor experiences in primary school. A score of one represents that the respondent reported a presence of outdoor experiences in primary school.

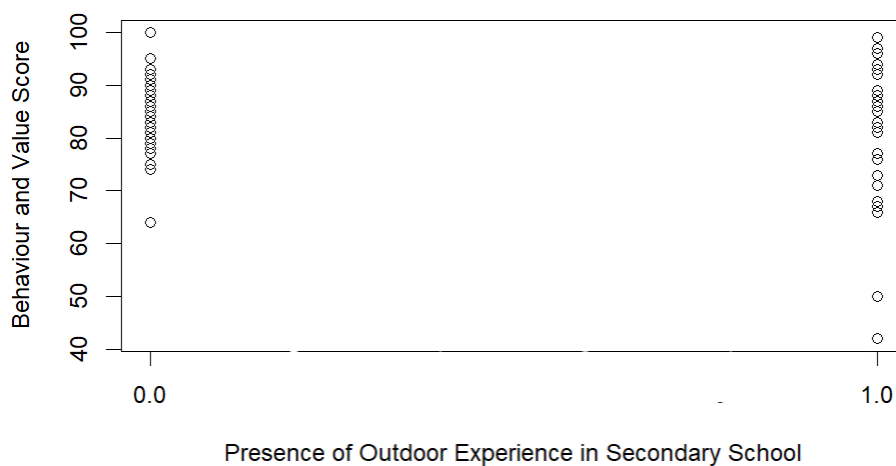


Figure 4: BVScore vs. Presence of Outdoor Experiences in Secondary School (n=96). Data collected from survey results. BVScore is plotted on the y-axis. Presence of Outdoor Experience is plotted on the x-axis. BVScore represents the extent to which the respondent practices environmentally friendly behaviours and holds environmentally

friendly values. A score of zero on the x-axis represents that the respondent reported no presence of outdoor experiences in secondary school. A score of one represents that the respondent reported a presence of outdoor experiences in secondary school.

Only three provinces had ten or more respondents who received a significant portion of their education within them. These provinces were Nova Scotia (Mean EdScore=62.3, SD=19.2, n=36), Ontario (Mean EdScore=70.5, SD=19.5, n=32), and British Columbia (Mean EdScore=77.6, SD=20.15, n=10) (Figure 5). Ontario ($t_{66}=1.736$, $p=0.09$) had a significantly higher EdScore than Nova Scotia at $\alpha=0.1$. British Columbia ($t_{44}=2.197$, $p=0.03$) had a significantly higher mean EdScore than Nova Scotia at $\alpha=0.05$. There was no significant statistical difference between the mean EdScores of British Columbia and Ontario.

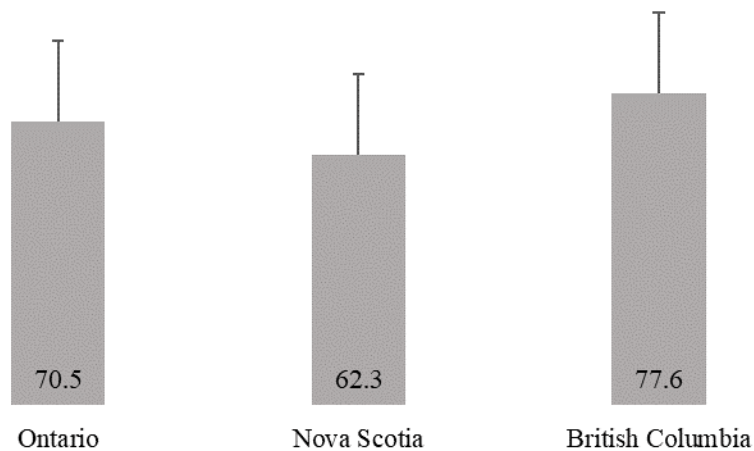


Figure 5: Mean (+SD) EdScore of respondents from Ontario (n=32), Nova Scotia (n=36), and British Columbia (n=10). Data collected from survey results. EdScore reflects the extent to which the respondent received formal environmental education.

The results of our first long-answer question included 60 responses from the 63 respondents who responded with yes to the question “Did you have outdoor experiences facilitated by formal schooling between ages 4-12?”. Of these 60 responses 48 coded field trips,

45 coded for outdoor activities on school grounds, 23 coded for protected areas, and six coded acts of service. Thirteen responses received three of four codes “field trips”, “outdoor activities”, and “protected areas” with one response (ID # 90) who received all three codes previously stated and in addition the fourth code for acts of service within their community. Almost all responses that were coded for “outdoor activities” also coded “field trips” making 42 out of 45 responses.

Our second long-answer question received 74 responses with a relatively even distribution in level of quality of education with 27 “lacking”, 26 “basic”, and 21 “thorough”. Codes used after these initial three could be added together to represent multiple themes but did not show any pattern or connection to a specific level of education quality. The only exception to this statement were the four responses that received the code “encouraged” also all received the code “thorough” in describing education quality. However, this relationship was not further investigated due to the low number of responses and varying degrees of detail provided in responses. The code ‘experience based’ comprised of eight responses, “recycling/waste” made up 14 responses, and “singular” described seven responses.

For our third long-answer question, we received 40 responses out of the 43 respondents who responded with yes to “Did you have any outdoor experiences facilitated by formal education between ages 13-18?”. For this question “outdoor activities” was most prominent with 33 codes, followed by “field trips” with 23 codes, then “not required” was used for seven responses, “integrated” for five responses, and “acts of service for three responses. The three responses coded under “acts of service’ also fell into the “outdoor activities” and ‘field trip’ categories as well.

The responses to our fourth long-answer question included 76 descriptions of quality of education in the 13-18 age range. These responses presented similar patterns as seen in the 4-12 age range with even distribution across levels of quality of education, 29 responses coded as “lacking”, 25 “basic”, and 22 “thorough”. Codes following these classifications could be used for multiple responses to represent multiple themes present if needed. Of these codes “not required” was most used representing 20 responses followed by “singular” which represented eleven responses and “integrated” representing ten responses. As seen in the 4-12 age range, the level of quality of education showed no relationship with other codes.

Results for our fifth long-answer question included 51 responses out of the 59 individuals who responded yes to the question “Has any form of education you received changed your stance on the environmental issues?”. The codes used with this question could be used simultaneously to represent multiple themes within a single response. Of the 59 descriptive responses received the code “awareness” was used for 40 of them, “solidified” with 18, “difference” with twelve, “specific practices” with eleven, “primary” with seven, and “interconnectedness” with six. Responses that received multiple codes were few with only ten responses sharing “awareness” and “difference”, and nine responses sharing “awareness” and “solidified”.

Discussion

The results obtained from the survey question were heavily skewed. This was likely influenced by the low numbers of respondents, of which most were environmental science, biology, and marine biology students. There were also far more respondents from Nova Scotia, British Columbia, and Ontario. A larger and more varied pool of respondents, at least from more provinces, would have likely shown more variations in education scores.

While many of the quantitative results were statistically insignificant, they still provide a basis for future studies to explore more thoroughly. Of our provinces with over ten respondents, Nova Scotia did have a significantly lower environmental score than both British Columbia and Ontario (Figure 5). Based on this we can assume there may be a difference in the emphasis or quantity of environmental education between the province's curriculums. In looking at the province of Nova Scotia's curriculum there were environmental topics peppered throughout but rarely dedicated units or classes (Department of Education and Early Childhood Development, 2024). This is of course based on the current curriculum found on the Nova Scotia Provincial Government website but may not be the education respondents received as many could have gone through elementary and high school many years ago. The Nova Scotia curriculum was last updated on September 12, 2023 (Department of Education and Early Childhood Development, 2024). It is worth investigating what the differences in environmental education are between provinces and how that impacts students. Expanding that to include the other provinces would be beneficial since there would be differences in their environmental education and curriculum as well. Our study was limited by the number of respondents from other provinces, but we presume

more responses from all provinces would also show differences in educational scores and likely curriculums too. When considering the curriculums it is also important to note prioritization. Presumably, when teachers are pressed for time prioritization is done to ensure essential information is covered by the end of term. Depending on the structure of curriculums and many other factors environmental topics may be dropped in favor of other subjects. Presumably, this would happen with small environmental units rather than full classes or in curriculums where environmental topics are key concepts. Differences such as these would be beneficial to study in terms of differences between provincial environmental education in curriculums.

We were able to pull two interesting findings from the coded written results from the survey. The results showed a decrease in both the number of outdoor experiences and satisfaction with their environmental education as respondents got older. Based on these findings we can infer there may have been a change in the way environmental topics were taught and received. Written responses indicated fewer field trips as respondents get older, and inversely indicating more time spent learning in the traditional classroom setting. Increasingly in literature, there is an idea that effective environmental education must involve fostering connection to and care for the earth and its environments, which in turn will build agency for the environment (Nazir & Pedretti, 2016). Providing people with authentic, multidimensional, and deeply engaging outdoor experiences often raises environmental consciousness and brings about learner transformation (Nazir & Pedretti, 2016). For those specialized pedagogies, or teaching methods, would need to be created (Nazir & Pedretti, 2016). Experiential learning has also been found to promote environmental literacy, stewardship, and emotional development in students (Shutaleva, 2023). For environmental education experiential learning can look like field trips, outdoor experiences, service-learning projects, and many others (Shutaleva, 2023). Considering this it is intriguing to see the connection between the lack of outdoor experiences and field trips and the lack of satisfaction in respondents' environmental education. While these experiences may not look the same across all age groups, there could be benefits to increasing experiential learning at all age groups but particularly the 13-18 age range. Whether or not these different teaching methods or pedagogies impact the effectiveness of environmental education would be a good topic for future research studies.

Based on the lower education scores in Nova Scotia as well as lowered outdoor experiences and satisfaction, show a need for improvements to the environmental education frameworks implemented by provinces currently. The integration of more Indigenous knowledge, although not addressed in this study, is likely to be important for improving the way environmental education is taught in schools. Future studies could likely inform a new environmental education framework.

Limitations

One key limitation with this study is the measurement of behaviour and values. All measurements of environmental behaviour and values were based on respondents self-reporting. Respondents may have tended to view their values and actions as more environmentally friendly than they may be in reality, leading to the extreme bias towards high BVScores. Behaviour is notoriously difficult to measure (Nesselroade & Molenaar, 2016), so it is very possible that this study did not accurately measure it. Another limitation is that this sample may not be reflective of the environmental behaviours and values of the population at large. Most of the respondents were from the provinces of Nova Scotia, British Columbia, and Ontario, which does not give an accurate view across all provinces and territories. Additionally, the intended sample population was all domestic undergraduate students at Dalhousie, only 100 valid survey responses were collected. Furthermore, over a third of the respondents reported Environmental Science as their main subject of study. Another 25% reported Biology or Marine Biology as their primary subject of study. These are all fields of study that might appeal to those with a predisposition to environmentalism. The high number of respondents in Environmental Science and similar fields could have led to a higher number of respondents with a strong set of environmental behaviours and values which would have led to the dramatic skew in BVScores. In addition to skewing BV values education values were self-reported based on memory and may not reflect the true nature due to being up to 15 years in the past. Future studies would do well to address these limitations.

Conclusion

Environmental education is and will remain an important tool for increasing environmental literacy and combating climate change in the years to come. The low scores associated with Nova Scotian students indicated that there is significant room for improvement within our local education curriculum. This is likely true for all the provinces as indicated by decreasing satisfaction with the environmental education as students age. Further, identifying differences across provincial curriculums and identifying effective teaching methods could help in developing a thoughtful, holistic, and impactful environmental education framework.

While most of our results were statistically insignificant the information obtained is still valuable in adding to the growing pool of knowledge about environmental education in Canada. Future studies can build off this study and consider the mentioned limitations, determining areas to further investigate.

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Appendix A Survey Questions

You are invited to take part in a research study being conducted by, Freddy Chandler-Baas, Gabrielle Barton, Quinn Vikedal and Lorel MacLellan, undergraduate students in Environmental Science at Dalhousie University. The purpose of this research is to study how previous sustainability education of Dalhousie University Undergraduate impacts their current environmental values and behaviours. The study is a part of the ENVS3502 course.

If you choose to participate in this research, you will be asked to answer questions about your general background, environmental education at different ages, environmental behaviours and environmental values. This survey should take approximately 10 minutes.

Your participation in this research is entirely your choice. You do not have to answer questions that you do not want to answer (by selecting prefer not to answer), and you are welcome to stop the survey at any time if you no longer want to participate. All you need to do is close your browser. We will not include any incomplete surveys in our analyses. If the survey is completed and you later wish to retract consent, we will not be able to remove the information provided as all responses will be anonymous.

Survey results will be anonymous, meaning no identifying information such as name or email address will be required. All responses will be saved on a secure Dalhousie server. Only Freddy Chandler-Baas, Lorel MacLellan, Quinn Vikedal, and Gabrielle Barton will have access to the survey results.

We will describe and share general findings of this research in an in-class presentation as well as publish a report of our findings on the Dalhousie University website. We will destroy all survey responses by April 15th, 2024.

The risks associated with this study are no greater than those you encounter in your everyday life.

There will be no direct benefit to you in participating in this research. The research, however, might contribute to new knowledge on how the integration of environmental studies into school curricula can shape environmental values and give a better understanding of relevant environmental issue. If you would like to see how your information is used, please feel free to visit <https://www.dal.ca/faculty/science/earth-environmental-sciences/research/publications-and-theses/past-envs-3502-projects.html> after April 15th, 2024.

You should discuss any questions you have about this study with Freddy Chandler-Baas, Gabrielle Barton, Quinn Vikedal, and/or Lorel MacLellan. Please ask as many questions as you like before or after participating. Our contact information is:

Freddy Chandler-Baas: Freddy.Chandler-Baas@dal.ca

Gabrielle Barton: gb672943@dal.ca

Quinn Vikedal: vk50781@dal.ca

Lorel MacLellan: lr333278@dal.ca

If you have any ethical concerns about your participation in this research, you may contact Dr. Caroline Franklin by email at Caroline.Franklin@dal.ca

1. I consent to complete this survey
2. I do not consent

General questions

3. Are you an Undergraduate student at Dalhousie University?
4. Are you a domestic or international student?
5. What is your current year of study?
6. What is your program of study

Primary schooling

You will now be asked a few questions about your education relating to environmental studies. All of the question pertain to your in school education from ages 4-12.

1. Did you receive the majority of your education from ages 4-12 in Canada?
 - a. Yes
 - b. No

2. What province or territory did you spend the most time living between ages 4 -12?
 - a. Alberta
 - b. British Columbia
 - c. Manitoba
 - d. New Brunswick
 - e. Newfoundland and Labrador
 - f. Nova Scotia
 - g. Ontario
 - h. Prince Edward Island
 - i. Quebec
 - j. Saskatchewan
 - k. Northwest Territories
 - l. Nunavut
 - m. Yukon

3. What type of formal schooling did you attend for the majority of time between ages 4-12?
 - a. Public
 - b. Private
 - c. Catholic/other religion
 - d. other

4. Which of these environmental/ sustainability topics do you recall learning about between the ages of 4-12 (check all that apply).
 - a. Plant and Animal Growth
 - b. Biodiversity
 - c. Recycling

- d. Pollution
 - e. Littering
 - f. Types of Habitat
 - g. Habitat Loss
 - h. Weather/Climate
 - i. Climate Change
 - j. Other
5. How would you describe the place(s) you lived for the majority of ages 4-12?
- a. Urban
 - b. Rural
 - c. Suburban
 - d. Other
6. Did you have any outdoor experiences facilitated by formal schooling between ages 4-12?
- a. Yes
 - b. No
7. Please explain.
8. In a few words describe your environmental education at these ages

Secondary education

You will now be asked a few questions about your education relating to environmental studies. All of the question pertain to your in school education from ages 13-18.

9. Did you receive the majority of your education from ages 13-18 in Canada?
- a. Yes
 - b. No
10. What province or territory did you spend the most time living in between ages 13-18?
- a. Alberta
 - b. British Columbia
 - c. Manitoba

- d. New Brunswick
 - e. Newfoundland and Labrador
 - f. Nova Scotia
 - g. Ontario
 - h. Prince Edward Island
 - i. Quebec
 - j. Saskatchewan
 - k. Northwest Territories
 - l. Nunavut
 - m. Yukon
11. What type of formal schooling did you attend for the majority of time between ages 13-18?
- a. Public
 - b. Private
 - c. Catholic/other religion
 - d. Home schooling
 - e. other
12. Which of these environmental/sustainability topics do you recall learning about between 13-18 (check all that apply).
- a. Climate Change
 - b. Biodiversity
 - c. Pollution
 - d. Acid Rain
 - e. Deforestation
 - f. Ocean Acidification
 - g. Plant and Animal Growth
 - h. Types of Habitat
 - i. Habitat Loss
 - j. Weather/Climate
 - k. Greenhouse Gas Emissions
 - l. Nuclear Energy/Waste
 - m. Nutrient Cycles (i.e. Carbon Cycle, Nitrogen Cycle, Phosphorus Cycle etc.)
 - n. Waste Disposal (i.e. Recycling, Landfills, Littering etc..)
 - o. Other

13. How would you best describe the primary location where you lived for the majority of time between ages 13-18?
- Suburban
 - Rural
 - Urban
 - other
14. Did you have any outdoor experiences facilitated by formal schooling between ages 13-18?
- Yes
 - no
15. Please explain.
16. In a few words describe your environmental education at these ages.

Overall education

17. Has any form of education you received changed your stance on environmental issues?
- Yes
 - no
18. Please explain.
19. Have you taken any post-secondary courses that incorporated environmental issues or sustainability into its curriculum?
- Yes
 - No
 - unsure
20. How many of these courses have you taken?
- 1
 - 2
 - 3

d. 4+

21. Describe how these courses have related to your degree:

- a. Elective
- b. Required course
- c. Both
- d. other

22. Describe your level of agreement with this statement (Strongly Disagree – Disagree – Neutral – Agree – Strongly Agree):

- a. Something I learned in these courses changed my behaviours that impact the environment.

Behavior

23. This section will indicate your level of participation related to environmentally impactful behaviours in your current life. (Never – Rarely – Sometimes – Often - Always)

- a. I sort my recyclables properly.
- b. I properly dispose of food waste in the compost.
- c. I prefer to buy second hand goods over new.
- d. I avoid using single use plastics when given the option.
- e. I walk, cycle, or take public transit over driving if possible.
- f. I properly recycle old electronics at electronic waste disposal sites.
- g. I donate, resell, or repurpose items before throwing them away.
- h. I minimize purchases of non-essential goods.

Values

24. This section will indicate your level of agreement with the following values related to sustainability in your current life. (Strongly Disagree – Disagree – Neutral – Agree – Strongly Agree)

- a. Human-caused climate change is a major threat to the world
- b. Preserving nature and wild spaces is important.
- c. Humans should focus on limiting their impact on the environment as much as possible regardless of short-term economic effects.
- d. Nature has an inherent right to exist free from human-caused degradation.

- e. Humans are currently consuming natural resources (such as fossil fuels, metals, timber, etc.) at a rate that is unsustainable (cannot continue forever)
- f. Humans have irreparably negatively changed the planet and its processes.
- g. Access to Nature is something that I value as a part of my life.
- h. It is our generation's responsibility to ensure a healthy environment for future generations.
- i. Reducing inequalities within and amongst countries is crucial
- j. I believe that exposure to environmental education is necessary regardless of desired career path.
- k. Promoting health and wellness for all beings is essential.