

Establishing a Relationship Between Demographic Factors and Students' Environmental Awareness

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ABSTRACT

A lack of environmental education has been shown to lead to lower levels of environmental awareness and consequently fewer climate change prevention measures (Toksoz et al., 2011). Researchers who study this issue focus on identifying the populations most vulnerable to a lack of environmental awareness based on demographic factors like household income and education level (Ajuang et al., 2016; Philippsen et al., 2017; Sun et al., 2020). This research is essential in guiding future climate-related education efforts, but there is limited data on the topic. In order to fill in this research gap, this project focuses on the relationship between demographic factors and the environmental awareness of high school students in the Washington, D.C., metropolitan area. One hundred twenty-five high school students were surveyed, and data were collected relating to students' annual household income, parental/guardian education, age, gender, race, household recycling and gardening practices, and environmental awareness. It was found that, in general, students with higher household income levels, parental/guardian education levels, or age had higher levels of environmental awareness. However, students with the lowest parental education levels also showed increased environmental awareness compared to other lower levels. Male students tended to be slightly more environmentally aware than female students, and students whose families recycled or gardened regularly had higher levels of environmental awareness than those who did not. This information can help to guide future environmental education campaigns to improve environmental awareness levels and environmental relationships, which is needed to effectively address the risks posed by climate change.

Introduction

In recent decades, climate change has been increasingly recognized as one of the most significant threats to the future of humanity (Chan, 2018; Solomon et al., 2009). The evidence supporting the existence of climate change is undeniable, as is the data that shows the harmful effects it is currently having on the planet, according to the Intergovernmental Panel on Climate Change (IPCC 2013). The past years have seen record numbers and increased intensity of natural disasters and extreme weather events like floods, forest fires, hurricanes, and heatwaves. According to the National Atmospheric and Space Administration (NASA), this pattern is expected to continue and increase in intensity as time goes on. Climate change will also bring other problems, like a rising global temperature, accompanied by a rise in sea level and mass animal and crop extinction. It has and will continue to have a direct impact on human health. There has been an increase in climate and air quality-related diseases in recent years (WHO 2018), with a disproportionate number of victims coming from lower socioeconomic classes and minority populations (Clark et al. 2017).

Many scientists and researchers are in concurrence that humans have only years left to address their effects on the climate and environment before said effects become irreversible and before the dangerous potential future of an environmentally ravaged world becomes imminent. While there is some dispute about the exact amount of time, estimations generally range around nine years (Garces, 2019; McGill, 2020). In response to this data, there has been an increase in climate and environmental research in recent years (Haunschild et al. 2016), especially research focused

on determining the direct impact of humans on the environment and what can be done to reduce or mitigate it. However, there is still a significant lack of information and data on this topic, which many scientists have identified as a roadblock to a strong climate change response (Korell et al., 2019).

Many new studies have addressed the gap in information about specific human impacts on the climate based on different population groups. Scientists have begun to realize that by identifying the different populations most vulnerable to climate misinformation and disinformation, they can more effectively target educational campaigns, which have been proven to impact an individual's environmental awareness (Jackson and Pang, 2017; Quince, 2006; Toksoz et al., 2011; Wang et al., 2004). In these studies, populations are often separated by defining demographic characteristics like household income or education level. New research has also begun to investigate the relationship between factors like age, gender, race, and an individual's environmental awareness level (Ajuang et al., 2016; Philippsen et al., 2017; Sun et al., 2020).

The most apparent gaps in this research come from a lack of geographic diversity of collected data. Existing research has been conducted on confined populations in countries like Brazil, Kenya, and China. Since this research is relatively new, there is very little data available on the topic. Throughout the background research for this project, no data on this subject was recorded anywhere in the United States. This project, therefore, attempts to address the lack of data based on location by investigating the question: "how do demographic factors affect the environmental awareness of high school students in the Washington, D.C. metropolitan area?"

Literature Review

Many researchers have conducted projects focused on establishing the best way to bridge informational gaps in the general public in order to address a lack of climate and environmental research and information. Some have determined that educational campaigns offer excellent potential to improve the public's awareness of climate change (Quince, 2006; Toksoz et al., 2011; Wang et al., 2004). Toksoz et al. (2011) attempted to establish a relationship between the national environmental policies of a country and the country's effectiveness at combating climate change and global warming. They did this by analyzing known data pertaining to different nations' environmental regulations and educational campaigns and their effectiveness in climate change prevention measures. They found that these campaigns and regulations positively impacted the effectiveness of such measures and concluded that education on climate change is one of the best ways to combat it internationally.

Quince (2006) attempted to evaluate whether direct climate-related education would help inform students' future climate-related actions. He concluded that environmental education could have a real effect on the environmental awareness and practices of students. Wang et al. (2004) investigated the relationship between education and environmental awareness in primary and secondary school students in Kunming, China. They did so by surveying students to determine their levels of environmental awareness before and after they partook in environmental and climate-related lessons. The researchers found that these lessons had a positive impact on the students' environmental awareness. While all this research shows the necessity and effectiveness of education in combating climate change, it is crucial to determine where limited educational resources need to be focused. In order to do this, many researchers have conducted projects aimed at establishing the specific populations most vulnerable to climate misinformation and disinformation, based explicitly on demographic factors (Philippsen et al., 2017; Ajuang et al., 2020; Sun et al., 2020).

Sun et al. (2020) attempted to determine the relationship between an individual's demographic factors and environmental awareness level. Their data was gathered from individuals chosen randomly from the 2013 China General Social Survey. They then compared income and education level to environmental awareness and found that both increasing income and education levels have a positive correlation with environmental awareness. This conclusion shows that limited environmental education resources should be focused on those with lower education and income levels, where it is most needed.

Philippsen et al. (2017) gathered data through interviews of 560 residents of Moringa and Sarandi, two towns in southern Brazil. They asked respondents about their environmentally friendly practices and compared the responses to the respondents' known demographic data by assigning their environmental responses numerical scores based on their levels of environmental awareness. This research also concluded that income and education level are directly related to environmental awareness.

Ajuang et al. (2020) also focused on establishing a relationship between demographic factors and environmental and climate awareness levels through a survey of 384 household heads in Upper Nyakach Division, Kisumu County, Kenya. They determined that income, education, and the gender of the household head did play a role in an individual household's level of climate awareness.

This research demonstrates that environmentally-focused campaigns can help improve a population's environmental awareness and provide information on what populations would most benefit from it. Determining which specific populations are most environmentally aware and which are more vulnerable to climate misinformation and disinformation can play a big role in helping to guide future climate-related educational actions. However, there exists a significant data gap; this specific kind of research has only been conducted in a few countries, like Kenya, China, and Brazil, as highlighted in this review. Based on a literature review, no research was found to have been conducted on this topic in the United States. This research attempts to address that gap. It focuses specifically on high school students in the Washington, D.C. metropolitan area, a location yet to be sampled for this kind of data.

Because this research addressed multiple demographic factors, the hypothesis was multifaceted. The primary hypothesis was that income and parental/guardian education level would be correlated with environmental awareness, as supported by previous research. A secondary hypothesis was that age would not significantly determine an individual's environmental awareness because all respondents were high school students with little age variability. It was also hypothesized that female students would be more environmentally aware because previous research indicates that female individuals generally tend to be more so (Ajuang et al., 2020). It was further hypothesized that race would not play a significant role in environmental awareness level because differences in income and socioeconomic status, which have been shown to have significant impacts, would most likely be more influential than race (Philippsen et al., 2017; Sun et al., 2020). The final hypothesis was that students whose families recycled and gardened regularly would have higher levels of environmental awareness because taking part in environmentally-friendly practices such as these depends on some existing level of awareness.

Methodology

A survey was employed as the research method for this project because it was successful in several similar studies analyzed in the literature review (Ajuang et al., 2016; Sun et al., 2020). In-person interviews, like those used by Philippsen et al., were not practical because of safety concerns related to the COVID-19. Implementing interviews as the research method might have allowed for a more comprehensive understanding of the respondents' environmental practices and awareness through more complicated survey questions and detailed answers. However, implementing a survey allowed for a higher volume of responses.

The survey was created using Google Forms. The survey consisted of ten questions (see Appendix B) and an informed consent form (see Appendix A), which allowed the author to include an individual's responses in the final data analysis. Out of the ten questions, five were used to establish the demographic identities of the respondent. These questions asked the respondent to select what demographic categories they fit into based on average annual household income level, education level of their parent/s or guardian/s, age, gender, and race. The remaining five questions established the respondents' environmentally-friendly practices and levels of environmental awareness. These questions were each formatted as a statement that the respondent had to rank based on favorability as either "strongly disagree," "disagree," "agree," or "strongly agree." Of these five questions, two related to familial environmental practices: gardening and recycling. The statements proposed by these questions were "my household recycles regularly," and "my household keeps a garden." The remaining three questions related to an individual's environmental awareness.

The statements proposed by these questions were: "I know a lot about climate change," "I stay up to date on environmental news/information," and "I make a conscious effort to reduce my environmental impact."

Because this research focused on the specific relationship between different demographic factors and environmental awareness, it was possible to have a completely randomized pool of respondents (Sun et al., 2020). The survey was distributed, by hyperlink, directly to students and to teachers to give to their respective students. The survey ultimately received 125 responses.

The responses were analyzed by keeping the demographic and familial environmental practice responses as qualitative data and turning the individual climate data into quantitative data by assigning a corresponding number value to each response. "Strongly disagree" was assigned a value of one, "disagree" was assigned a value of two, "agree" was assigned a value of three, and "strongly agree" was assigned a value of four. These scores were added up for each student, resulting in students' environmental awareness scores. This score ranged from three to twelve, with twelve being highly environmentally aware and three being less environmentally aware. The qualitative and quantitative data were then compared and analyzed. The data relevance was established, when appropriate, by using a Pearson Correlation Coefficient Test (r-test) to determine an R-value. An R-value could range from -1.0 to 1.0, but the closer it was to one of these extremes, the stronger the correlation between the tested variables. Therefore, an R-value greater than 0.5 or less than -0.5 demonstrates a correlation.

Results

The survey received a total of 125 responses, 4 of which were unable to be used because the respondents chose not to include their data in the final analysis via the informed consent form. The data relating to specific demographic factors and familial practices will be addressed in separate sections.

Demographic Data:

The annual household income level of respondents ranged from "less than \$30,000" to "\$501,000 or above," with an average income level of "\$101,000 to \$200,000." The data showed that students whose household income level fell between \$201,000 and \$500,000 had the highest levels of environmental awareness, and those whose household income level fell between \$51,000 and \$71,000 had the lowest levels of environmental awareness. It also showed a direct correlation between household income level and a student's environmental awareness, demonstrated by an R-value of 0.826 on the Pearson Correlation Coefficient test.

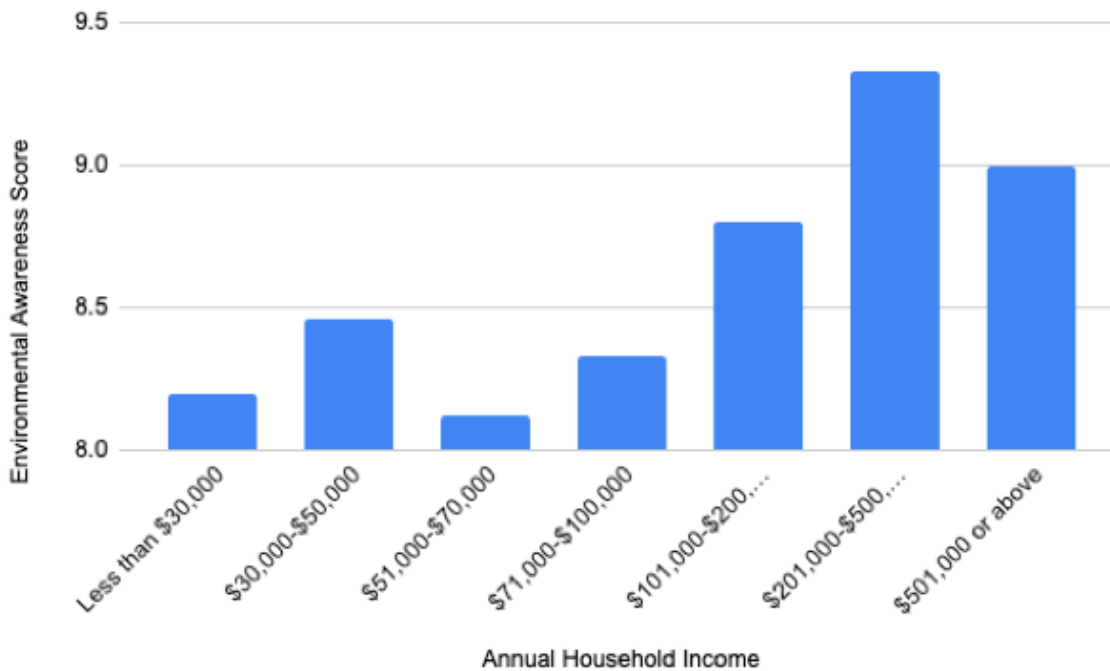


Figure 1. Relationship between annual household income and environmental awareness.

The education level of respondents' parent/s or guardian/s ranged from "no formal education" to "Doctorate's degree," with an average education level of "bachelor's degree." The data showed that students whose parent/s or guardian/s had obtained a Doctorate had the highest levels of environmental awareness, and those whose parent/s or guardian/s had obtained some high school education had the lowest. It also showed a direct correlation between parent/guardian education level and a student's environmental awareness, demonstrated by an R-value of 0.562. However, it is important to note that students whose parents had no formal education had relatively high levels of environmental awareness. There was no existing research found to explain this data point, so speculation would be inappropriate. More research would be beneficial to the understanding of its origin/cause.

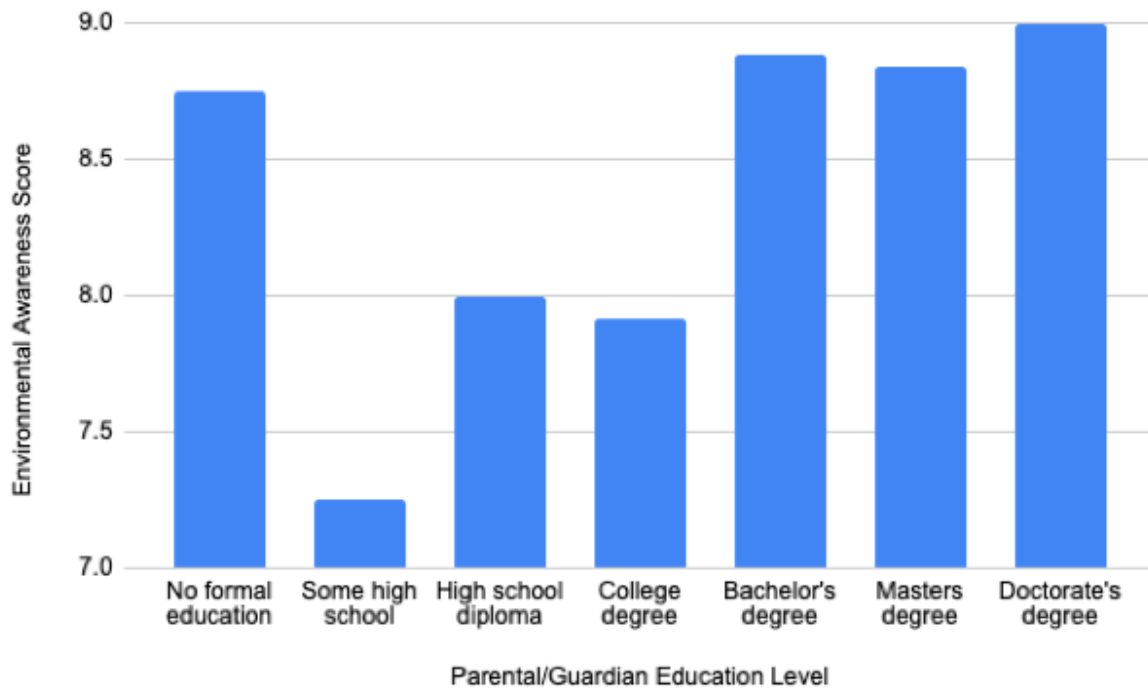


Figure 2. Relationship between parental/guardian education and environmental awareness

The age of the respondents ranged from "14 or under" to "18 or older," with an average age of 16. The data showed that students aged 18 and older had the highest levels of environmental awareness, and those aged 14 or younger had the lowest. It also showed a direct correlation between a student's age and environmental awareness, demonstrated by an R-value of 0.875.

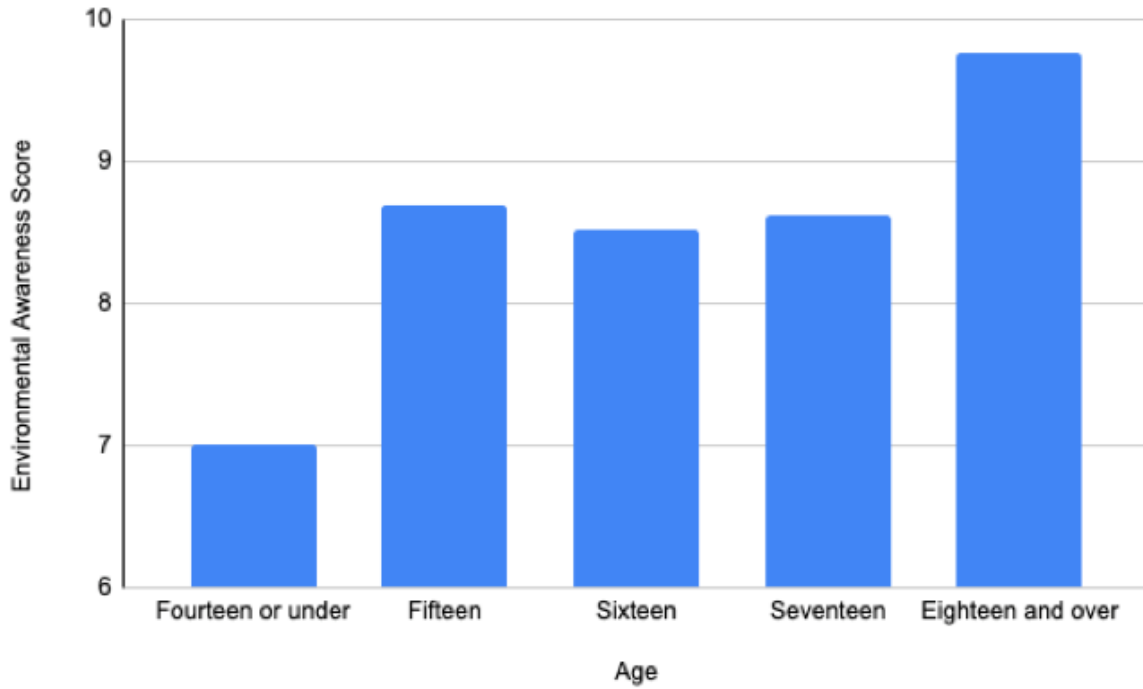


Figure 3. Relationship between age and environmental awareness

Of the total survey respondents, 83 were female, and 38 were male. The data showed that male students had slightly higher levels of environmental awareness than female students, with an average environmental awareness score of 8.895 versus 8.590.

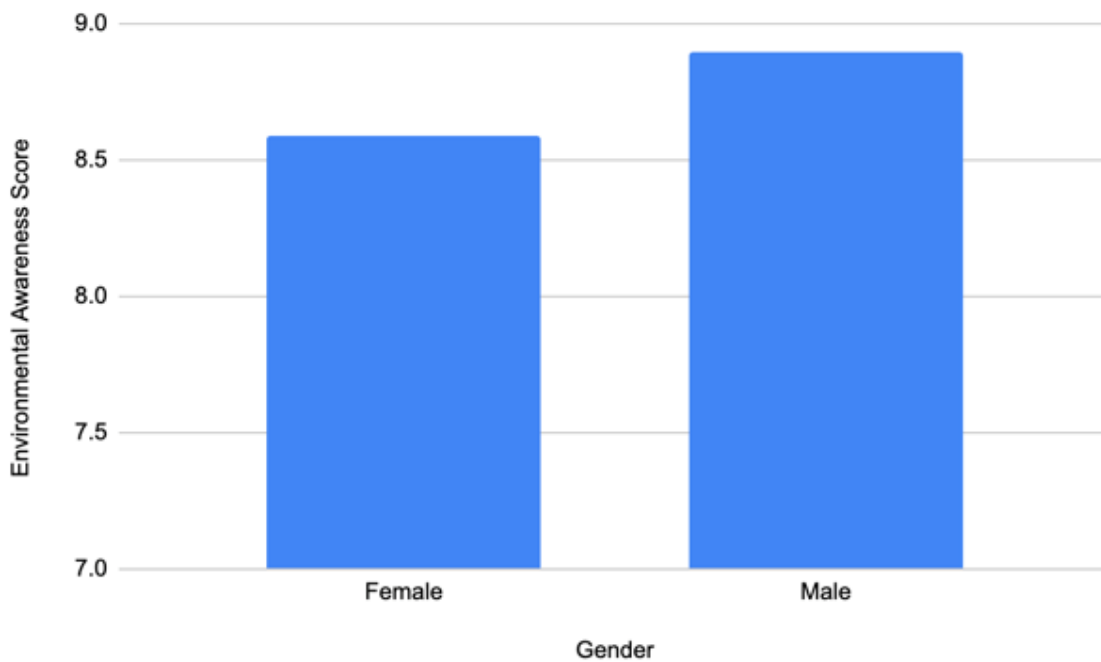


Figure 4. Relationship between gender and environmental awareness

The data gathered relating to the relationship between race and environmental awareness level was excluded from the final results because of current sensitivity surrounding racial issues and profiling.

Familial practices:

The respondents self-evaluated their familial recycling practices based on the favorability of the statement "my household recycles regularly." The data showed that students who responded "strongly agree" to this statement had the highest levels of environmental awareness, and those who responded "disagree" had the lowest levels of environmental awareness. It also showed a generally direct relationship between household recycling practices and students' environmental awareness.

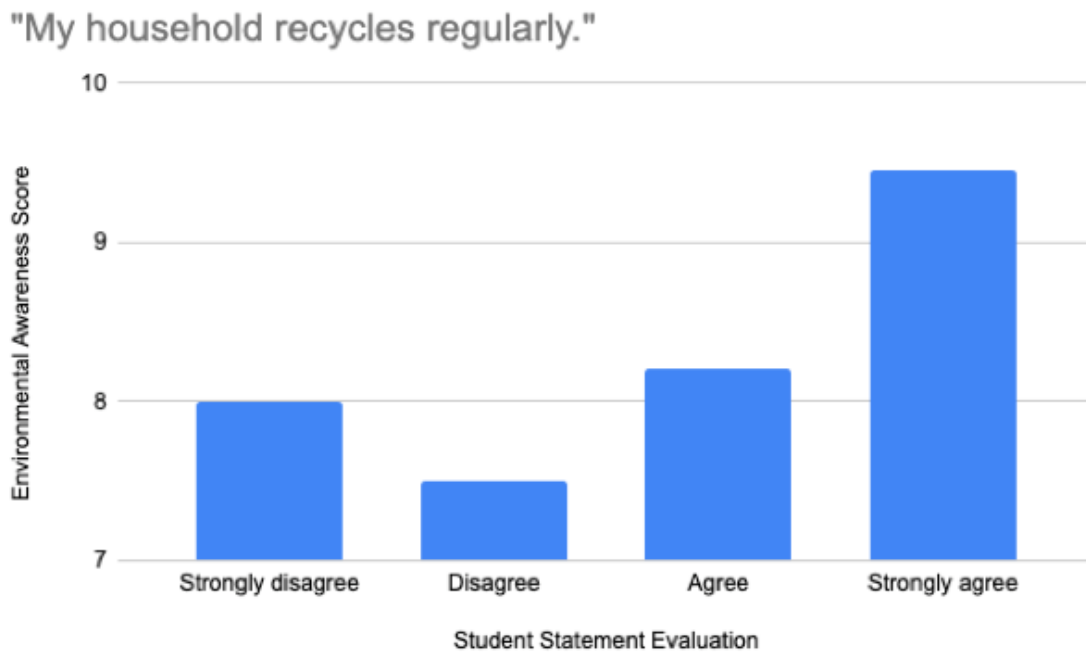


Figure 5. Relationship between familial recycling practices and environmental awareness

The respondents self-evaluated familial gardening practices based on the favorability of the statement "my household keeps a garden." The data showed that students who responded "strongly agree" to this statement had the highest levels of environmental awareness, and those who responded "strongly disagree" had the lowest levels of environmental awareness. It also showed a strong direct relationship between household recycling practices and students' environmental awareness.

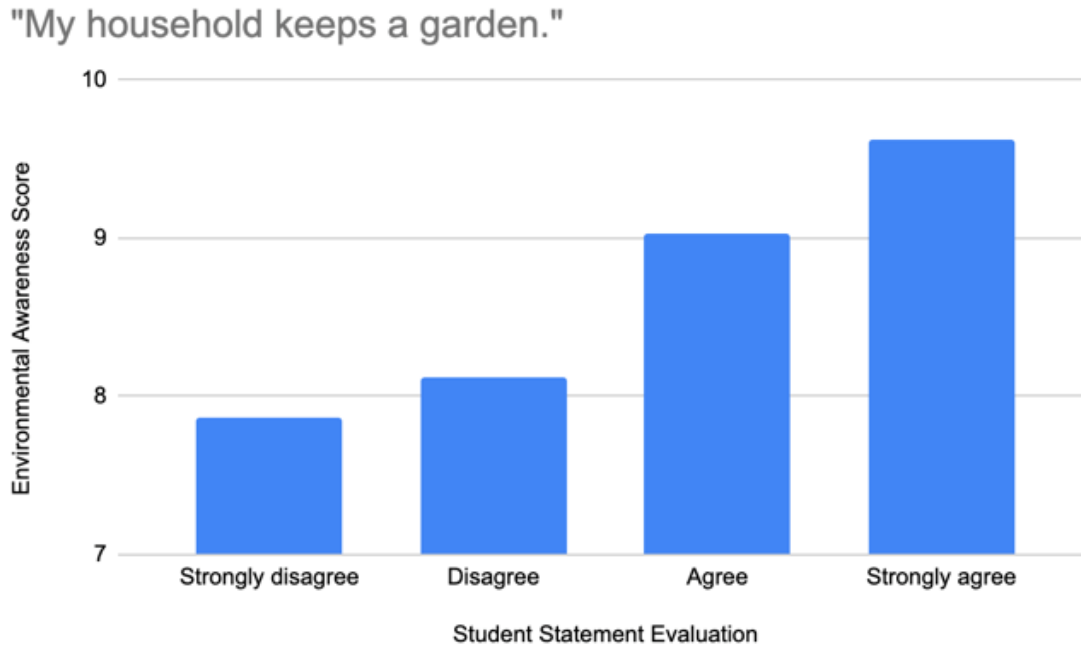


Figure 6. Relationship between familial gardening practices and environmental awareness

Discussion

The collected data showed that income had a strong relationship to environmental awareness, meaning that students who had higher annual household income levels tended to have higher levels of environmental awareness. This indicates that students with lower household income levels are more vulnerable to a lack of climate and environmental information and need to be more targeted for environmental education campaigns.

The data also showed a direct relationship between parental/guardian education and students' level of environmental awareness, meaning that students whose parents had higher levels of education tended to have higher levels of environmental awareness. This indicates that students whose parents have lower levels of education are more vulnerable to a lack of climate or environmental information and so need to be more targeted for environmental education campaigns. However, it is important to note that students whose parents had obtained no formal education had relatively high levels of environmental awareness. There was no existing research found to explain this data point, so speculation would be inappropriate, but more research would be beneficial to the understanding of its origin/cause.

The data further showed that the age of high school students has a direct relationship to environmental awareness, with older students tending to have higher levels of environmental awareness than younger students. This indicates that younger students are more vulnerable to a lack of climate and environmental information and may need to be more targeted for environmental education campaigns. However, the ages tested by this project were very limited. These data suggest that even year differences in education can significantly impact environmental awareness, which further supports the idea that environmental education campaigns could be used to address inconsistencies in environmental awareness, and that it may be useful to target lower high school year-classes in environmental education campaigns.

The data indicated that male students were slightly more environmentally aware than female students. This suggests that female students may be more vulnerable to a lack of climate and environmental information and may need to be more targeted for environmental education campaigns. However, since no existing research was found to

support this point, this data may be specific to the survey respondent pool. More research would be needed on this point to make any conclusions.

The data also showed a generally direct relationship between familial recycling practices and students' environmental awareness, with students whose families recycled regularly tending to have greater environmental awareness. While it is possible that the practice of regular recycling stems from an existing level of environmental awareness and that it does not bring such awareness itself, this relationship may exist in reverse. Therefore, this suggests that students should be strongly encouraged to recycle, and those who do not do so regularly should be targeted for environmental education campaigns.

The data also showed a strong direct relationship between familial gardening practices and students' environmental awareness, with students whose families regularly keep a garden tending to have greater environmental awareness. While it is possible that the practice of regular gardening comes from an existing level of environmental awareness and does not bring such awareness itself, this relationship may exist in reverse. Therefore, students should be strongly encouraged to garden, and those who do not do so regularly should be targeted for environmental education campaigns.

Limitations

Before addressing the implications and results of this research, it is vital to recognize the limitations that could impact the accuracy of the data. The most prominent of these limitations was the volume of survey responses. Only 121 complete responses were received. While this number is large enough to draw conclusions from the data, it would be less accurate than a larger respondent pool.

Another limitation was the restriction of the respondent population. Because all respondents had to be students enrolled in one specific high school, the data was also specific to that population. If students from other high schools, the general population of the area, or individuals from other locations were sampled, the data might differ. Demographic-related data is particular to the population from which it is gathered.

Another limitation to the data was its reliance on self-evaluative data. Because the research was gathered through a self-evaluative survey by high school students, the data received might not have reflected the actual nature of the respondent pool and its environmental awareness levels. Students might not be able to accurately evaluate their annual household income level, for example. Alternatively, they might not give completely accurate information regarding their environmental and climate-related practices. Future research on this topic should attempt to account for these limitations. This can be done by increasing the number of survey respondents or gathering data through interviews with a high volume of respondents. It would also be useful to find a way to verify the respondents' demographic factors in order to ensure accurate data.

Conclusion

Given this data, the original hypotheses were shown to be only partially correct. As earlier hypothesized, income and parental/guardian education level have direct relationships with environmental awareness. This data is supported by the relevant sources that were analyzed in the literature review. However, the data gathered from this project also shows that age directly relates to environmental awareness. It was initially hypothesized that age would not impact environmental awareness in this project because the respondent pool was confined to high school students with little age variability. The data indicated that even a few of years difference in education level can significantly impact environmental awareness, which is supported by previous research on the topic and shows the great potential effectiveness of targeted environmental education campaigns on an individual's level of environmental awareness.

Additionally, the data showed that male students were slightly more environmentally aware than female students. Because the difference between these two groups was minimal, and previous research on the topic did not support this conclusion, it follows reason to theorize that this difference was specific to the respondent pool. However, more research on this topic would be needed before drawing any conclusions. Race-related data, which was also sampled and hypothesized to have little influence on environmental awareness, was chosen not to be included in the final data analysis because the differences between different racial groups were deemed too difficult to quantify and inappropriate to identify.

Data relating to familial environmental practices conformed to the hypotheses. Students whose families recycled regularly had higher levels of environmental awareness than those who did not. Additionally, students whose families kept a garden had higher levels of environmental awareness than those who did not. Between these two factors, gardening had a greater impact on environmental awareness.

This data has several implications for the future of climate change educational programs. It provides information on the populations of high school students likely to be most vulnerable to a lack of climate and environmental information, and therefore, those populations that most need to be targeted for environmental education campaigns. Such targeted campaigns have been proven effective in increasing environmental and climate change awareness in several previous studies (Toksoz et al., 2011). Additionally, the methodology used to conduct this research could be adapted to evaluate other populations, giving researchers an even better understanding of the overall relationship between demographic factors and environmental awareness, thus contributing to improved targeting of environmental and climate change education to improve citizens' environmental awareness. This improved awareness is needed to support future efforts to address and reduce human impact on the climate and environment.

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