

Understanding Environmental Motivation in College Students

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ABSTRACT

The goal of this study is ultimately to understand sources of environmental motivation to serve as a model for inspiring pro-environmental behaviors. Environmental motivation can take biospheric, altruistic, or egoistic forms, and two potential sources of environmental motivation are environmental knowledge and environmental worldviews. I conducted a survey of an undergraduate class at UC Berkeley to determine the relationships between environmental knowledge, worldview, and motivations. To collect my environmental motivation data, I included an adapted version of the Environmental Motives Scale (EMS) in my survey. To collect environmental knowledge data, I asked multiple choice survey questions assessing the respondents' environmental knowledge. To collect environmental worldview data, I included an adapted version of the New Ecological Paradigm (NEP) scale. Students studying within the Rausser College of Natural Resources held a higher amount of biospheric motivation than students in other departments. Students studying all other majors possessed stronger ties to altruistic motivation than the other two types. In general, environmental knowledge showed very weak correlations to environmental motivation. Environmental worldview correlated more strongly to each type of environmental motivation than environmental knowledge did, though the overall correlation was still weak. The strongest NEP correlations indicate that environmental worldview is particularly related to biospheric motivation. Though my hypotheses were not supported, the more detailed information did show that biospheric motivation was linked to environmental knowledge and environmental worldviews.

KEYWORDS

environmental knowledge, environmental worldviews, altruistic, biospheric, egoistic

INTRODUCTION

In 2020, the planet experienced multiple alarming climate milestones: 2020 measured as one of the top three hottest years ever recorded, recorded the second lowest amount of sea ice in the Arctic, and left almost 10 million people displaced due to climate-related natural disasters (World Meteorological Organization 2021). Despite slowing carbon emissions during 2020, conditions are worsening. In the first half of 2021, global carbon emissions were higher than in the first half of 2019 (United in Science 2021). Moreover, because climate warming is largely a result of human actions, human action must also take place to resolve these issues (Abrahamse 2019). Given this worsening of environmental issues, taking environmental action is becoming increasingly more urgent. Fortunately, people are recognizing the importance of environmental awareness and action and are expecting environmental engagement from their peers, universities, and governments (Alderman and Meheut 2021, Tyson and Kennedy 2020).

There is opportunity for environmental engagement in many aspects of life, including transportation choices, energy usage, waste management, political participation, and more (Kaiser et al. 2003). However, determining what constitutes a pro-environmental behavior is not straight forward. One definition emphasizes that behaviors and actions need to be separated by intention; conscious actions with an intention of benefiting the environment are different than innate personal practices that are not choices specifically made to benefit the environment (Alisat and Riemer 2015). Another definition considers that regardless of intention, any behaviors that benefit the environment count as pro-environmental behavior (Fang 2021). Moreover, engagement in pro-environmental behaviors is not always an indicator of being environmentally motivated. For recycling or bike riding, the motivation behind the action is likely to be a non-environmental reason (Alisat and Riemer 2015). These actions typically fall under the personal practices category of behaviors (McDougle 2011) and are more linked to motivations of convenience or social norms (Vining et al. 1992, Alisat and Riemer 2015, Freed and Wong 2019). Alternatively, in pro-environmental behaviors that are conscious, intentional environmental choices, motivations can have egoistic, altruistic, or biospheric orientations (Schultz 2001), while still being grounded in environmental concern. Understanding specific types of motivation orientations gives a more

nuanced view of environmental motivation. This allows for a targeted approach to increasing specific types of environmental motivation that will select for specific behavioral outcomes.

Two potential sources of environmental motivation are environmental knowledge and environmental worldviews (Shin et al. 2017). In general, higher levels of environmental knowledge are linked to more environmentally friendly behaviors (Goodale 2021). Additionally, in more specific cases of energy consumption and wildlife conservation, higher degrees of knowledge manifest as more environmentally friendly behaviors in each of those areas (Frick et al. 2004, Pothitou et al. 2016). However, although environmental knowledge seems to be correlated to pro-environmental behavior, environmental knowledge does not necessarily always result in more environmental motivation (Zannat et al. 2021). In fact, in some cases, increased environmental knowledge only results in more environmental concern if the individuals value the environment to begin with (Liu et al. 2020). Furthermore, environmental attitudes and values, sometimes referred to as “green identity,” are generally positively associated with environmental motivation. Individuals with a higher sense of green identity and more positive environmental attitudes are more environmentally concerned and motivated (Hansmann et al. 2020, Pothitou et al. 2016). And, because attitudes can predict behavior (Ajzen 1996), individuals with positive environmental attitudes are more willing to engage in higher effort environmental actions (Seguin et al. 1998). However, this field of research provides conflicting conclusions. Environmental identity and environmental attitudes are not always a strong predictor of environmental motivation: sometimes environmental action is simply a matter of convenience (Freed and Wong 2019). In other cases, environmental attitudes and identity arise for social reasons (McDougle et al. 2011, Torkar et al. 2021). The conflicting narratives surrounding environmental motivation’s relationship to knowledge and attitudes call for a deeper understanding of these three ideas. There is a significant amount of research that links environmental motivation to environmental behaviors, but a lack of information about the factors impacting environmental motivation itself. Although it would be simple to assume that knowledge and worldviews are linearly linked to motivation and behaviors, in reality, these concepts are all intertwined. By simultaneously looking at the relationships between environmental knowledge, worldviews, and motivation, there is an opportunity to see patterns emerge that otherwise would not be known when looking at these items individually.

The goal of this study is ultimately to understand sources of environmental motivation to serve as a model for inspiring pro-environmental behaviors, and to distinguish between environmental behavior and environmental motivation. To achieve this, I asked the central research question: What factors impact environmental motivation in college students? To answer the larger central question, I asked three sub-questions: (1) How are college students environmentally motivated towards environmentally friendly behaviors? (2) How does environmental education and knowledge influence environmental motivation? (3) How do environmental attitudes and values influence environmental motivation? To answer these questions, I conducted a survey to assess the relationships between environmental motivation, environmental behavior, environmental knowledge, and environmental worldviews. I hypothesized that I would see a significant link between environmental knowledge and environmental motivation, and similarly another significant link between environmental worldviews and environmental motivation. With these links, I hoped to pinpoint specific types of environmental knowledge and attitudes to target to increase environmentally friendly behaviors.

BACKGROUND AND CONTEXT

Environmental Motivation and Connection to Behavior

Environmental motivation can take biospheric, altruistic, or egoistic forms (Schultz 2001, Abrahamse 2019), which results in varying theories as to how motivation drives environmentally friendly behaviors (Abrahamse 2019, Mees 2020). Each of these forms of environmental motivation operates on a spectrum and an individual can have any combination of varying degrees of each item (Snelgar 2006).

Biospheric environmental motivation comes from a sense of concern and appreciation for the environment and the planet (Snelgar 2006, Marshall et al. 2019). Biospheric concerns are the most significant in determining pro-environmental behavior (Marshall et al. 2019), for example in energy conservation (Shi et al. 2019) and especially in social change efforts such as protests or lobbying (Sloot et al. 2018). Individuals with a high degree of biospheric motivations are also more likely to hold strong environmental values through their beliefs in and responses to climate change (Marshall et al. 2019) and recognition of personal responsibility in environmental efforts (Shi et

al. 2019). Individuals who have stronger biospheric motivations are more likely to be called to action by experiencing environmental issues or just by simply talking about environmental issues (Marshall et al. 2019).

Altruistic environmental motivation comes from a sense of concern towards other people or towards one's community (Birch et al. 2018, Abrahamse 2019). For example, someone with a high degree of altruistic environmental motivation might decide to conserve energy because of the perceived benefits this could have in the community (Shi et al. 2019). The environmental actions that arise from altruistic environmental motivation seem to be similar to that of people with stronger egoistic concerns. People with stronger altruistic motivations were also more likely to be willing to pay for wildlife restoration efforts in Spain (Ojea and Loureiro 2006), and were more likely to be willing to pay higher prices for fairtrade organic coffee beans (Maaya et al. 2018). People with altruistic motivations respond well to environmental messaging that emphasizes empathy (Marshall et al. 2019).

Egoistic environmental motivation comes from a sense of self-concern (Mees 2020). Individuals who partake in environmentally friendly actions out of an egoistic motivation do so because of benefits to themselves. For example, someone might shop for local produce at a farmers market because of the personal health benefits associated with the higher nutrient content in local foods, rather than the purely environmental benefits of buying locally grown food (Birch et al. 2018). Although the self-centered nature of egoistic concerns may seem negative, egoistic environmental concerns have been positively linked to some environmental actions and issues. People with higher degrees of egoistic concern were among those more willing to pay for wildlife restoration efforts (Ojea and Loureiro 2006), and were more likely to express "reef grief" (concern over ecological degradation) in Australia (Marshall et al. 2019). People with egoistic motivations respond well to environmental messaging that emphasizes ecosystem services, and focuses on how protecting the natural environment protects humans (Marshall et al. 2019).

Environmental Education

The Environmental Protection Agency defines Environmental Education as, "a process that allows individuals to explore environmental issues, engage in problem solving, and take action to improve the environment" (Environmental Protection Agency). This definition means

environmental education can take the form of more formal education through a high school, college, other formal school or class, or can be informal such as self-directed collecting of information through the internet, media, books, or other people. Therefore, sources of environmental education can vary and influence the kind of environmental knowledge people hold (Zareva-Simeonova et al. 2009). This environmental knowledge in turn influences the ways people are environmentally motivated and determines the types of environmental actions and behaviors people are likely to participate in (Pothitou et al. 2016, Shin et al. 2017). For the purposes of this research, environmental education refers to any means of acquiring accurate environmental knowledge.

Environmental Worldview

Encompassing environmental attitudes and environmental values (Dunlap et al. 2000), environmental worldview is characterized by someone's tendency to see the natural environment in either a favorable or unfavorable light and will therefore be more likely to act environmentally friendly (Milfont and Duckitt 2009). For example, someone with strong environmental attitudes and values might be more likely to conserve water in the face of a water shortage (Milfont and Duckitt 2009). Factors such as digital media, written media, and childhood home influences have an impact on the formation of environmental attitudes (Eagles and Demare 2010). Furthermore, there is a demonstrated link between environmental education and development of environmental attitudes, especially when people are exposed to environmental education in childhood (Eagles and Demare 2010). Likewise, environmental knowledge in general is also linked to more positive environmental attitudes (Park and Sohn 2018) which are in turn linked to more environmentally friendly behaviors in some cases, such as making more environmentally conscious purchases (Park and Sohn 2018).

College Students and Environmentalism

College students are an important population to measure regarding environmental motivations due to the access they have to environmental education, their exposure to environmental initiatives, and their ability to make community changes after graduating. Formal

environmental education through university coursework is recognized as a significant factor influencing environmentally friendly actions in college students (Li and Chen 2015). Being enrolled in a university that offers environmental courses gives college students access to this formal environmental education and a chance for research to demonstrate the effects the education has on environmental motivation (Kaplowitz and Levine 2005).

College students are also exposed to many other informal forms of environmental education and introduced to positive environmental worldviews, in the form of campus environmental initiatives, environmental student organizations, and sustainability ideas (Harraway et al. 2012). Informal forms of environmental education also exist in other areas of life, adding to the information college students have access to. For example, information available at National Parks or zoos adds to peoples' environmental knowledge (Zareva-Simeonova et al. 2009, Wolfe et al. 2018). Understanding environmental motivations in university students is crucial to fostering more environmental motivation in non-university students because of the impact college graduates have in their work-places after graduating (Hansmann et al. 2019). Making more environmentally motivated college graduates might lead to more environmentally friendly workplaces in the future.

ESPM 50AC as a Sample Population

At UC Berkeley, students are exposed to numerous sources of environmental information. Some examples of our campus environmental initiatives and environmental student organizations include the Zero Waste campaign, CALPIRG (which saw over 2,800 students participate across the UC system during the 2020-21 school year) (CALPIRG Annual Report 2020-2021), and the Student Environmental Resource Center (SERC). The Environmental Science, Policy, and Management (ESPM) department at the University of California, Berkeley is a highly ranked department with an interdisciplinary focus (About ESPM), “driven by a collective interest in our environmental future” (About ESPM). This emphasis on the environmental future makes any ESPM course suitable for a survey because those dealing with environmental issues in their daily studies tend to show more pro-environmental behaviors and motivation (Hansmann et al. 2020). The wide variety of student backgrounds present in ESPM 50AC makes it an appropriate course to survey. As an American Cultures course, a type of course which every undergraduate UC Berkeley student is required to take, ESPM 50AC attracts students from a multitude of campus

departments. These individuals have likely received other environmental education (formal schooling and self-directed information gathering) at some point in their lives, and considering they chose to enroll in an ESPM course, they likely have some significant environmental values and are environmentally motivated. This means I had ample room to complete this study because environmental knowledge, environmental worldviews, and environmental motivation would be present within this population. For this research, I sampled ESPM 50AC due to the environmental content of the course and department, and the varying backgrounds of the students.

METHODS

Data Collection

I used a survey with four sections to collect data: environmental motivation, environmental behavior, environmental worldviews, and environmental knowledge. ESPM 50AC students at UC Berkeley in the Fall 2021 semester received this survey as an extra credit opportunity. Made available to them by their instructor, Kurt Spreyer, in December, students received 10 extra credit points for the semester if they submitted proof of having completed the survey. My survey was one of three surveys administered to the students in the form of one larger combined survey on Qualtrics, with different blocks of questions denoting different research studies. This survey was Block 2 out of three.

Survey instrument

Environmental motivation. To collect my environmental motivation data, I included an adapted version of the Environmental Motives Scale, or EMS, (Schultz 2001) in my survey. Through 12 motivation items, the EMS places the environmental motivation of the respondent on a spectrum of biospheric, altruistic, or egoistic motivation. The styles of motivation are not mutually exclusive; having a high level of one style of environmental motivation does not mean an individual cannot also have a high level of either of the other motivation styles (Snelgar 2006). In my adapted version of the scale, I condensed and modified some of the variables under each of the motivation factors, for a total of 8 items. I did this to be concise and clear. Under biospheric

motivation, rather than asking about concern for “plants”, “animals”, “marine life”, and “birds”, I updated the terms to ask about concern for “biodiversity”, “water quality”, and “air quality.” Under egoistic motivation, rather than asking about “me,” “my future,” “my health,” and “my lifestyle,” I included only “my health” and “my future.” Under altruistic motivations, rather than asking about “people in my community,” “all people,” “children,” and “my children,” I included only “people in my community,” “all people,” and “future generations.” Schultz’s (2001) original study has respondents rank these items on a 7-point Likert scale; however, to keep continuity with the other Likert scales in my study, I assessed environmental motivation using a 5-point Likert scale, with 1 being Not Important and 5 being Very Important. For each survey respondent, I calculated the mean per motivation type, for a total of three motivation scores per person: one biospheric, one altruistic, and one egoistic. These scores could then be compared against data from other sections of the survey.

To collect environmental behavior data, I asked 10 questions adapted from Sousa et al. (2021), Alisat and Riemer (2015), and Kaiser (1998). The questions assessed the following behaviors: recycling, resource (water, paper, or energy) usage, use of reusable bags, talking about environmental issues with friends, using social media to spread environmental awareness, making financial contributions to environmental causes, engaging in direct environmental actions (such as beach clean ups), engaging in environmental political acts (such as contacting elected officials), and engaging in environmental activism (such as attending protests). I presented these items on a Likert scale from 1-5 asking respondents to self-evaluate the frequency they participate in each behavior, with 1 being Never and 5 being Always. I calculated the mean of the Likert scores for each of the behavioral items, giving everyone a behavior score. I could then compare this score against other data. I also identified the median score per behavior item in order to correlate specific items with motivation.

Environmental knowledge. To collect environmental knowledge data, I asked 9 multiple choice survey questions assessing the respondents’ environmental knowledge. I adapted these questions from Kaplowitz and Levine’s (2005) study of environmental knowledge in college students at Michigan State University. The questions used in Kaplowitz and Levine’s study are from the National Environmental Education and Training Foundation and Roper Starch Worldwide environmental knowledge surveys (National Environmental Education and Training Foundation

& Roper Starch Worldwide 2001). Similar to Michigan State University, UC Berkeley has no required environmental education curriculum, which is why I used the same set of questions used in the Michigan State University environmental knowledge assessment (Kaplowitz and Levine 2005).

From the original set of knowledge questions, I removed three questions entirely and I altered two questions. I removed question 1, asking about personal perception of one's own environmental knowledge. I removed question 5, about common sources of water pollution, because the question was very objective and lacked geographic specifications, meaning there would be no one singular correct answer choice. I removed question 9, which asked about the name of the Environmental Protection Agency, because the question seemed irrelevant to the goal of my survey. I altered question 4, about sources of electricity generation in the United States, because the question was outdated and lacked geographic specification. I altered this question to instead focus on sources of renewable energy. I altered the answer choices to question 7, about ozone protection, because the original correct answer used biased language alluding to it being the correct answer. For each question, I scored each correct answer as 1 point, and each incorrect answer as 0 points. For each respondent, scores were added to create a composite score out of 9. This numerical knowledge score allowed me to compare the environmental knowledge factor against other variables in my survey. I also identified the average score per knowledge item in order to relate individual knowledge items to motivation.

Environmental worldviews. To collect environmental worldview data, I included an adapted version of the New Ecological Paradigm, or NEP, scale (Dunlap et al. 2000) in my survey. The NEP scale is used to measure environmental attitudes, beliefs, and worldviews and shows individuals' environmental orientations in a series of 15 belief statements (Dunlap et al. 2000). This scale has been used numerous times to assess the environmental orientations of college students (Harraway et al. 2012, Goodale 2021). Results indicate that people with higher NEP score (and therefore hold stronger environmental attitudes and values) are people who self-identify as environmentalists or study an environmentally related field (Dunlap et al. 2000, Harraway et al. 2012, Goodale 2021). The NEP scale consists of 15 items and contains several factors-- the tendency to recycle, the tendency to conserve, the tendency to support animal rights, and the tendency to be cautious about the future (Harraway et al. 2012).

I used an adapted version of the NEP scale to modernize some of the language and to ask questions relevant to my study. I altered two of the NEP items: items 10 and 11. The phrasing of item 10 (“so-called ‘ecological crisis’”) seemed biased and outdated, so I altered it to read “the ecological crisis....” The phrasing of item 11, comparing earth to a spaceship with limited space and resources, distracted from the goal of my survey. I altered it to read, “The earth has very limited room and resources.” I presented each of the NEP items on a Likert scale from 1-5, with 1 being Strongly Disagree and 5 being Strongly Agree (Dunlap et al. 2000). For each survey respondent, I calculated the mean of the Likert scores for each of the 15 NEP items, giving everyone a NEP score. I could then compare this score against other data. I also identified the median score per NEP item in order to correlate specific items with motivation.

Data Analysis

To determine the style of environmental motivation of UC Berkeley students, I calculated the mean and standard deviation of biospheric, egoistic, and altruistic motivation scores (Snelgar 2006). I also differentiated between students in Rausser College majors and students in all other majors, and calculated these metrics again. Finally, I calculated correlation coefficients to determine how the knowledge factor and worldviews factor impact motivation (Schultz 2001). I also calculated correlation coefficients between environmental motivation and general environmental behavior and between environmental motivation and each behavior item.

I calculated the mean, standard deviation, lower bound, upper bound, minimum score, and maximum score for the environmental knowledge questions (Kaplowitz and Levine 2005). I calculated correlation coefficients between the environmental knowledge scores and environmental motivation data to determine how environmental knowledge (or lack thereof) might indicate a stronger leaning towards any one of the three styles of environmental motivation (Wong-Parodi and Ruben 2022).

Although I altered the NEP scale from its original form, I did not conduct a Confirmatory Factor Analysis, as was done in previous research when the NEP scale was altered. In previous research, researchers performed a CFA to determine that the factor loading of the original scale still held for their study (Gargkouvzi et al. 2019), however the changes I made were minor and only updated the language of the NEP scale to match modern environmental language and

knowledge rather than altering the content. To visualize differing distributions of NEP scores versus type of environmental motivation, I calculated correlation coefficients (Liu et al. 2020).

RESULTS

Demographics

Out of the 493 students enrolled in ESPM 50AC, I received 258 complete survey responses. Survey respondents represented 48 majors, with Molecular Environmental Biology, Environmental Science, Computer Science and Society & Environment being the four most common majors. In terms of major, 57.4% of the survey respondents studied a major within the Rausser College of Natural Resources. In terms of degree progress, 51.5% of respondents (133 individuals) were Freshmen, 24% of respondents (62 individuals) were Sophomores, 15.9% of respondents (41 individuals) were Juniors, and 8.1% of respondents (21 individuals) were Seniors.

Environmental Motivation

The means and standard deviations of the environmental motivation data showed that UC Berkeley students generally found biospheric motivation and altruistic motivation most important, followed closely by egoistic motivation (Table 1). According to major, students studying within the Rausser College of Natural Resources showed a higher amount of biospheric motivation by 7.32%, a higher amount of altruistic motivation by 3.46%, and a higher amount of egoistic motivation by 1.76%. Rausser College students were most motivated by biospheric ideals. Non-Rausser students were most motivated by altruistic ideals. Students outside of RCNR showed the lowest average biospheric motivations. Students with a high amount of one type of motivation were more likely to also have a high amount of the other two types of motivation. Similarly, students who had a low amount of one type of motivation were likely to have low amounts of the other types of motivation (Figure 1). Motivation in general correlated weakly with behavior. Of these weak correlations, biospheric motivation was the strongest correlated, with a Spearman Rank correlation coefficient of 0.231, followed by altruistic motivation with a correlation coefficient of 0.204, and egoistic motivation with a coefficient of 0.04.

Table 1: Motivation Results. Mean and standard deviation of each style of motivation, organized by all respondents, those in Rausser College, and those in all other fields. The table also contains a summary of the behavior data.

Motivation Type	All Respondents		RCNR Majors		Non-RCNR Majors		Behavior
	Mean	SD	Mean	SD	Mean	SD	
Biospheric	4.7	0.55	4.84	0.38	4.51	0.63	0.231
Altruistic	4.72	0.53	4.79	0.5	4.63	0.59	0.204
Egoistic	4.59	0.73	4.62	0.68	4.54	0.8	0.04

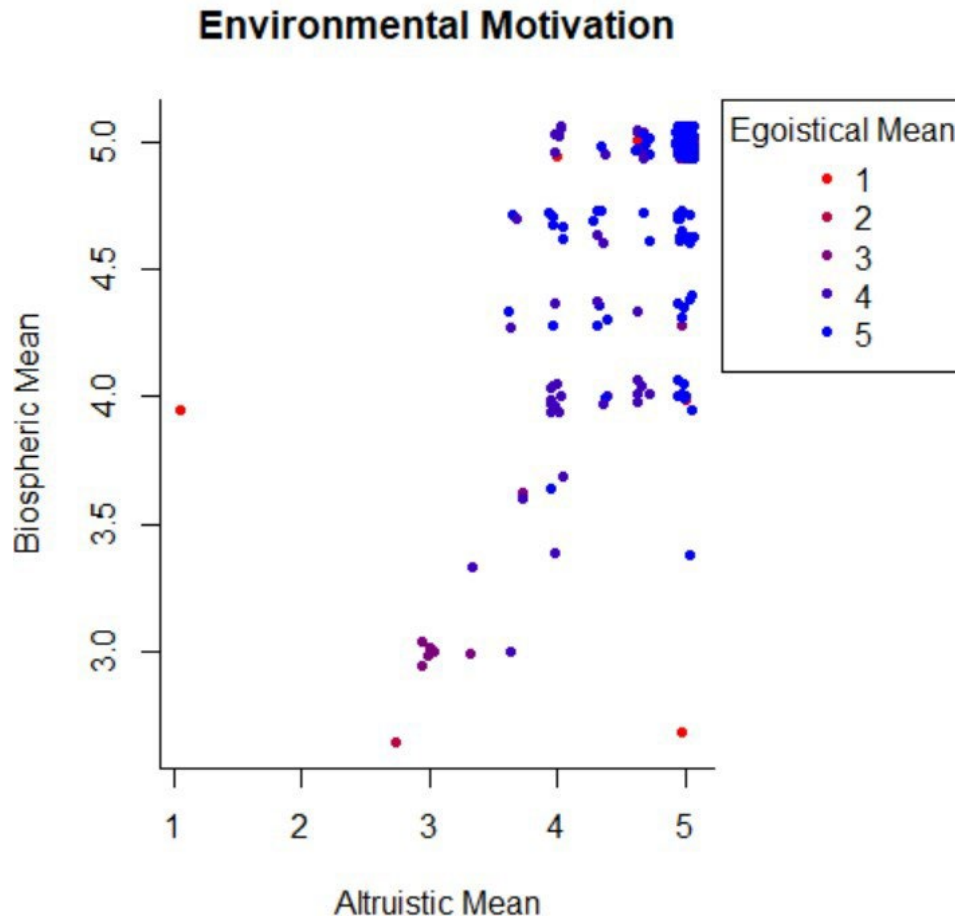


Figure 1: Types of environmental motivation. Values of 5 represent the highest motivation score achievable in each category. The altruistic data is represented on the x-axis, and the biospheric data is represented on the y-axis. The

egoistic data is represented via color—red points represent the lowest egoistic score and blue represents the highest egoistic score.

Environmental Knowledge

Students studying majors within the Rauser College of Natural Resources showed higher average environmental knowledge scores than students in majors outside of Rauser College (Figure 2). Compared to other common majors such as Business or Computer Science, students studying Environmental Sciences, Environmental Economics and Policy, and Conservation and Resources Studies had the highest average environmental knowledge. Conservation and Resources Studies students averaged 86.6% correct answers, Environmental Economics and Policy students averaged 82% correct, and Environmental Sciences students averaged 79% correct. In the same pool of common majors of respondents, students studying Economics, Computer Science, and Society & Environment had the lowest average environmental knowledge, with an average of 67% correct for Economics students, 71% correct for Computer Science students, and 68% correct for Society and Environment students (Table 2). Compared to other common majors, students studying Conservation and Resource Studies and Microbial Biology showed the most consistent levels of environmental knowledge, as demonstrated by the lower standard deviation values, whereas students studying Computer Science and Economics showed the most variation in levels of environmental knowledge, as demonstrated by the higher standard deviation value.

Table 2: Summary of Environmental Knowledge scores. Mean, standard deviation, minimum, and maximum for environmental knowledge scores, broken down by major. Appendix B.

Major	n	Mean	SD
ES	41	7.12	1.38
MEB	39	6.67	1.59
CS	22	6.41	1.89
SE	18	6.22	1.52
EEP	16	7.44	1.50
MCB	16	6.5	1.21
CRS	15	7.87	1.13

Econ	13	6.08	1.66
MB	11	7.09	1.14
BA	5	6.6	1.34

RCNR vs. Non-RCNR Knowledge Scores

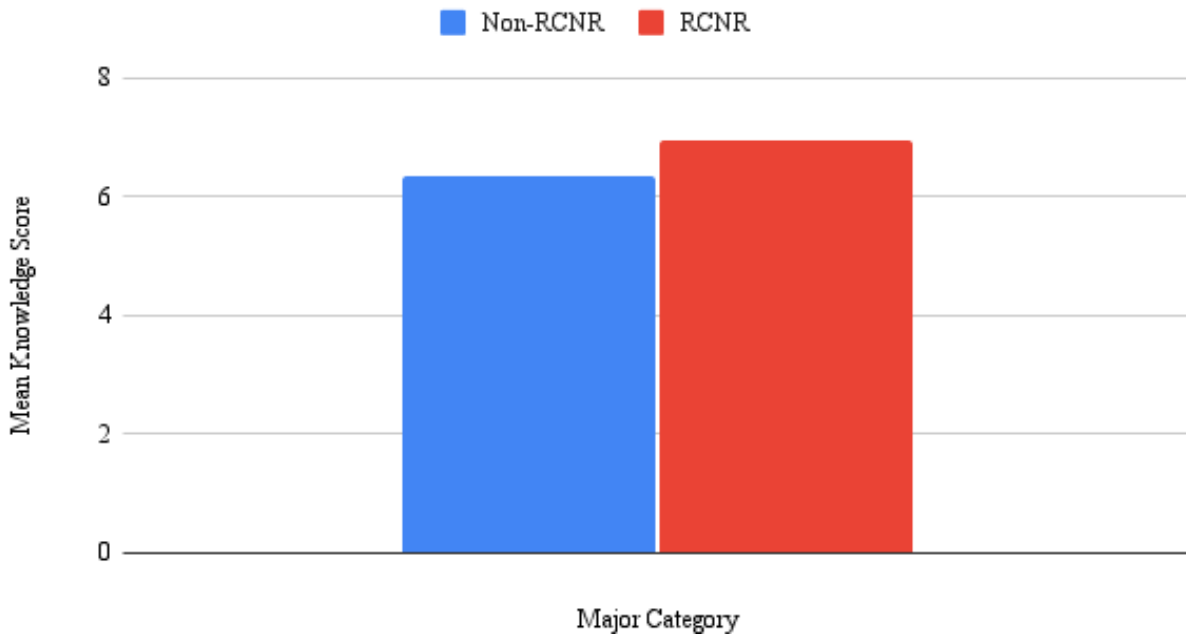


Figure 2: Knowledge scores by major. RCNR majors had an average knowledge score is 6.97 versus Non-RCNR majors had an average knowledge score of 6.34.

Using Spearman Rank correlation coefficients, biospheric motivation was slightly positively correlated with overall environmental knowledge. There was not a significant correlation between Altruistic motivation and overall environmental knowledge nor between Egoistic motivation and overall environmental knowledge. In analyzing individual knowledge items against the means of each motivation type, I found that knowledge item 5, about ozone, was slightly positively correlated with Biospheric motivation, with a correlation coefficient of 0.203 (Table 3).

Table 3: Environmental Knowledge Correlation coefficients. Correlation coefficients between environmental knowledge and environmental motivation. Appendix B.

Knowledge item	All Respondents			RCNR Majors			Non-RCNR Majors		
	Bio	Altru	Ego	Bio	Altru	Ego	Bio	Altru	Ego
3: Renewable Energy	0.0767	0.0912	0.0355	-0.0691	-0.0934	-0.1302	0.127	0.212	0.179
4: Renewable Resources	0.1004	0.061	-0.0127	-0.0201	-0.0462	-0.09605	0.213	0.168	0.0868
5: Ozone	0.203	0.184	0.148	0.0983	0.0739	0.0373	0.2105	0.232	0.235
6: Landfills	0.0530	-0.0255	-0.0718	-0.019	-0.0957	-0.205	0.0543	-0.00201	0.0724
Knowledge Score	0.145	0.0438	-0.0325	0.022	-0.0852	-0.231	0.225	0.162	0.219

Environmental Worldviews

In general, NEP scores correlated weakly with motivation, however looking at individual NEP items provided more information. NEP items 5, 9, 10, 12, and 15 had the strongest correlations with environmental motivation out of all the NEP items. These items also contained the most polarized average responses (Table 4, Figure 3). Looking specifically at these items, for the whole population, the strongest correlations are between biospheric motivation and each of these NEP items (Table 5). For example, the Spearman Rank correlation coefficient between biospheric motivation and NEP item 15 is 0.425, and the correlation coefficient between biospheric motivation and NEP item 5 is 0.405. Though these correlations are still not particularly strong, compared to the correlation coefficients seen in the environmental knowledge data, these numbers are more indicative of a relationship.

Upon breaking the data down into groups of Rausser students and non-Rausser students, it is clear that the stronger correlations here are due to the Non-Rausser students (Table 5). Using the biospheric relationship to NEP items 15 and 5 as examples again, the correlation coefficient for NEP item 15 was 0.524 for non-Rausser students versus 0.247 for students within Rausser College. Similarly, the correlation coefficient for NEP item 5 and biospheric motivation for

students outside of Rausser College was 0.463 versus 0.224 for students within Rausser College. A similar trend exists for both altruistic and egoistic motivation, though with smaller correlations all around than as with biospheric motivation.

Table 4: NEP Summary. Mean and Standard Deviations per NEP item. The NEP item descriptions are also listed.

NEP Item	Mean	SD
1: We are approaching the limit of the number of people the earth can support.	3.81	1.13
2: Humans have the right to modify the natural environment to suit their needs.	2.73	1.11
3: When humans interfere with nature it often produces disastrous consequences.	4.11	0.82
4: Human ingenuity will ensure we do NOT make the earth unlivable.	3.06	1.13
5: Humans are severely abusing the environment.	4.51	0.69
6: The earth has plenty of natural resources if we just learn how to develop them.	3.27	1.16
7: Plants and animals have as much right as humans to exist.	4.29	0.93
8: The balance of nature is strong enough to cope with the impacts of modern industrial nations.	2.14	1.09
9: Despite our special abilities humans are still subject to the laws of nature.	4.35	0.78
10: The ecological crisis facing humankind has been greatly exaggerated.	1.96	1.15
11: The earth has very limited room and resources.	3.91	1.02
12: Humans were meant to rule over the rest of nature.	1.90	1.11
13: The balance of nature is very delicate and easily upset.	3.60	1.02
14: Humans will eventually learn enough about how nature works to be able to control it.	2.52	1.16
15: If things continue on their present course, we will soon experience a major ecological catastrophe.	4.41	0.81

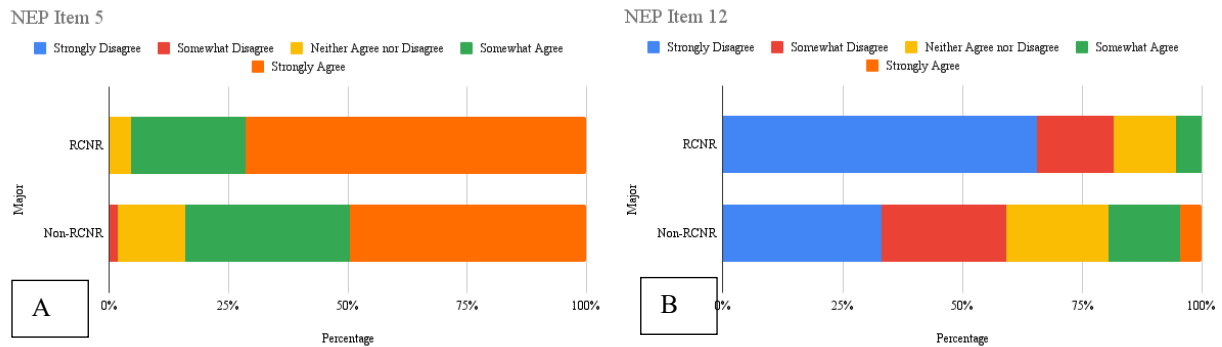


Figure 3: NEP Items 5 and 12 Summaries. These are more polarized NEP items, especially within Rausser College students. Each color represents a differing level of agreement with the item, as per the legend.

Table 5: NEP Correlation Matrix. Correlation coefficients between NEP items and motivation type. Appendix B.

NEP Item	All Respondents			RCNR Majors			Non-RCNR Majors		
	Bio	Altru	Ego	Bio	Altru	Ego	Bio	Altru	Ego
5	0.405	0.285	0.1904	0.224	0.0779	0.0837	0.463	0.428	0.293
9	0.346	0.238	0.206	0.203	0.129	0.119	0.414	0.309	0.316
10	-0.316	-0.217	-0.153	-0.174	-0.0975	-0.0277	-0.393	-0.302	-0.3009
12	-0.378	-0.214	-0.149	-0.169	-0.1105	-0.0668	-0.406	-0.215	-0.202
15	0.426	0.272	0.216	0.247	0.149	0.0973	0.524	0.358	0.364
NEP Score	0.127	0.139	0.233	0.0705	0.0458	0.173	0.188	0.235	0.310

DISCUSSION

In general, environmental knowledge and environmental worldviews are only weakly positively correlated with each type of environmental motivation, if at all. However, biospheric motivation showed the strongest correlations to several individual knowledge items and worldview items. Further, both knowledge and worldview survey results for students in majors outside of Rausser College were more strongly linked to all types of motivation than were results of students within Rausser College. The educational correlation patterns do not fall in line with expectations from previous research. However, the worldview correlation patterns are supported by conclusions in previous research.

Environmental Motivation

ESPM 50AC students are highly environmentally motivated; further, the even higher motivation of Rausser College students is potentially indicative of knowledge and worldviews' relationships to motivation. In comparing these results to other similar environmental motivation surveys, ESPM 50AC students at UC Berkeley hold a significantly higher average for each of the three categories of motivation. In a 2006 environmental motivation survey by Snelgar (2006), the

respondents' average Biospheric Motivation score was 5.62 on a 7-point Likert scale, average Altruistic Motivation score was 6.24, and average Egoistic Motivation was 5.53. In a 2001 environmental motivation survey of US College Students by Schultz (2001), the average Biospheric Motivation Score was 5.33, average Altruistic Motivation score was 5.89, and average Egoistic Motivation score was 5.67. After rescaling the ESPM 50AC 5-point Likert environmental motivation results to a 7-point scale, the average Biospheric Motivation score was 6.55, average Altruistic Motivation score was 6.57, and average Egoistic Motivation score was 6.45. Assuming that the survey content and set up was similar enough and that the respondents who strongly agreed are consistent with the rescaling, the results of Snelgar (2006) and Schultz (2001) can be used as a guide for interpreting the motivation of ESPM 50AC students. Given that the ESPM 50AC survey respondents were almost 60% students within the Rausser College of Natural Resources and that this is a course within the ESPM department, I expected general environmental motivation to be high and the average motivation scores to be higher than in the general population, but I was surprised at how much higher these scores were for ESPM 50AC students. Given that Rausser College students engage in more environmentally oriented coursework than other UC Berkeley students, these results indicate that environmental education and environmental worldviews do play a role in influencing environmental motivation, though this is not necessarily reflected in later survey data.

This high level of environmental motivation across the board will result in more environmentally friendly behavior (Bouman et al. 2020). In cases of purchasing local food and purchasing organic food, individuals of different types of environmental motivations reported different reasons for partaking in the environmentally friendly action (Birch et al. 2018, Kareklas et al. 2014). In cases of being willing to pay for wildlife conservation, altruistic and egoistic motivation were more correlated with a willingness to pay than was biospheric motivation (Ojea and Loureiro 2006). With high degrees of environmental motivation in each of the three categories of motivation, it creates more opportunities for someone to engage in environmentally friendly behavior. Additionally, because of the significant correlations between each of the three motivation types, if an individual has a high amount of one type of motivation, they are likely to also score high in the other two types of motivation (Figure 1). This also has the potential to complicate analyses, however, because the co-occurrence of each motivation type makes it difficult to identify which motivation type is tied to environmental behaviors.

As pro-environmental behavior is thought to be an expression of environmental motivation (Sharpe et al. 2021, Fang 2021), the weak correlations between environmental behavior and environmental motivation were unexpected. This weak relationship might be due to the types of behavior items included in the study. Some of the items, such as recycling, avoiding waste, or engaging in environmental campus organizations, can be categorized as “personal practices” rather than conscious environmental choices and might have little to do with one’s environmental motivation. However, for this to be the cause of the overall weak correlation, the correlation coefficients of the “conscious environmental choices” (such as engaging in direct action or engaging in environmental political acts) would have been higher. This was not the case. The ESPM 50AC behavior results did match previous research in one area, however. The results of Marshall et al. (2019) connect both biospheric and altruistic motivation to environmentally friendly behaviors, supporting the stronger coefficients existing in this study for altruistic and biospheric motivation. Although the correlations are weak in the ESPM 50AC results, there is a potential for a similar relationship to that seen in Marshall et al. (2019).

Environmental Knowledge

Some ESPM 50AC students are highly environmentally knowledgeable, while others possess only a moderate amount of environmental knowledge. Overall, the average knowledge score for ESPM 50AC students matched previous research: for both the ESPM 50AC students and the students in the MSU study I adapted the survey from, the average knowledge score was about 74% (Kaplowitz and Levine 2005). Respondents majoring within the Rausser College of Natural Resources tended to have higher knowledge scores than students in all other majors, which is consistent with previous research which says students in natural sciences majors know more about the natural world (Goodale 2021). Within the knowledge scores for the 10 most common majors of survey respondents (Table 2), the percentage of correct knowledge items ranges from 69% to 87%. Looking at each knowledge item, there were some items where a higher percentage of ESPM 50AC students answered correctly, and other items where a higher percentage of MSU students answered correctly. For example, in the question about biodiversity, 97% of ESPM 50AC students answered the question correctly versus only 86% of MSU students. On the other end of the

spectrum, in the question about landfills, 80% of MSU students answered correctly versus only 49% of ESPM 50AC students (Kaplowitz and Levine 2005).

In general, environmental knowledge correlated weakly to environmental motivation. The only knowledge item that showed even mildly significant correlation to any of the motivation types for the whole population was the knowledge item about ozone. These results were not surprising, given that environmental knowledge seems to be more tied to environmental behaviors rather than environmental motivation (Frick et al. 2004, Pothitou et al. 2016). However, there are also some discrepancies. Previous research holds that environmental motivation is not significantly linked to environmental knowledge, except in cases where environmental values are strong (Zannat et al. 2021, Liu et al. 2020). Students within Rausser College have more access to environmental education than students in other majors through required ESPM coursework, might be more likely to socialize in environmentally oriented circles (Hansmann et al. 2020), and therefore have access to more environmental knowledge. Considering students within Rausser College scored the highest amounts of environmental knowledge and showed the highest amounts of environmental motivation in all three categories, there should have been a stronger relationship between environmental motivation and environmental knowledge for students in Rausser College. Instead, this relationship existed within students not in Rausser College. While these students in general were still highly motivated and highly knowledgeable, the students within Rausser college were more highly motivated and knowledgeable, so it is interesting that the ESPM 50AC data do follow that of Liu et al. (2020).

Breaking environmental motivation into three smaller subcategories offers a more nuanced relationship between environmental motivation and environmental knowledge. Although egoistic motivation and altruistic motivation show virtually no correlation with environmental knowledge, biospheric motivation shows a very slight relationship to environmental knowledge, with a Spearman Rank correlation coefficient of 0.145. This is especially for students outside of Rausser College, as biospheric motivation also shows a very slight relationship to environmental knowledge in this group, with a Spearman Rank correlation coefficient of 0.225. These correlation coefficients are extremely weak, however compared to the other correlation coefficients in the 0.04 range, these demonstrate a potential relationship. The presence of a correlation at all means that environmental knowledge is an avenue for increasing environmental motivation and therefore increasing environmental actions. Biospheric and altruistic environmental concerns have already

been linked to increasing environmentally friendly motivations and behaviors (Bouman et al. 2020). The ESPM 50AC results confirm that there is an opportunity for increasing environmental motivation through environmental education.

Environmental Worldview

I measured environmental worldview via NEP scores. The NEP scores of ESPM 50AC students were lower than expected. In a survey of university students in New Zealand, the average NEP score of respondents was 3.78 (Harraway et al. 2012) and in a survey of 150 people in Greece, the average NEP score of respondents was 3.52 (Gkargkavouzi et al. 2019). For ESPM 50AC students, the average NEP score was 3.36. Considering the ESPM 50AC students were a majority students studying some sort of science, the average NEP scores should have been higher (Goodale 2021). One explanation for this could be the polarity of different NEP items. Some items were positive, pro-environmental items, garnering medians of 5 on a 5-point likert scale, such as item 7, “Plants and animals have as much right as humans to exist.” Other items were negative, anti-environmental items, with medians of 1, such as item 12, “Humans were meant to rule over the rest of nature.” Given the strong environmental orientation of the ESPM 50AC students, it is expected that the respondents would hold strong opinions on the NEP items, which would lower the average NEP score if opinions were strongly negative on the negative NEP items. It was surprising to see that the average NEP scores between Rausser College students and Non-Rausser students were not at all different-- an average of 3.37 versus 3.36. I expected to see RCNR students holding slightly higher NEP scores (Goodale 2021).

In general, environmental worldview correlated more strongly to each type of environmental motivation than environmental knowledge did, though the overall correlation was still weak. The weak correlation was unexpected, as previous research suggests that environmental worldview and environmental motivation are linked positively (Hansmann et al. 2020, Pothitou et al. 2016), though this might have been due to the education levels of the study populations. In Hansmann et al. (2020), the survey respondents were far along in their bachelors’ degrees, masters’ students, or faculty whereas in the ESPM 50AC population, most of the students (51.5%) were only in their first semester of their bachelor’s degree. Instead, the correlations for students outside of Rausser College did show correlations more in line with what was expected. Biospheric

motivation held the strongest correlations to worldviews, especially for students outside of Rausser College. In such a highly motivated population, such as the Rausser College students in ESPM 50AC, it is possible a relationship would not show up clearly in the data. Although the correlation coefficients were weaker for Rausser College students, the Rausser College students held more certain environmental beliefs than non-Rausser students. There was less variation in the Likert scores of Rausser students and a lot more variation in the Likert scores of non-Rausser students (Figure 2). With high degrees of motivation in every person, there was a lack of low motivation scores to link to low worldview (or knowledge) scores. In other words, the narrow range of motivation scores paired with the wider range of worldview scores made for a murky quantitative relationship.

The strongest NEP correlations (with items 5, 9, 10, 12, and 15) indicate that environmental worldview is particularly related to biospheric motivation. Biospheric motivation is linked to an increased sense of personal responsibility around environmental actions (Shi et al. 2019). The ESPM 50AC results support this conclusion, as the previously mentioned NEP items that are most strongly correlated with biospheric motivation all carry a theme of environmental personal responsibility. Though worldview is not entirely correlated with any of the environmental motivation types, biospheric motivation proved to be significant. The relationships between environmental worldviews and biospheric motivation increases the opportunity to improve environmental motivation and therefore environmental behaviors.

The results of this study create more clarity around the distinction between environmental behavior and environmental motivation. Previous research showed that environmental behavior was linked to environmental motivation (Bouman et al. 2020) and that environmental motivation was not linked to environmental knowledge (Zannat et al. 2021). Where other studies in the past might have assumed environmental motivation when actually referring to environmental behavior, the results of the ESPM 50AC survey confirm that environmental motivation is barely linked to environmental knowledge. Because of the loose correlations of both worldviews and knowledge to environmental motivation, this means there are other factors that exist that more directly influence environmental motivation. This is an exciting opportunity to learn more about environmental motivation.

Limitations

One of the largest limitations of this study was the abstract nature of motivation in general. Because items like knowledge or NEP scores are somewhat more concrete than the concept of motivation, comparing motivation against these concepts was difficult to make sense of. A lot of existing research focused on environmental behaviors rather than environmental motivation, and I now understand why, as behavior is much more concrete than motivation. To address this, it would have been beneficial to conduct surveys or ask open-ended questions to gain more insight. Another limitation was the RCNR-bias of my sample population. Due to time constraints, I only had the ability to conduct one survey in one class, which limited the types of people who would be completing my research. A third limitation would be the way I altered the EMS, NEP, and EK survey items from their original form. Altering the items allowed for collection of relevant information. However, altering these scales created difficulty in contextualizing my results because it was not as straightforward to compare my results against the results of other surveys.

Broader Implications

This study confirmed the ambiguity of the relationship of environmental knowledge and worldview to environmental motivation. This suggests that these particular knowledge items and the NEP scale might not actually be the best methods of studying the relationship between environmental knowledge, values, and other variables. Although on a more general level my hypotheses were not supported, looking at the more detailed information did show that Biospheric motivation was linked to environmental knowledge, environmental worldviews, and environmental behavior. Future research should focus on the significance of biospheric motivation. The recurrence of biospheric motivations in these results indicates that there is room to learn more. Considering that the presence of one's biospheric motivation can foster biospheric motivation and environmentally friendly actions in other people (Carrico and Riemer 2011, Bouman et al. 2020), it is important to note any potential source of biospheric motivation. Knowing that there are specific points of environmental knowledge and environmental worldviews that more strongly connect to biospheric motivation will help inform future environmental education and the environmental attitudes formed through that education. With an eventual goal of increasing

environmentally friendly behavior through environmental motivation, pinpointing biospheric motivation will be beneficial in creating more environmentally conscious citizens.

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APPENDIX A

Environmental Motivation Questions

Please indicate your level of concern the consequences of environmental problems in terms of the following:

1. Biodiversity
2. Water quality
3. Air quality
4. My future
5. My health
6. People in my community
7. All people
8. Future generations

Environmental Behavior Questions

Please indicate how frequently you do the following (1- Never, 2-Sometimes, 3-About half the time, 4- Most of the time, 5-Always):

1. Recycle paper, plastics, glass and/or metal?
2. Avoid wasting water, paper, and/or energy?
3. Use reusable bags instead of plastic bags when grocery shopping?
4. Talk about environmental issues with other people?
5. Use social media to spread awareness of environmental issues?
6. Make financial contributions to environmental causes or pro-environmental organizations or political parties?
7. Participate in environmental groups (e.g., CALPIRG, SOGA, etc.)?
8. Engage in direct environmental actions (e.g., beach clean up or other conservation activities, etc.)?
9. Engage in environmental political acts (e.g. contacting elected officials, signing petitions, etc.)?
10. Engage in direct environmental activism (e.g. protests, marches, rallies, etc.)?

Environmental Worldview Questions

Please indicate your level of agreement or disagreement with the following (1-Strongly Disagree, 2-Somewhat Disagree, 3-Neither Agree nor Disagree, 4-Somewhat Agree, 5-Strongly Agree):

1. We are approaching the limit of the number of people the earth can support.
2. Humans have the right to modify the natural environment to suit their needs.
3. When humans interfere with nature it often produces disastrous consequences.
4. Human ingenuity will ensure we do NOT make the earth unlivable.
5. Humans are severely abusing the environment.
6. The earth has plenty of natural resources if we just learn how to develop them.
7. Plants and animals have as much right as humans to exist.
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.
9. Despite our special abilities humans are still subject to the laws of nature.
10. The ecological crisis facing humankind has been greatly exaggerated.
11. The earth has very limited room and resources.
12. Humans were meant to rule over the rest of nature.
13. The balance of nature is very delicate and easily upset.
14. Humans will eventually learn enough about how nature works to be able to control it.
15. If things continue on their present course, we will soon experience a major ecological catastrophe.

Environmental Knowledge Questions

1. There are many different kinds of animals and plants living in many different types of environments. What is the word used to describe this idea?
 - a. Multiplicity
 - b. Biodiversity**
 - c. Socio-economics
 - d. Evolution
 - e. Don't know
2. Carbon monoxide is a major contributor to air pollution in the U.S.. Which of the following is the biggest source of carbon monoxide?
 - a. Factories and businesses
 - b. People breathing
 - c. Motor vehicles**
 - d. Trees
 - e. Don't know
3. Which of the following is not considered a source of renewable energy?
 - a. Oil and coal**
 - b. Biomass burning
 - c. Solar radiation
 - d. Hydroelectric power plants
 - e. Don't know
4. Which of the following is a renewable resource?
 - a. Oil
 - b. Iron ore
 - c. Trees**
 - d. Coal
 - e. Don't know
5. Ozone forms a protective layer in the earth's upper atmosphere. What does ozone protect us from?

- a. Acid rain
 - b. Global warming
 - c. Sudden changes in temperature
 - d. Ultraviolet radiation**
 - e. Don't know
6. Where does most of the garbage in the U.S. end up?
- a. Oceans
 - b. Incinerators
 - c. Recycling centers
 - d. Landfills**
 - e. Don't know
7. Which of the following household wastes is considered a hazardous waste?
- a. Plastic Packaging
 - b. Glass
 - c. Batteries**
 - d. Spoiled food
 - e. Don't know
8. What is the most common reason that an animal species becomes extinct?
- a. Pesticides are killing them
 - b. Their habitats are being destroyed by humans**
 - c. There is too much hunting
 - d. There are climate changes that affect them
 - e. Don't know
9. Scientists have not determined the best solution for disposing of nuclear waste. In the U.S. what do we do with it now?
- a. Use it as nuclear fuel
 - b. Sell it to other countries
 - c. Dump it in landfills
 - d. Store and monitor the waste**
 - e. Don't know

APPENDIX B**Table 1: Summary of environmental knowledge scores, by major.**

Major	n	Mean	STDEV	MIN	MAX
ES	41	7.12195122	1.381939252	4	9
MEB	39	6.666666667	1.594948165	2	9
CS	22	6.409090909	1.893826836	1	9
SE	18	6.222222222	1.516790557	3	9
EEP	16	7.4375	1.504160896	5	9
MCB	16	6.5	1.211060142	5	8
CRS	15	7.866666667	1.125462868	5	9
Econ	13	6.076923077	1.656378503	4	9
MB	11	7.090909091	1.136181804	5	9
BA	5	6.6	1.341640786	6	9
IB	5	5	2.828427125	2	8
DS	4	7.25	0.5	7	8
EECS	4	6.75	2.872281323	3	9
Math	4	7.25	0.5	7	8
Arch	3	4.333333333	4.041451884	0	8
Chem	3	5.333333333	2.081665999	3	7
ChemE	3	6.666666667	0.5773502692	6	7
GPB	3	7	0	7	7
PoliSci	3	7.666666667	0.5773502692	7	8
Psych	3	5.333333333	1.527525232	4	7
Undeclared	3	7.666666667	1.527525232	6	9
Undeclared-CNR	3	7.666666667	2.309401077	5	9
Art	2	7	0	7	7
EMF	2	7.5	2.121320344	6	9
Eng	2	4.5	3.535533906	2	7

NST	2	4.5	0.7071067812	4	5
Physics	2	7	1.414213562	6	8
SED	2	8	0	8	8
BioE	1	6	N/A	6	6
Ethnic	1	5	N/A	5	5
Korean	1	1	N/A	1	1
Ling	1	8	N/A	8	8
MechE	1	7	N/A	7	7
PubHealth	1	5	N/A	5	5
Psych	1	6	N/A	6	6
Stat	1	4	N/A	4	4
Undeclared	1	8	N/A	8	8

Table 2: Environmental knowledge correlation coefficients. Correlation coefficients between knowledge and motivation, by Rausser College or non-Rausser College.

Knowledge item	All Respondents			RCNR Majors			Non-RCNR Majors		
	Bio	Altru	Ego	Bio	Altru	Ego	Bio	Altru	Ego
1: Biodiversity	0.08	0.0518	0.1066	0.0448	0.195	0.0782	0.0904	-0.0579	0.139
2: Carbon Monoxide	0.0843	0.00293	-0.0365	0.0699	-0.0271	-0.156	0.0688	0.0294	0.134
3: Renewable Energy	0.0767	0.0912	0.0355	-0.0691	-0.0934	-0.1302	0.127	0.212	0.179
4: Renewable Resources	0.1004	0.061	-0.0127	-0.0201	-0.0462	-0.09605	0.213	0.168	0.0868
5: Ozone	0.203	0.184	0.148	0.0983	0.0739	0.0373	0.2105	0.232	0.235
6: Landfills	0.0530	-0.0255	-0.0718	-0.019	-0.0957	-0.205	0.0543	-0.00201	0.0724
7: Hazardous Waste	0.0762	0.0605	0.0995	0.0352	0.0538	0.0917	0.118	0.07403	0.114
8: Extinction	0.0329	0.0246	0.00982	-0.0354	-0.0661	-0.0992	0.0740	0.0829	0.108

9: Nuclear Waste	0.0975	0.0376	-0.0392	0.0809	-0.0374	-0.117	0.0764	0.109	0.0604
Knowledge Score	0.145	0.0438	-0.0325	0.022	-0.0852	-0.231	0.225	0.162	0.219

Table 5 : NEP Correlation coefficients. Correlation coefficients between environmental worldview and environmental motivation, by Rausser College and non-Rausser College.

NEP Item	All Respondents			RCNR Majors			Non-RCNR Majors		
	Bio	Altru	Ego	Bio	Altru	Ego	Bio	Altru	Ego
1	0.214	0.123	0.139	0.167	0.0524	0.0360	0.204	0.1505	0.265
2	-0.232	-0.0864	0.0053	-0.149	-0.0263	0.0802	-0.255	-0.104	-0.0789
3	0.309	0.248	0.266	0.153	0.121	0.152	0.386	0.341	0.416
4	0.00250	0.0103	0.111	-0.0419	-0.00691	0.102	0.0566	0.0362	0.105
5	0.405	0.285	0.1904	0.224	0.0779	0.0837	0.463	0.428	0.293
6	0.0455	-0.0325	0.0689	0.00246	-0.0717	0.0873	0.08903	-0.0443	0.0438
7	0.382	0.213	0.153	0.249	0.129	0.113	0.280	0.195	0.142
8	-0.259	-0.118	-0.0385	-0.178	-0.0974	0.0307	-0.235	-0.111	-0.117
9	0.346	0.238	0.206	0.203	0.129	0.119	0.414	0.309	0.316
10	-0.316	-0.217	-0.153	-0.174	-0.0975	-0.0277	-0.393	-0.302	-0.3009
11	0.109	0.0826	0.0868	0.0196	-0.0348	0.00341	0.16005	0.185	0.201
12	-0.378	-0.214	-0.149	-0.169	-0.1105	-0.0668	-0.406	-0.215	-0.202
13	0.223	0.229	0.213	0.177	0.187	0.145	0.289	0.268	0.295
14	-0.167	-0.0920	0.0025	-0.00701	-0.0627	0.0966	-0.198	-0.0539	-0.0666
15	0.426	0.272	0.216	0.247	0.149	0.0973	0.524	0.358	0.364
NEP Score	0.127	0.139	0.233	0.0705	0.0458	0.173	0.188	0.235	0.310