

Environmental Perception: A Comparison between Southwestern U.S. and Honduras Agricultural-Related College Students



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Abstract

Understanding agricultural students' environmental perception is necessary to design meaningful interventions to enhance their environmental awareness. This study aims to understand and compare undergraduate students' environmental behavior and perceptions in the College of Agricultural Sciences and Natural Resources at a Southwestern United States (US) university and an agricultural university in Honduras (HN). The MANOVA and descriptive statistics show a large effect on the attitude-behavior relationship. Overall, HN students presented higher scores in attitudes, behaviors, and perceptions of environmental education at their university than students from the U.S. university. The most influential behavioral

factors for students are financial incentives, friends, and people who take action.

Keywords: undergraduate, agriculture, perceptions, attitudes, environment

Environmental problems are rapidly increasing worldwide (United Nations Environment Program [UNEP], 2016) and are intertwined in a complex web of relationships (Schultz & Zelezny, 1999). A critical component of this complex relationship is societies, which can alleviate or exacerbate the environmental status of an ecosystem (Jagers et al., 2017). As a result, the relationship between the environment and people, including people's perceptions

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and attitudes, has been widely studied throughout the years (Kollmuss & Agyeman, 2002; Kim et al., 2012). Understanding people's lifestyles, social identities, beliefs, and sense of environmental responsibility is essential to address environmental problems and create appropriate interventions (Atav et al., 2015; Fielding & Hornsey, 2016).

Recognizing people's environmental attitudes is critical to understanding their behavior toward the environment as they may predict people's behavioral intentions (Costarelli & Solloca, 2004; Leonidou et al., 2015). Environmental attitudes can be defined as the "psychological tendency to evaluate the natural environment and factors affecting its quality, with some degree of favor or disfavor" (Milfont, 2012, p.270). People's attitudes vary depending on the individual's culture and geographical location (Kim et al., 2012). Nevertheless, there are contexts in which people have more pro-environment attitudes than others (Pisano & Lubell, 2017). Studies also reflect the impact of people's political, economic, and social views on their attitudes toward the environment (Dunlap & McCright, 2008; Kim et al., 2012).

Environmental behavior is focused on understanding how context impacts people's actions (Pisano & Lubell, 2017). Studies focused on people's environmental behavior vary depending on the population, stressing the effect of society and culture on attitudes, perceptions, and behaviors (Tam & Chan, 2017). In addition, some studies support the belief that behaviors and attitudes toward the environment depend on people's experiences and complex interactions with their surroundings (Schultz & Zelezny, 1999; Stern, 2000). In a study developed by Arnold et al. (2009), researchers describe the positive influence of parents, outdoor experiences, friends, and role models on increasing youth's environmental attitudes and behaviors. Additionally, researchers found that based on the context, people's concerns about environmental issues and their behaviors can vary (Tam & Chan, 2018). However, researchers also found similar environmental attitudes and behaviors among different locations. For example, Schultz and Zelezny (1999) found similarities in environmental attitudes between different cultures, such as the United States and Latin America.

Concerns about the environment are increasing, and more people recognize the importance of pro-environmental actions (Funk & Kennedy, 2020). Several studies focused on understanding the attitudes and behaviors of the population to better design environmental interventions (Schultz & Zelezny, 1999; Taylor et al., 2009). These environmental interventions often come from education, which effectively promotes people's environmental attitudes and subsequent behaviors (Gifford & Nilsson, 2014). Designing educational interventions to enhance environmental attitudes is a complex task that needs to integrate the educational content with the target population's contextual realities and knowledge (Kollmuss & Agyeman, 2002; Taylor et al., 2009).

Universities now offer courses, programs, and projects focused on environmental education to increase environmental awareness and positively impact students' environmental behavior (Fu et al., 2017; Hsu, 2004; Pe'er et al., 2007). Several studies have been conducted to create

an effective educational intervention for youth (Corner et al., 2015; De Vreede et al., 2014; Schelly et al., 2012). However, these studies are focused on understanding the impact of these environmental education strategies in a specific context without exploring the impact they could have in more than one context.

College students pursuing a degree related to the environment, such as agriculture, natural resources, and ecology, have an essential role in the field as their practices directly influence the region's environment (Beekman, 2008; Duran Gabela et al., 2022; Lamino Jaramillo et al., 2022). Understanding the environmental attitudes and behaviors of college students involved in agriculture and the elements that influence them to take action is a necessary first step to creating a baseline and designing meaningful interventions to enhance environmental awareness (Sabiha et al., 2016). Ensuring that upcoming professionals possess the requisite attitudes and behaviors is paramount in enabling them to serve their respective fields most effectively.

Theoretical framework

The Theory of Planned Behavior proposed by Ajzen (1991) was the framework used for this study. This theory examines the components that can influence and change people's behavior. It has been applied to several disciplines and, in the last years, to environmental behaviors (Oreg & Katz-Gerro, 2006). The theory consists of three components that can influence an individual's behavioral intentions, resulting in a specific behavior: behavioral attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991). For this study, the theory constructs have been adapted to fit the components that influence pro-environmental behaviors.

These three components are defined in this study as follows. *Environmental attitudes* are students' attitudes toward the environment that will be impacted by different components, such as people's beliefs. *Subjective norms* are the social conditions, the context in which students live, and what the people around them think about the environment. Finally, *Perceived environmental behaviors* include students' willingness to take environmental action, including their perceived ability to act and the control they think they will have when performing an environmental action. Figure 1 shows the theory of planned behavior components.

Environmental education aims to impact environmental behaviors (Eilam & Trop, 2012). Thus, environmental educators must understand the three components influencing students' environmental behaviors. Understanding these potential relationships is essential to increasing people's environmental awareness (Grønhøj & Thøgersen, 2012) and environmental practices.

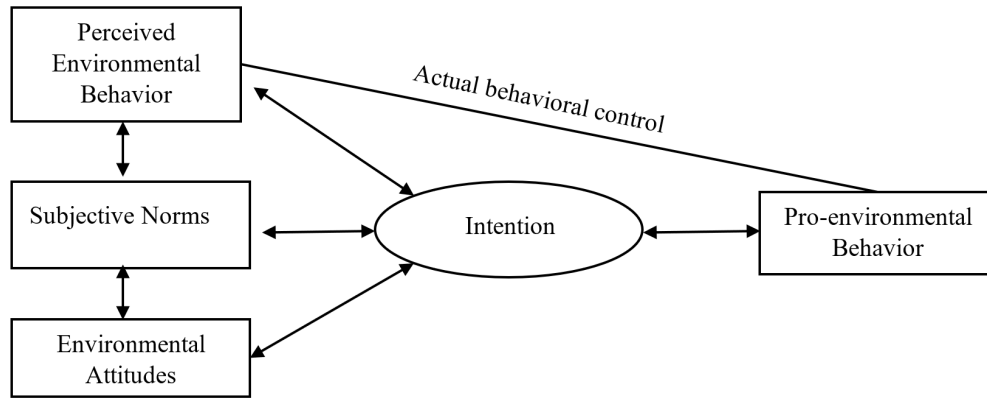
Purpose and Objectives

This study aims to understand and compare the environmental attitudes and behaviors of students from the College of Agricultural Sciences and Natural Resources (hereafter, CASNR) of a Southwestern United States (US) university and an agricultural university in Honduras

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Figure 1.

Theory of planned behavior (Ajzen, 1991)



(hereafter, HN). We hypothesized that there is a relationship between environmental attitudes and behaviors and that students' attitudes and behaviors differ among universities, more specifically among universities in different countries given geographically different contexts. Five specific objectives shaped the study:

1. To explore the relationship between environmental attitudes and behaviors
2. To compare students' environmental attitudes at both universities
3. To compare students' environmental behaviors at both universities
4. To evaluate students' perceptions regarding environmental education at their university
5. To propose alternatives to enhance students' behavior toward the environment.

Methods

For this quantitative study, the target population included undergraduate students pursuing a degree in agricultural sciences and natural resources from one university in the United States and one in Honduras. Since researchers are interested in understanding students majoring in agricultural sciences and natural resources, only students in CASNR at the US university were asked to participate in the study. In the case of the agricultural university in HN, the university's four majors are related to agricultural sciences and natural resources; thus, students from all majors were asked to participate in the study.

Instrument

Researchers created a 33-item instrument based on the "Attitudes toward Environmental Issues: Empirical Evidence in Europe and the United States" (Peycheva et al., 2014) and "The Environment: Public Attitudes and Individual Behavior—A Twenty-Year Evaluation" (Johnson, 2011). The instrument consisted of the following sections: demographic and participant's general information, environmental attitudes, environmental behaviors, perception of environmental education at their institution, and influences to take action. Multiple choice was used to

assess participants' demographic and general information. Likert-type items were used to measure the environmental attitudes and behaviors sections. Multiple-choice questions were also used to measure participants' perception of environmental education at their institution and participants' influences to take action.

The instrument was created in English for the CASNR students in the United States and pilot-tested to measure its reliability and validity before its distribution. Then, the instrument was translated into Spanish for the Honduran university participants. Finally, the Spanish version of the instrument was pilot-tested and reviewed to ensure its translation accuracy and reliability.

Data Collection

Data were collected after obtaining permission from the Human Research Protection Program, IRB2016-1164. Researchers asked professors' permission to visit their classrooms before the class to share information about the study and asked students to participate in the voluntary and anonymous survey. A total of 1,330 undergraduate students were part of the non-probabilistic convenience sample. The sample comprised 650 students from the CASNR and 680 students from HN.

Data Analysis

Data collected were transcribed to Excel®, coded, and analyzed using Statistical Package for Social Sciences (SPSS) v. 24 for Windows database. Missing data equivalent to less than 10% were mitigated through mean substitution. Questionnaires with less than 90% of data variables were not used in the analysis. Post-hoc reliability analysis was conducted after the data collection. For the English-version instrument, the reliability for the environmental attitudes construct was $\alpha = .80$; and for the environmental behavior construct, the reliability was $\alpha = .78$. For the Spanish-version instrument, the reliability for the environmental attitudes construct was $\alpha = .64$. The reliability for the environmental behavior construct was $\alpha = .77$.

Assumptions for a Multivariate Analysis of Variance (MANOVA) were reviewed, and researchers decided to

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eliminate 64 influential cases using Cook's distance (Fox, 2015). Skewness, kurtosis, and histograms were examined to ensure the data was normal and linear. To assess multicollinearity, VIF values were used. None of the variables had a VIF higher than 2; therefore, the sample assumed no collinearity. Homogeneity of covariance was analyzed through Box's test, showing a violation of the assumption; however, the literature suggests that Box's test is sensitive to large samples (Field, 2013). Since the sample sizes in this study are almost the same, studies usually disregard Box's test due to its instability (Field, 2013).

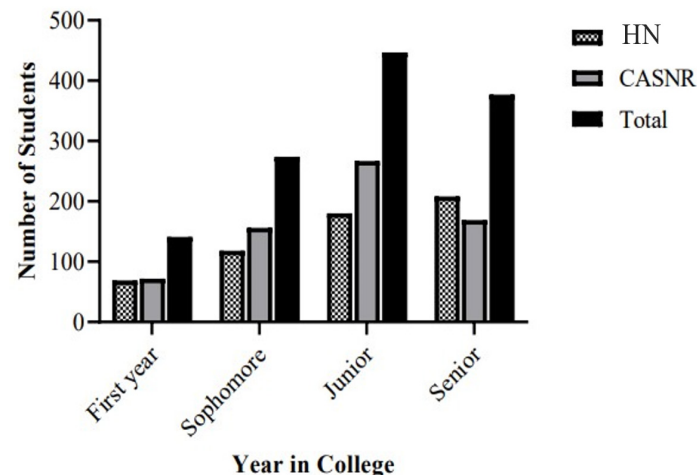
After data cleansing, the sample for CASNR was equivalent to 612, and the HN sample was equal to 621 for a total sample size of 1,233 students. The data collected were analyzed based on the objectives. Spearman's correlation was employed to determine the relationship between attitudes and behaviors. Multivariate Analysis of Variance (MANOVA) was used to compare the attitudes, behaviors, and students' perceptions regarding environmental education at their university. A follow-up analysis was conducted with a post-hoc Fisher's Least Significant Difference (LSD) analysis. Researchers used descriptive statistics to describe the sample and propose alternatives to enhance students' behavior toward the environment. An alpha level of .05 was established *a priori*.

Results

The sample collected consisted of 504 women and 729 men. In both universities, most participants were male ($n = 394$ in HN and $n = 335$ in CASNR). Women were represented by 224 participants in HN and 280 in CASNR. Students were asked to provide their years in college. Most of the participants of this study were from upper-level classes, with a total of 824 juniors and seniors. There were 415 first- and second-year students in the sample. Figure 2 shows the graphic representation of students' school classification year.

Figure 2.

Sample of the study based on the year in college



Participants selected which major they were pursuing. The HN university has a different approach to identifying majors than CASNR. All students are considered undeclared for the first two years at the HN university and receive the same curriculum. At the end of the second year, students can choose one of the university's four majors: 1) Agronomical Sciences, 2) Agroindustry, 3) Agribusiness, and 4) Environmental Sciences and Development. As seen in Figure 3, there are students from all the HN university degrees represented in this study, but more students in the sample were majoring in agronomical sciences.

Figure 3.

Distribution of students among majors in the sample from Honduran university

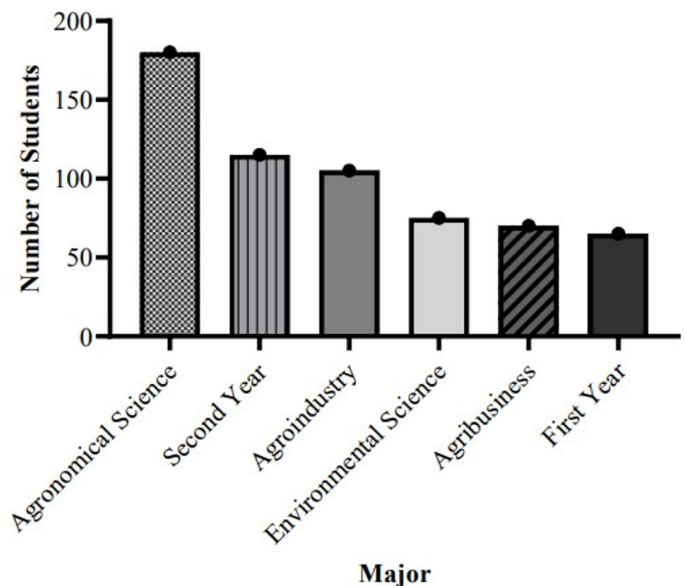
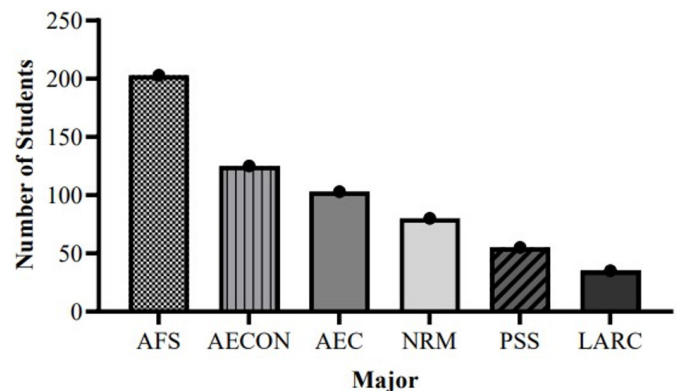


Figure 4 represents the sample distribution for CASNR students based on major. The college has six departments: 1) Agricultural and Applied Economics, 2) Agricultural Education and Communications, 3) Animal and Food Science, 4) Landscape Architecture, 5) Natural Resource Management, and 5) Plant and Soil Sciences. Most of the sample was composed of animal and food science students.

Figure 4.

Distribution of students among majors in the sample from Southwestern U.S. university



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To address the first objective, Spearman's correlation was used. Results showed a positive correlation between environmental attitudes and behavior, $r_s = .51$, $p < .001$. To address objectives two, three, and four, a MANOVA was conducted. Levene's test was violated; therefore, Pillai's Trace values were interpreted to ensure the tests were robust. There was a significant difference between CASNR students and HN students on at least one of the three dependent variables: attitudes, behaviors, and perceptions of environmental education at their universities, $V = 0.211$, $F(3, 1240) = 110.86$, $p < 0.001$, $\eta^2 = 0.21$. Consequently, a post-hoc LSD analysis was conducted to determine the differences in each dependent variable.

Objective two was intended to compare the attitudes at both universities. Results from the post-hoc LSD showed a significant difference between students' attitudes from CASNR and HN ($F = 167.57$, $p < 0.001$, $\eta^2 = 0.12$). On average, students from HN present higher environmental attitudes ($M = 3.98$, $SD = 0.50$), than students from CASNR ($M = 3.58$, $SD = 0.57$) on the five-point Likert-type scale, where 1 represented "strongly disagree" and 5 represented "strongly agree."

Objective three compared students' pro-environmental behaviors at both universities. Results from the post-hoc LSD showed a significant difference between the behaviors of students from CASNR and HN ($F = 213.65$, $p < 0.001$, $\eta^2 = 0.15$). On average, students from HN presented higher environmental behaviors ($M = 2.89$, $SD = 0.39$), than students from CASNR ($M = 2.55$, $SD = 0.43$) on the four-point scale, where 1 represented "never" and 4 represented "always."

Objective four aimed to evaluate students' perceptions regarding environmental education at their universities.

Table 1.

Mean Scores and Standard Deviations for Measures of Environmental Attitudes, Environmental Behaviors, and Perception of Environmental Education

Location of university	Environmental attitudes		Environmental behaviors		Perception of environmental education	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Honduras	3.98	.50	2.89	.39	1.49	.62
Southwestern U.S.	3.58	.57	2.55	.43	1.80	.55

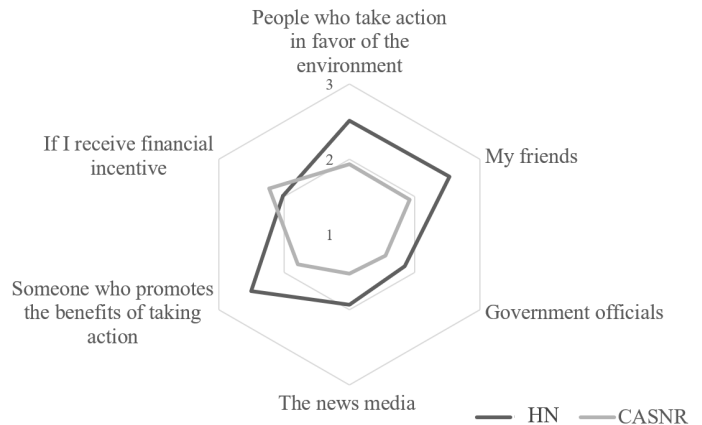
Table 2.

Multivariate and Univariate Analysis of Variance

	<i>F</i>	<i>p</i>	η^2
Multivariate	110.86	< 0.001	.21
Univariate			
Environmental Attitudes	167.57	< 0.001	.12
Environmental Behaviors	213.65	< 0.001	.15
Perception of Environmental Education	81.91	< 0.001	.062

Figure 5.

Radar chart showing students' responses toward factors that influence their environmental behavior.



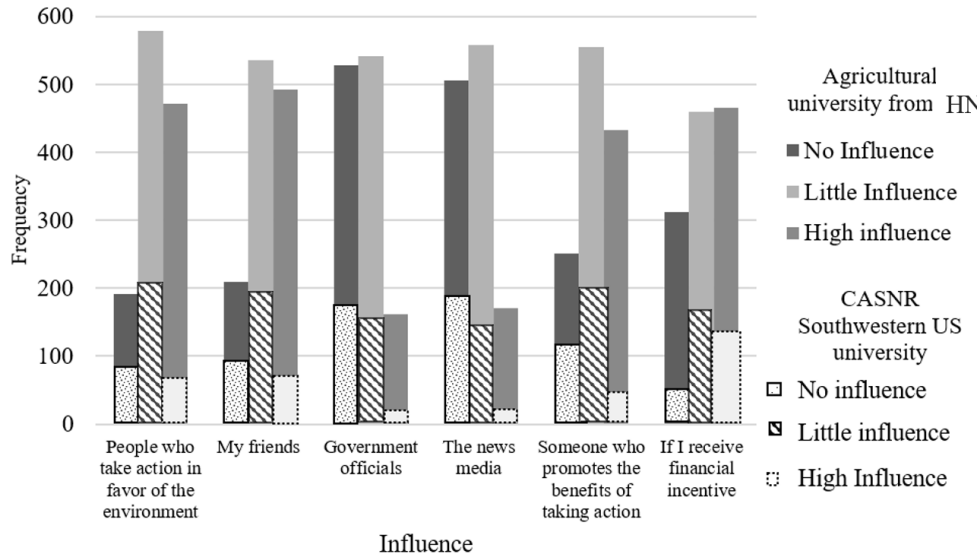
Results from the post-hoc LSD showed a significant difference between the perceptions of students from CASNR and HN ($F = 81.91$, $p < 0.001$, $\eta^2 = 0.06$). Students from HN presented a more positive perception of the efforts the university undertakes to educate students on environmental issues ($M = 1.49$, $SD = 0.62$) than CASNR ($M = 1.80$, $SD = 0.55$) on a scale from 1 to 3, where 1 represented "good," 2 "regular," and 3 "bad." Tables 1 and 2 summarize the results of objectives two, three, and four.

Objective five proposed to determine the alternatives students consider most efficient to improve students' pro-environmental behavior. Students from CASNR scored most of the initiatives provided by the researcher as less

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Figure 6.

Frequency bar chart showing the level of influence they receive per category.



influential than students from HN. Figure 5 shows that the most crucial strategy for CASNR students was receiving financial incentives (n = 236). The essential strategies for the HN students were: 1) my friends (n = 374), 2) people who take action (n = 360), and 3) someone who promotes the benefits of taking action (n = 358).

Figure 6 shows the strategies presented to students combined. Overall, students feel less influenced by government officials and the news media. Though they feel somewhat influenced by all the strategies, the highest levels of influence were found in the following: 1) my friends, 2) financial incentives, and 3) people who take action in favor of the environment.

Discussion

This study aimed to explore and compare a Southwestern U.S. and an agricultural university in Central America students' environmental behavior and perceptions. Since researchers did not use a random sample, results cannot be generalized. Still, the study provides sufficient evidence of the environmental perceptions, attitudes, and behaviors of CASNR and Central America.

There is a large effect size on the relationship between environmental attitudes and behaviors, accounting for 26.3% of the variance (Field, 2013), showing a strong relationship between environmental attitudes and environmental behaviors that need to be considered when developing initiatives. It is important to emphasize that this is not a cause-effect relationship, and these results do not tell which of the two variables is the cause and which is the effect. Future studies can be developed to understand the direction of the relationship between environmental attitudes and behaviors. However, the fact that there is a strong relationship between attitudes and behaviors provides evidence that education programs can have an impact on students' pro-environmental attitudes and behaviors (Davis, 1971).

Overall, the findings indicate that students from the university in Honduras exhibit greater environmental attitudes and behaviors than CASNR students. The medium effect sizes on attitudes ($\eta^2 = .12$) and behaviors ($\eta^2 = .15$) strengthen this study's results. These results differ from what Schultz and Zelezny (1999) found almost 20 years ago, in which attitudes were similar between the U.S. and Latin American students. This difference may be attributed to external sources of influence that vary through time, such as generational opinions and politics. The results obtained in this study support a previous study that emphasized the importance of context on attitudes and behaviors (Pisano & Lubell, 2017) and showed that environmental attitudes and behaviors could vary based on the context. It is necessary to highlight that although HN students presented higher scores in pro-environmental attitudes and behaviors, both universities' mean scores were in the "neither agree nor disagree" category of the environmental attitude construct, meaning that neither of the institution's student body has a strong environmental attitude toward the environment. In the environmental behavior construct, both universities' students' averages are between "rarely" and "sometimes" when asked about the environmental behaviors in their daily routines. Therefore, there is still room for environmental attitudes and behavioral growth, and improvement at both universities.

Students' perceptions of environmental education were higher in HN than in CASNR. This comparison has a low effect size ($\eta^2 = .06$). However, both universities' students perceive environmental education between "regular" and "good." This is an exciting finding, especially since students' environmental behaviors and attitudes were not reported as high. According to Eilam and Trop (2012), this can depend on the type of environmental education the institutions provide and their purpose. Also, this study has the limitation of not being a longitudinal study, so it may be that education impacted their pro-environmental attitudes and behaviors.

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Therefore, future studies can focus on understanding these institutions' environmental education initiatives and the intended impact on students' environmental behaviors and attitudes. Understanding this relationship would help educators evaluate the effectiveness of the programs, thus allocating their efforts and budget accordingly.

The U.S. University has an office of sustainability to encourage the population to adopt sustainable and environmental efforts. Most of the efforts provided by this office have been focused on recycling, improving transportation options on campus, promoting energy-saving strategies, and providing water bottle refill stations, among others. Most of these actions focus on improving the institution's sustainability scores by implementing pro-environmental actions. On the other hand, the agricultural university in HN also has several pro-environment initiatives, including the enactment of an environmental policy, the execution of an environmental management program, and the construction of a solar park that covers a considerable proportion of the university's energy needs (Carvajal, 2021; Escuela Agrícola Panamericana El Zamorano, 2022; Mora, 2013). Both institutions are working toward increasing the environmental initiatives on campus. However, students have limited opportunities to participate in programs that increase their pro-environmental attitudes and behaviors. Therefore, it is recommended to provide more opportunities for students to participate in workshops and activities focusing on increasing environmental awareness and assessing these interventions to ensure their effectiveness (Eilam & Trop, 2012).

Researchers also explored strategies that participants considered could improve students' environmental behavior. There are different responses depending on the university, so it is essential to explore these responses individually to target the populations with the most appropriate intervention. Although these students live and study in different contexts, they have similar career interests and will be future leaders in agriculture and natural resources. For CASNR students, economic incentives are the most effective way to improve participants' environmental behavior. Although the CASNR students identified this strategy as the most effective way to improve their environmental behavior, experts suggest that economic incentives are not extrinsic and do not necessarily promote behavioral change (Gneezy et al., 2011). Gneezy and colleagues (2011) suggest that when there is an extrinsic incentive, students will only participate in the initiatives if there is a monetary reward and do not promote a change in attitudes or behavior. Although students considered that having an economic incentive would be the best way to increase their environmental behavior, their responses show a lack of intrinsic motivation to take action and a need for an external source to compel them to act. Therefore, other influences and strategies to increase environmental attitudes and behaviors must be studied, aiming at an intrinsic strategy to increase students' attitudes and perceptions toward the environment.

HN students achieved the highest scores in the category of influence, particularly in the affective domain. This indicates their sensitivity towards environmental issues, feelings of concern, and motivation to take action (Lovren

& Jablanovic, 2023). Several studies explore the impact of friends on college students (De Vreede et al., 2014; Lovren & Jablanovic, 2023). According to Social Norms Theory, students feel compelled to engage in certain behaviors to gain acceptance from their peers (Perkins & Berkowitz, 1986). For students from HN, placing interpersonal relationships is a reason to take action.

Another area of influence for environmental action among students from the HN University was to have someone explain the benefits of taking action. These results show that education can be an important determinant in improving the environmental behavior of students in HN if it is focused on teaching students the benefits and reasons for taking action (Boca & Saraçlı, 2019). Students want to know why adopting an environmental attitude is essential, and education is the perfect way to address this issue.

According to the Theory of Planned Behavior (Ajzen, 1991), three constructs need to be considered to achieve a change of behavior and increase the environmental behavior of students over the long term. The first construct is attitude. Does having an environmental attitude make sense for the students? In this case, students' environmental attitude scores are low at either university, and this component is crucial so that behavior persists over time. The second construct, subjective norms, is related to the context, including the impact of family and friends. This is related to what others think of the behavior in question and influences the decision to take action. The universities have two different contexts, and the students' experiences are different. Results show that students from HN consider the opinion of their friends and those who take action as "very important." This was not particularly visible in the CASNR sample, as influence from others was not an important component.

Finally, the last component of this theory is perceived behavioral control. This construct relates to the perceived control individuals believe they will have if they adopt a behavior. If one of these constructs is not deemed as favorable by an individual, it is not likely that the person will adopt the behavior under consideration. Additionally, subjective norms impact environmental behavior, as seen in the effect that context has on the participating students in both institutions. As a result, the Theory of Planned Behavior can explain pro-environmental behaviors.

Summary

This study aimed to explore and compare the environmental behavior and perceptions of agricultural-based students from a Southwestern U.S. university and an agricultural university in Honduras. There is a strong relationship between environmental attitudes and environmental behaviors which needs to be considered when developing initiatives to improve environmental behavior. Overall, results showed that students from the university in Honduras present higher environmental attitudes and behaviors levels than students in the Southwestern U.S. Students' perceptions of environmental education were also higher in HN than in CASNR. However, both universities' students perceive environmental education between

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“regular” and “good.”

Similarly, both institutions are working toward increasing the environmental initiatives on campus. However, students have limited opportunities to participate in programs that increase their pro-environmental attitudes and behaviors.

Economic incentives are the most effective way to improve participants' environmental behavior in students from the Southwestern U.S.; in contrast, students from HN showed the highest scores on influence and mainly on the affective domain category, such as seeing other people taking environmental action and having friends who promote environmental behaviors (Lovren & Jablanovic, 2023). These results can lead researchers and teachers to better strategies to improve the environmental behavior.

This study can be replicated in a different context to understand if changing environmental behaviors can impact environmental attitudes. Additionally, it is recommended to use a random sample to generalize the results of the population. This study focused on students from agriculture and natural resources majors. Future studies should explore students' environmental attitudes and behaviors from other disciplines to create a baseline for educational interventions on campus.

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