

An Educational Exploration of Generation Z's Systems Thinking Tendencies and Green Consumer Values

Abstract

University agricultural educators are challenged to employ innovative approaches to prepare undergraduates in agriculture and natural resources to address complex global problems while understanding interconnected systems. Undergraduates, current members of Generation Z (Gen Z), prefer environmental sustainability and innovation, but solutions for addressing these preferences in educational settings remain elusive. Exploring Gen Z's environmental consumption values and how those values relate to their systems thinking tendencies may provide university educators with insights on how to approach complex topics with Gen Z students. The purpose of this study was to examine the association between Gen Z students' green consumer values and systems thinking tendencies. Data were collected using a web-based survey instrument of 68 undergraduate students at the University of Georgia. Findings revealed respondents somewhat agreed they had green consumer values and respondents often used systems thinking when seeking to make an improvement. A Spearman's rank-order correlation coefficient indicated a positive, yet weak, association between systems thinking tendencies and green consumer values. The association necessitates further exploration. University agricultural educators should incorporate systems thinking educational strategies into classrooms to potentially increase Gen Z students' engagement in systems thinking when addressing complex agricultural issues, like sustainability. Additional implications for systems thinking and teaching are explored.

Keywords: systems thinking; environmental consumption; Generation Z; agriculture and natural resources education

Introduction

The 2021 inaugural United Nations (UN) Food Systems Summit emphasized a difficult truth – the world's food systems are broken. Hosted in an effort to address the grand challenges associated with the world's current food systems, the summit called for action by “external and internal drivers, as well as through feedback mechanisms between these drivers” (von Braun et al., 2021, p. 748). As countries work cohesively to address food systems issues and reach the UN Sustainable Development Goals (SDGs), they seek to move toward sustainable food systems (*Future food systems: For people, our planet, and prosperity*, 2020). Within sustainable food systems, food production occurs with the intent to limit harm to the long-term functionality of the natural environment by reducing “biodiversity loss, pollution, soil degradation, or climate change” (*Future food systems: For people, our planet, and prosperity*, 2020, p. 15). The current generation of students pursuing higher education degrees in agriculture and natural resources are a crucial part of creating innovative, transdisciplinary approaches to address emerging ecosystem issues in changing global societies (Chang et al., 2020). Colleges of agriculture and natural resources must use innovative educational methods to produce graduates who understand the differences between and connections among complex global systems (Foster et al., 2014; Hunter et al., 2006).

Today's university undergraduate students are primarily classified in the United States (U.S.) within the generational cohort known as Generation Z (Gen Z) – individuals born between 1995 and 2012 (Maloni et al., 2019). From an educational perspective, studies have found that Gen Z students are skilled at multitasking and value creativity (Schwieger & Ladwig, 2018). However, Gen Z students may not feel prepared for the challenges of the real world and often have short attention spans (Schwieger & Ladwig, 2018). Thus, teaching Gen Z students is unlike educating any other generation, especially considering their preferences for innovative technology and instant access to information (Cilliers, 2017; Nicholas,

2019). Educators must build upon existing Gen Z characteristics such as technical orientation and problem-solving ability by providing knowledge and experiences that will prepare Gen Z students to navigate a quickly evolving workforce that has unique expectations for entry-level employees from this tech-savvy generation (Schwieger & Ladwig, 2018).

The consumption values of Gen Z have been studied from a generational marketing perspective to understand their food consumption as related to their common values (Garai-Fodor, 2019) and typical behaviors (Kamenidou et al., 2019) but pose a particular challenge for marketers because of their focus on constant innovation (Priporas et al., 2017). Still somewhat elusive from both an educational standpoint and a consumer standpoint, further exploration of Gen Z is necessary to understand how instructors can best utilize Gen Z's generational cohort characteristics when educating and preparing them for future careers in agriculture and natural resources (Schwieger & Ladwig, 2018). Exploration of how to best educate Gen Z may be instrumental in addressing the world's wicked problems from a holistic perspective considering both social and ecological factors (Pauley et al., 2019).

One defining characteristic of Gen Z is their emergence as the "sustainability generation" (Petro, 2022). According to the 2021 global survey of Millennials and Gen Z, compared to preceding generations, Gen Z is more concerned about climate change and protecting the environment than almost any other issue and values the environmental impact and sustainability of their purchasing habits (Deloitte, 2021). Gen Z is more likely to engage in sustainable consumption due to their environmental concern – also identified in the literature as green, environmentally friendly, ethical, and ecologically friendly consumption (Halder et al., 2020). The agricultural and natural resources industries have been called upon to foster sustainable practices within the formative years of Gen Z's upbringing, necessitating adaptability within the industries (Pauley et al., 2019). Therefore, exploring the environmentally friendly, or green, consumption values unique to Gen Z may give university agricultural educators insight into how to connect with students about broad-reaching, systemic problems related to environmentally conscious, sustainable production and consumption patterns within the food system.

Green consumption has been associated with responsible handling of personal financial and physical resources (Haws et al., 2014), while cultural and geographic differences between students in different countries have been shown to play a role in students' pro-environmental behavior (Vicente-Molina et al., 2013). However, the relationships between socio-demographic characteristics and environmentally conscious behaviors are extremely complex, making it difficult to profile consumers by their environmental consciousness and associated behaviors (Diamantopoulos et al., 2003). For example, Gen Z students' consumption behaviors surrounding certain types of food are not only influenced by their knowledge, views on the sustainability of food production, and opinions about regulations, but are connected to Gen Z students' personal identities, experiences with food, and their familial relationships (Gibson et al., 2023). Understanding more about students' decision-making patterns and values associated with green consumption may help agricultural educators understand more about the values students hold and the influence they may have on students' consideration of complex systems-based problems.

The current study sought to investigate the association between Gen Z undergraduate students' systems thinking tendencies and their green consumption values in order to explore connections agricultural educators can make between environmentally friendly consumption and systems thinking. By tapping into sustainable consumption mindsets which have been associated with Gen Z (Petro, 2022), teachers may be able to draw systems thinking connections while preparing students for a globalized workforce seeking to solve wicked problems (Foster et al., 2014; Hunter et al., 2006). Therefore, the current study addresses a key value of the American Association for Agricultural Education (AAAE)'s research values: Advancing Public Knowledge of AFNR Systems (AAAE, 2023).

Conceptual Framework

The conceptual framework guiding the current study was the integration of systems thinking and green consumerism.

Systems Thinking

Systems thinking is an educational perspective that has been proposed as a solution to guide students in comprehending and taking actions to solve issues with intricate and interconnected elements, such as the complex challenges facing the food system (Monroe et al., 2015; Reynolds et al., 2018). Systems thinking may help students understand and explain the dynamics of complex systems that have evolved over time (Sweeney & Sterman, 2000). However, systems thinking capacities are one of the most challenging skills for students to acquire (Molderez & Ceulemans, 2018), and agriculture and natural resource educators are challenged to utilize a systems thinking framework to encourage students to solve global grand challenges (Pauley et al., 2019).

Systems thinking is frequently studied in the health field because it considers the constantly changing context, actors, and interactions within a system (Rusoja et al., 2018). Recently, systems thinking has received attention as an approach for STEM education (e.g., York et al., 2019) and, more specifically, sustainability education (e.g., Molderez & Ceulemans, 2018). For example, systems thinking has been used as a mechanism in education to emphasize the importance of understanding the environmental chemistry consequences behind individual consumer choices and how certain products affect other systems in a society (Murphy et al., 2019). In the classroom, instructors who have utilized systems thinking approaches have reported active participation among students, deeper understanding of content, students asking better questions, and students making connections between and within concepts (York et al., 2019). By utilizing systems thinking scenarios in the classroom, educational researchers have additionally encouraged students to explore how individual decisions may affect the food system as a whole, thus challenging them to think beyond obvious answers and propose systems-minded solutions (Sanders et al., 2022; Sanders et al., 2023). According to Molderez and Ceulemans (2018), “the competencies for systemic thinking and handling complexity were fundamental for students to be able to understand contemporary societal challenges and to shape a more sustainable world” (p. 758). Systems thinking is therefore well suited for the ambiguous context of sustainability (Molderez & Ceulemans, 2018), yet it has not been widely integrated into STEM education (York et al., 2019). While systems thinking is currently being employed in a STEM education context, there is limited literature surrounding systems thinking as an approach in agricultural and natural resource education.

Green Consumerism

Promotion of green products is widespread and the idea of purchasing green products is supported by many consumers (Schuitema & de Groot, 2014). Haws et al. (2014) defines green consumption values as “the tendency to express the value of environmental protection through one’s purchases and consumption behaviors” (p. 337). However, the idea of purchasing green products is not always translated to actual purchasing behavior, indicating green consumerism may be influenced by a variety of unknown factors, meriting further research (Schuitema & de Groot, 2014). Environmental education programs have been found to increase consumers’ green purchasing behavior. For example, Percy (2009) found a significant positive relationship between college student involvement in informal environmental education programs and their green consumption behavior.

Not all consumers will purchase green products regardless of their environmental benefits (Haws et al., 2014), but Gen Z students may have higher green consumption values than prior generations considering their stance on environmental issues (Deloitte, 2021). Green consumption values influence green consumer behavior in that consumers tend to purchase more green products when they are aware their purchase patterns will not harm the environment (Alagarsamy et al., 2021). While individuals with greater green consumption values hold stronger preferences for sustainable consumption, the impact of cultural

values and ethical ideologies on green consumption values adds to the complexity of translating green values to green consumer behavior (Halder et al., 2020).

Although Gen Z students value the environmental impact and sustainability of their purchasing habits (Deloitte, 2021), barriers such as product cost may limit actual purchasing behavior (Schuitema & de Groot, 2014). Additional relevant barriers that may hinder Gen Z consumers from transferring green consumption values into purchasing behavior include perceptions of quality, brand loyalty, and convenience of acquiring green products (Moser, 2015). It is possible systems thinking tendencies play a role in green consumption considering the complexities associated with green consumerism. Therefore, this study aims to add to the existing literature by examining green consumer values in relation to systems thinking within agriculture and natural resources classrooms.

Purpose and Research Objectives

The purpose of this study is to describe the association between students' green consumer values and their systems thinking tendencies using the following objectives:

1. Describe students' green consumer values and systems thinking tendencies.
2. Determine if an association exists between students' green consumer values and their systems thinking tendencies.

Methods

This quantitative study was part of a larger research project designed to explore undergraduate students' systems thinking tendencies related to sustainable seafood consumption through an online survey and focus groups (Gibson et al., 2023; Sanders et al., 2022; Sanders et al., 2023). Data were collected from University of Georgia undergraduate students enrolled in classes within the College of Agricultural and Environmental Sciences. Two parts of the online survey instrument were used for the current study: a systems thinking scale and green consumer values scale. The study was approved by the University of Georgia Institutional Review Board (Protocol #00004479).

Instrumentation

A web-based survey instrument was created using the Qualtrics online survey platform and included demographic and Likert-type questions. Students' green consumption values were measured using the GREEN scale, which is a six-item scale measuring green consumer values rather than behavior (Haws et al., 2014). The seven-point Likert-type scale asked respondents to indicate their level of agreement or disagreement with a set of six questions related to their green consumption values (1 = *Strongly disagree*; 2 = *Disagree*; 3 = *Somewhat disagree*; 4 = *Neither agree nor disagree*; 5 = *Somewhat agree*; 6 = *Agree*; 7 = *Strongly agree*). Scale reliability was calculated post hoc ($\alpha = 0.87$). Responses were averaged to form a single green consumption values score between one and seven.

Systems thinking tendencies were measured using a 20-item researcher-adapted systems thinking scale (Dolansky et al., 2020). Respondents were asked to indicate their personal process for making improvements using a five-point Likert Scale (0 = *Never*; 1 = *Seldom*; 2 = *Some of the time*; 3 = *Often*; 4 = *Most of the time*). For example, "When I want to make an improvement...I look beyond a specific event to determine the cause of the problem" (Dolansky et al., 2020, p. 2318) or "When I want to make an improvement...I keep in mind that proposed changes can affect the whole system" (Dolansky et al., 2020, p. 2318). Scale reliability was calculated post hoc ($\alpha = 0.89$). Responses were summed to provide an overall systems thinking score ranging from zero to 80 (Dolansky et al., 2020).

To ensure content validity, a team of experts in survey design, agricultural and environmental communication, and program evaluation reviewed the instrument to ensure the previously validated scales

were appropriate for the context under which the present survey was conducted. The instrument was pilot tested with seven individuals who were Gen Z students to further confirm face validity. No modifications were made to the scales based on responses to the pilot study.

Data Collection and Analysis

Respondents who participated in the study were undergraduates at the University of Georgia in courses within the College of Agricultural and Environmental Sciences. Students were invited to participate in the study because of their enrollment in these classes but were informed that choosing not to participate in the study would not affect their course standing or grade. Students who consented to participation answered hypothetical case scenarios (HCS) or “choose your own adventure” scenarios related to systems thinking archetypes outlined by Rutherford (2019) before completing the survey. It is possible the manner in which the HCS were presented may have affected student responses to the present constructs within the survey and is recognized as a limitation. However, to researcher knowledge, participants were not exposed to educational interventions about systems thinking or green consumer values prior to engaging in the survey, therefore limiting exposure. Data collection began November 10, 2021 and concluded April 20, 2022 based upon scheduling availability in undergraduate courses.

Responses from 68 students were obtained across five classes. Responses were eliminated from any students who fell outside the Gen Z demographic age maximum of 26 at the time of the survey. Detailed demographics of respondents can be found in Table 1.

Table 1

Demographics of Respondents (N = 68)

	<i>f</i>	<i>%</i>
Gender Identity		
Male	20	29.4
Female	47	69.1
Age		
18	3	4.4
19	15	22.1
20	14	20.6
21	16	23.5
22	13	19.1
23	6	8.8
24	1	1.5
Race/Ethnicity ^a		
White	55	80.9
Black or African American	8	11.8
Asian	2	2.9
Hispanic or Latino/a/x	4	5.9
Prefer to self-describe (Middle Eastern)	1	1.5
Student Classification		
First-year student	4	5.9
Sophomore	12	17.6
Junior	25	36.8
Senior	24	35.3
Graduate student	1	1.5
Other (Exchange Student)	1	1.5
College Enrollment		
College of Agricultural and Environmental Sciences	44	64.7

College of Arts and Sciences	9	13.2
College of Business	6	8.8
School of Public and International Affairs	2	2.9
College of Engineering	1	1.5
College of Journalism and Mass Communication	1	1.5
College of Education	1	1.5
Undeclared	1	1.5

Note. ^aRespondents were permitted to select more than one race or ethnicity.

Data were analyzed using SPSS 26. The Spearman rank-order correlation coefficient was used to determine the nonparametric strength and association between the two variables (Leclezio et al., 2014). Non-parametric testing was used because the sample did not meet normality assumptions. The correlation coefficients for Spearman rank-order range from -1 to +1, with values closer to 1 indicating a stronger relationship. The strength of the relationship should be interpreted as: 0.01-0.19 no relationship, 0.20-0.29 weak relationship, 0.30-0.39 moderate relationship, 0.40-0.69 strong relationship, and greater than or equal to 0.70 very strong relationship (Leclezio et al., 2014).

Results

Respondents indicated their level of agreement or disagreement with items on the GREEN scale (Haws et al., 2014). More than half of respondents (54.4%) somewhat agreed they would describe themselves as environmentally responsible. The majority of students also agreed or strongly agreed (69.1%) they were concerned about wasting the resources of our planet. Out of all items in the GREEN scale, the item with the lowest percentage agreement was that purchasing habits were affected by environmental concern, with only 2.9% strongly agreeing with the statement. However, 60.3% of respondents somewhat agreed or agreed that their purchasing habits were affected by these environmental concerns. The mean GREEN scale score revealed respondents somewhat agreed they valued environmentally friendly consumption ($M = 5.27$, $SD = 0.85$).

Table 2

Respondents' Green Consumer Values (N = 68)

	Strongly disagree %	Disagree %	Somewhat disagree %	Neither agree nor disagree %	Somewhat agree %	Agree %	Strongly agree %
I am concerned about wasting the resources of our planet.	0	0	2.9	2.9	25	38.2	30.9
It is important to me that the products I use do not harm the environment.	0	0	5.9	5.9	38.2	32.4	17.6
I am willing to be inconvenienced in order to take actions that are more	0	2.9	4.4	16.2	30.9	32.4	13.2

environmentally friendly.							
I consider the potential environmental impact of my actions when making many of my decisions.	0	0	7.4	13.2	32.4	35.3	11.8
I would describe myself as environmentally responsible.	0	1.5	8.8	8.8	54.4	16.2	8.8
My purchase habits are affected by my concern for our environment.	1.5	4.4	14.7	16.2	41.2	19.1	2.9

Respondents indicated their personal process for making improvements through their responses to the systems thinking scale (Dolansky et al., 2020). With the exception of one item, no respondent indicated they never engaged in systems thinking when seeking to improve a situation. Respondents indicated they often engaged in most systems thinking tendencies. A majority of students (89.7%) indicated the understanding of how a chain of events occurs is crucial in making improvements often or most of the time. The mean systems thinking scale score indicated respondents were often using systems thinking ($M = 61.26$, $SD = 8.67$) when they wanted to make an improvement.

Table 3

Students' Systems Thinking Tendencies (N = 68)

	Never %	Seldom %	Some of the time %	Often %	Most of the time %
I think understanding how the chain of events occur is crucial.	0	1.5	7.4	35.3	54.4
I keep in mind that proposed changes can affect the whole system.	0	0	7.4	45.6	47.1
I think more than one or two people are needed to have success.	0	2.9	20.6	33.8	42.6
I consider the cause and effect that is occurring in a situation.	0	1.5	8.8	45.6	41.2
I include others to find a solution.	0	0	10.3	51.5	38.2
I consider that the same action can have different effects over time, depending on the state of the system.	0	1.5	16.2	44.1	38.2
I think that systems are constantly changing.	0	2.9	19.1	41.2	36.8
I consider how multiple changes affect each other.	0	1.5	14.7	47.1	36.8
I think about how different individuals might be affected by the improvement.	0	0	14.7	48.5	36.8
I recognize system problems are influenced by past events.	0	0	2.35	41.2	35.3

I think small changes can produce important results.	0	0	20.6	44.1	33.8
I think recurring patterns are more important than any one specific event.	0	1.5	29.4	36.8	32.4
I see everyone's view of the situation.	0	2.9	17.6	48.5	30.9
I think of the problem at hand as a series of connected issues.	0	2.9	23.5	42.6	30.9
I look beyond a specific event to determine the cause of the problem.	0	1.5	14.7	54.4	29.4
I keep the overall mission and purpose of systemic changes in mind.	0	0	23.5	47.1	29.4
I consider history and culture related to potential actions.	0	1.5	23.5	45.6	29.4
I consider the relationships among stakeholders.	1.5	10.3	38.2	26.5	23.5
I try strategies that do not rely on people's memory.	0	16.2	33.8	30.9	19.1
I propose solutions that affect a particular environment, not specific individuals.	0	7.4	50	30.9	11.8

Spearman's rank-order correlation coefficient was computed to assess the association between respondents' green consumer values and systems thinking tendencies. There was a positive, yet weak, association between the two variables, which was statistically significant ($r_s(65) = .276, p = .029$; Leclezio et al., 2014).

Table 4

Spearman's Rank-Order Correlation Coefficient

	<i>N</i>	<i>r_s</i>	<i>df</i>	<i>p</i>
GREEN scale and Systems Thinking scale	67	.276	65	.029*

Note. * $p < .05$.

Conclusions, Recommendations, and Implications

To address the grand challenges associated with the world's complex food systems, those involved in food production must appropriately consider effects on the natural environment while striving to feed a growing population (*Future food systems: For people, our planet, and prosperity*, 2020). Future generations of agriculture and natural resources students are a vital part of creating these systemic changes that will address the world's wicked problems (Foster et al., 2014). Understanding the thought processes and values of Gen Z students may be a useful tool in strategically equipping students to face interdisciplinary obstacles, especially as educators must determine how to sharpen Gen Z students' existing skills and characteristics to prepare them for the workforce (Schwieger & Ladwig, 2018). The current study examined the systems thinking tendencies and green consumption values of Gen Z undergraduate students and explored the association between the two constructs.

There are a few limitations that need to be addressed before the findings are discussed. First, the present research was limited by a small sample size and convenience sampling. Therefore, the results are not generalizable and may differ with a more representative population of Gen Z college students. Additionally, respondents were exposed to HCSs about sustainable seafood within the survey instrument in advance of answering the GREEN and systems thinking tendencies scales. Because the results from the HCS highlighted environmental, economic, community, and personal consequences about making certain choices within a system (See Sanders et al., 2022; Sanders et al., 2023), respondents may have been more

inclined to answer questions with these concepts in mind. Next, all respondents were enrolled in classes within a college of agricultural and environmental sciences. While the respondents held a variety of majors in colleges across campus at a large university, enrollment in these specific courses and the course content may have affected their responses to the survey constructs. Finally, considering the context in which the survey was administered, the results may be influenced by social desirability bias, or when respondents answer an item in the way they think is viewed favorably by others,

Acknowledging the limitations, the study does provide valuable insight as agricultural educators strive to explore the relationships between green consumerism and systems thinking as a mechanism to better understand students' thought processes. Respondents agreed it was important products did not harm the environment. For the GREEN scale, the response item with the strongest agreement corresponded with concern over wasting the resources of the planet. The findings aligned with Gen Z's overall concern with climate change and protecting planetary resources (Deloitte, 2021). Respondents were less likely to agree their purchasing behaviors were influenced by concern for the environment. Even though Gen Z students are acquiring more purchasing power and attracting the attention of marketers (Priporas et al., 2017), the respondents were college students who generally have lower incomes and less disposable income than counterparts who may be employed full-time. Green consumer values do tend to align with responsible management of personal finances (Haws et al., 2014); however, green consumer values do not account for the income level of college students, who may not be able to afford environmentally friendly products. Respondents also may perceive purchasing green products as inconvenient or misaligned with their brand preferences (Moser, 2015).

Respondents also indicated they engaged in practices associated with systems thinking at least some of the time when attempting to make an improvement within a situation with complex problems. For the systems thinking tendencies scale, respondents agreed that most of the time in making improvements, understanding the chain of events is crucial. However, respondents less frequently indicated they consider the relationships among stakeholders. This could be because respondents were unsure about the definition of stakeholders or may not have considered all active stakeholders within a system. Respondents indicated they often think systems are constantly changing, which aligns with the Gen Z focus on innovation (Priporas et al., 2017). However, while students said they often or most of the time choose to include others to find a solution, this is contradictory to literature on Gen Z that indicates students are focused on individualism (Schwieger & Ladwig, 2018). Overall, the students' scores were relatively high on the systems thinking scale.

The relationship between green consumer values and systems thinking was small, but the association between the two constructs indicates a need for further investigation. The weak association may be due to the small sample size or the limited sample characteristics as only college students within classes in a college of agricultural and environmental sciences were included. It is also possible that Gen Z does not think about green consumption in systems because sustainability is ingrained in their generation and, therefore, Gen Z cohort members prioritize green consumption regardless of the situation and their corresponding systems. However, prioritizing sustainability without regard to systems may not always be the most effective approach to grand challenges associated with food systems because of the multiple stakeholders at play. Future studies using a larger sample size or qualitative methods should investigate the relationships between specific scale items related to green consumer values and systems thinking tendencies. Exploring the relationships between specific items may complement existing literature on helping Gen Z college students connect concepts in the classroom. A greater understanding of how Gen Z students make informed sustainability decisions has the potential to provide educators with additional insights on facilitating classroom conversations around students' values and systems thinking strengths.

There may be additional socio-demographic variables that impact the association between green consumption values and systems thinking tendencies. For example, do students' demographic

characteristics beyond generational cohort membership contribute to their tendencies to value green consumption values? Students from urban areas may value environmentally friendly consumption differently than students from rural areas because of the availability of environmentally friendly products and practices available in heavily populated areas (such as recycling centers). Previous literature has demonstrated that socio-demographic variables' relationships to green consumption values are nuanced (Diamantopoulos et al., 2003), and an audience segmentation analysis of Gen Z students' characteristics related to their green consumption values may provide additional insights into variables that influence their values. Additionally, students' exposure to different employment or experiential learning opportunities may influence their tendencies toward systems thinking as previous studies have proposed interventions for students to increase their systems thinking (Murphy et al., 2019). Further examination of students' demographic characteristics and their tendencies toward the two concepts may inform the creation of educational interventions appropriate for diverse students with a variety of background characteristics and educational experiences.

The mean results of the GREEN scale indicated respondents somewhat agreed they possessed green consumer values, which aligns with literature that has established Gen Z is concerned about the environment (Deloitte, 2021). Future studies should consider collecting longitudinal data on students' GREEN consumption to see if their green consumer values remain stable over time or change as they enter the workforce and move into their own homes. In addition, future studies should explore if students' green consumer values align with their actual behaviors. Students' perceptions of their actions may vary from reality, due to differences between reported engagement in a behavior and actually engaging in a behavior.

Systems thinking tendencies were high in the results of the present study but in the population may be more nuanced for undergraduate students who are accustomed to memorizing coursework to succeed on summative assessments. Therefore, further exploration of undergraduate students' mindsets around systems thinking is recommended. This study was conducted under the assumption respondents had little to no prior known exposure to systems thinking in advance of taking the survey. It is possible respondents may have responded differently to the items about systems thinking with prior education in systems thinking. Future studies could employ a mixed methods approach by asking students if they were exposed to systems thinking in prior educational contexts and, if yes is selected, ask for a short description of systems thinking to inform study results. Future research could utilize a pre-test, post-test methodology or a retrospective post-test to explore changes in systems thinking tendencies after a systems thinking educational intervention related to specific wicked problems associated with agriculture and natural resources. This intervention might include an entire course focusing on the topic, an experiential learning internship incorporating systems thinking to introduce students to wide-reaching, complex industries over the course of a semester, or in a study abroad program that immerses students in complex global systems (Foster et al., 2014; Hunter et al., 2006). Perhaps educators could focus on systems thinking as an educational objective in each of the diverse proposed courses and see which interventions influenced changes or a lack thereof in students' systems thinking tendencies. Understanding potential changes in systems thinking and how specific interventions influence students' abilities and tendencies to employ systems thinking could help educators build curriculum that not only achieves objectives related to coursework but incorporates systems thinking throughout the entire curriculum of a course progression. Bolstering systems thinking in students and being able to demonstrate their abilities may make the curriculum more attractive to prospective students, while the ability to demonstrate students' competencies in systems thinking could also make them more marketable employees in an increasingly competitive job market (Schwieger & Ladwig, 2018).

Finally, agricultural educators should find ways to further connect the concepts of green consumption values and systems thinking through the lens of socio-ecological frameworks (Pauley et al., 2019). Students' existing environmentally conscious attitudes and values may influence their willingness to incorporate these values into the way they think about broader global contexts, those required for systems thinking and solving the world's wicked problems associated with agriculture and natural resources.

Because systems thinking may be a necessary skill for creating solutions in an increasingly complex and interconnected world food system, equipping students with the ability to think in systems should be further explored throughout agricultural and natural resource classrooms. If undergraduate educators in agricultural and environmental sciences can draw connections between Gen Z students' existing values toward environmentally friendly consumption and use them to teach systems thinking in the classroom, students may be more prepared to strategically tackle problems in a systems-minded manner. Trained with the ability to think through systems in the classroom, students should be able to transfer these skills to real-world situations in which they must address interdisciplinary problems and consider how their solutions impact diverse audiences. Understanding how students' various values influence their ability and willingness to propose systems solutions will help educators train students who are equipped for a globalized workforce. Students accustomed to building upon their systems knowledge have the capacity to create holistic solutions in an increasingly interconnected world.

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