Article

Enhancing Sustainability Communication among UAE's Higher Education Students: The Relationship between Sustainable Living Knowledge and Intention to Live Sustainably

Samar Ben Romdhane *, Sang Lee and Salem Al-Shaebi

College of Mass Communication, Ajman University, Ajman 346, United Arab Emirates; s.lee@ajman.ac.ae (S.L.)
* Correspondence: s.benromdhane@ajman.ac.ae

Abstract: This study investigates the association between sustainable living knowledge and the intention to live sustainably among university students in the UAE. Using a survey method, the research examines students' perceptions, attitudes, and intentions. The results indicate a positive correlation between sustainable living knowledge and the intention to live sustainably. Specifically, higher levels of sustainable living knowledge are correlated with a strong inclination towards engaging in sustainable behaviors. Additionally, the data analysis supports a proposed serial mediation model, suggesting that sustainable living knowledge influences the intention to live sustainably through perceived benefits and attitudes. These findings emphasize the significance of providing education on sustainable living practices to university students, as it can foster environmentally conscious behaviors and contribute to community development. This research enhances our understanding of the factors influencing individuals' inclination towards adopting sustainable behaviors, offering valuable insights for designing interventions and educational programs targeted at promoting sustainable living among UAE students.

Keywords: sustainability; sustainable living; sustainable community; survey

1. Introduction

Sustainability has gained attention from various disciplines, including communication scholars. The multidimensional nature of sustainability allows for its exploration across different social systems and levels of public discourse (Golob et al., 2023; Weder et al., 2021) [1,2]. From a communication perspective, sustainability provides a valuable framework for comprehending the societal and organizational obligations in addressing global environmental challenges. Communication scholars emphasize the importance of effective communication strategies in conveying sustainability goals and initiatives, building legitimacy, and restoring trust among stakeholders (Golob et al., 2023; Steyn & Niemann, 2014) [1,3]. Sustainability's communication aspect extends beyond organizational contexts to engage individuals and communities. Communication plays a crucial role in facilitating meaningful conversations, raising awareness, promoting education, and encouraging active participation in environmental matters (Godemann & Michelsen, 2011). [4]

However, sustainability encompasses more than just environmental considerations. As emphasized by Kuhlman et Farrington (2010) [5], sustainability is a comprehensive concept that incorporates social, economic, political, and environmental dimensions. This broader understanding becomes even more critical when considering the promotion of the principles included in the Sustainable Development Goals (SDGs) (Shayan et al., 2022) [6], particularly among the younger generation. Notably, the United Nations also recognizes the global significance of sustainable development and the role of education in promoting sustainable behaviors (United Nations, 2015) [7].

In this regard, the United Arab Emirates (UAE) has emerged as a country showcasing a strong dedication to fostering a culture of sustainability and implementing sustainability

policies and initiatives. A noteworthy accomplishment in this pursuit is the establishment of the Ministry of Climate Change and Environment in 2006, which has played a pivotal role in advancing sustainable practices and policies within the country. Additionally, the UAE government has undertaken notable initiatives, such as the promotion of Education for Sustainable Development (ESD) (Al-Naqbi & Alshannag, 2018) [8], to develop a generation empowered to understand the importance of sustainability beyond its environmental aspect and informed of its comprehensive principles, as outlined in the SDG (United Nations, 2015) [7].

As highlighted by (Al-Naqbi and Alshannag 2018) [8], the National Committee on SDGs in the UAE underscores the importance of collaboration between the public, business, and knowledge sectors in three key areas: leveraging knowledge institutions for technical advancement and intellectual leadership, integrating international understanding through knowledge institutions, and incorporating sustainable development concepts into secondary and higher education.

Today's university students, including Millennials and Gen Zers, have either developed sustainability knowledge as they have grown or have been immersed in a digital era where digital media and online technologies promote green products and values aligned with sustainability (Dabija et al., 2019; Yamane & Kaneko, 2021) [9,10]. These students are part of Higher Education Institutions (HEIs) that have established dedicated Green and Sustainability Offices and similar governance structures. The institutionalization of sustainability in higher education has played a crucial role in raising awareness about sustainability matters, as evidenced in the literature (Leal Filhoe et al., 2019) [11]. Consequently, today's university students likely possess a heightened understanding of sustainability in comparison to previous generations. Continuing to engage this young generation in sustainability efforts holds immense significance for several reasons.

Firstly, as recognized environmental stewards for the future (Han & Ahn, 2020) [1] and influential agents of change (Han & Ahn, 2020) [12], they have the potential to drive sustainable innovation and promote sustainable practices. Their active involvement in sustainable practices and advocacy can have a profound impact on shaping societal norms and behaviors. Secondly, the hyperconnected nature of this generation enables them to access and disseminate sustainability-related information more readily, amplifying the potential impact of their actions. Their interconnectedness empowers them to reach wider audiences and inspire others to embrace sustainable practices. Thirdly, this generation is known for being more receptive to appeals related to corporate responsibility and sustainability practices and benefits (Aledo-Ruiz & Santos-Jaén, 2022) [13]. They are open to embracing new concepts and to exploring innovative ideas, such as living in sustainable communities and adopting practices that minimize environmental impact.

In light of these considerations, comprehending the attitudes of university students towards sustainability and providing them with the necessary knowledge and skills to embrace sustainable practices in their personal and professional lives is crucial for promoting a sustainable future (Hofman-Bergholm, 2018) [14]. This is not only imperative for the individual well-being of students but also for developing strategies and interventions that foster sustainable living on a larger scale. However, despite the UAE government's implementation of sustainability communication initiatives in various Higher Education Institutions (HEIs), there remains a lack of comprehensive data on both the outcomes of these initiatives and the attitudes and intentions of the young generation towards sustainability. While studies on sustainability attitudes and behaviors have been conducted in various contexts, there remains a specific research gap regarding the relationship between sustainable living knowledge and the intention to live sustainably within the distinctive cultural and environmental factors of the UAE. This research gap emphasizes the importance of conducting a study that specifically investigates this relationship within the UAE context, where cultural and environmental factors play a significant role in influencing sustainable behaviors (Alshuwaikhat & Abubakar, 2008) [15].

Thus, the primary purpose of this study is to understand how students' level of knowledge leads to understanding of benefits of sustainable living, positive attitudes toward sustainable living, and, ultimately, intention to live in a sustainable living community. By examining the relationships between these factors, the study contributes to our understanding of sustainability education in the UAE's Higher Education population. In particular, the study proposes and tests a serial mediation hypothesis to better understand the relationships among the sustainability education-related variables.

2. Theoretical Framework and Literature Review

The concept of sustainability has evolved beyond its initial focus on environmental issues (Hardin, 1968) [16] and has expanded to encompass a broader scope that includes sociopolitical, economic, and cultural dimensions. Scholars have recognized the importance of considering multidimensional aspects in discussions of sustainability. The social–ecological systems (SES) theory is one influential framework that recognizes the interconnectedness and interdependence between human societies and ecosystems (Berkes et al., 2000) [17].

According to the SES theory, sustainability can only be achieved by managing the dynamic interactions and feedback loops between social and ecological systems. It highlights the complex relationships, feedback mechanisms, and interdependencies that exist between human activities and the environment. Within the SES framework, resilience is a concept that refers to the capacity of social–ecological systems to withstand and recover from disturbances, adapt to changing conditions, and undergo transformative changes when necessary. This is achieved through the implementation of flexible governance systems, adaptive management approaches, and fostering social learning (Folke et al., 2010) [18].

In the context of sustainability, there are several influential theories that highlight the interconnections between economic, social, and environmental dimensions. One such theory is the Triple Bottom Line (TBL) theory, introduced by Elkington (1998) [19]. The TBL theory emphasizes the interconnectedness of economic, social, and environmental dimensions when assessing sustainable development. It suggests that organizations should evaluate their performance based on financial viability, social impact, and environmental responsibility. The TBL framework recognizes that sustainability requires considering and integrating economic, social, and environmental considerations.

Another influential perspective is Ecological Modernization Theory (EMT), which has played a significant role in shaping environmental policy and discourse (Bugden, 2022) [20]. EMT focuses on the connection between sustainability and the economy and has been influential in shaping discussions and approaches to environmental protection and reform.

It argues that economic growth and environmental protection can be mutually reinforcing as societies develop cleaner and more efficient technologies and industries (Mol & Spaargaren, 2009) [21]), as well as environmentally friendly practices, such as industrial ecology and environmentally conscious manufacturing.

In summary, these more recent theories provide fresh perspectives and frameworks for understanding and addressing sustainability issues.

2.1. Sustainability and Sustainable Living Community

Flint (2012) [22] argued that sustainable development can be viewed as a system of values and a process that requires individuals to consider the consequences of their thoughts and actions on others, their local environment, and the broader landscape. This perspective goes beyond short-term considerations and aims to motivate and organize individuals to drive positive change for the long-term future.

Sustainability encompasses various definitions, but it generally refers to the capacity for long-term continuation (Flint, 2012) [22] and the avoidance of depletion of natural resources while enhancing overall well-being and meeting human needs (Rayan et al., 2020) [23]. At its core, sustainability involves fulfilling the needs of the present generation without jeopardizing the ability of future generations to meet their own needs, as articulated by the World Commission on Environment and Development (1987) [24].

While sustainability is often narrowly perceived from an environmental lens (Alexander et al., 2022) [25]., scholars argue that this characterization fails to encompass its broader social, political, economic, and cultural dimensions (Boyer et al., 2016; Giddings et al., 2002; Glasby, 2002) [26–28]. The three-pillar approach (Giddings et al., 2002) [27] emerged in response to early academic critiques of the prevailing economic status quo (Purvis et al., 2019), emphasizing the need to expand the understanding of sustainability beyond its environmental aspects. The three-pillar approach, often referred to as the triple bottom line, portrays sustainability as a tripartite conception, with society, environment, and economy represented as intersecting circles (Purvis et al., 2019) [29]. Sustainability is positioned at the intersection, highlighting the interconnectedness of these three dimensions (Purvis et al., 2019) [29]. The environmental pillar aims to maintain the balance of Earth's environmental systems, allowing for the replenishment of natural resources as humans use them. The economic pillar emphasizes the need for all human groups to have access to the necessary resources for autonomy. The social pillar focuses on ensuring that everyone has access to resources that are sufficient to maintain the safety and well-being of their families and communities, as well as to universal human rights and the basics of life.

In recent years, the concept of sustainable living communities has emerged as a way to promote sustainable living. Sustainable communities encompass a range of community capitals that contribute to their long-term resilience. These capitals include environmental capital, human capital, social capital, cultural capital, public structural capital, and commercial capital (Callaghan & Colton, 2008) [30].

By integrating and leveraging these various types of community capital, sustainable communities can move beyond mere subsistence and develop the capacity to make choices that promote resilience, well-being, and long-term benefits. These benefits cover the three pillars of environmental, economic, and social sustainability, as highlighted by Shareef and Altan (2021) [31]. Environmental sustainability within these communities involves reduced energy consumption and reliance on natural resources, leading to lower environmental emissions. This is achieved through decreased dependency on fossil fuels, the adoption of renewable energy sources such as wind and solar power, and the effective control of electricity consumption (Saad al-sumaiti et al., 2014) [32]. Economic sustainability is also emphasized, aiming to optimize resource utilization and generate benefits for residents, including lower utility bills, increased home value, and the recycling of wastewater. Social sustainability plays a crucial role in sustainable communities by providing open spaces, landscapes, playgrounds, and community facilities. These amenities encourage social interaction and a sense of community among residents, promoting overall well-being and quality of life. Additionally, sustainable communities often incorporate smart home systems solutions, including smart monitoring, smart locks, smart alarms, smart air quality control, lighting control, and home automation. These technologies allow residents to control and monitor any connected home devices from smart home apps, smartphones, or other networked devices (Aliero, et el., 2021) [33]. The concept of sustainable communities is indeed multi-dimensional, encompassing various features and dimensions. These include aspects such as walkability, cycling infrastructure, cultural diversity, and social cohesion, all of which should be emphasized in communication about sustainability (Genç, 2017) [34].

2.2. University Students and Sustainability Communication

Effective sustainability communication plays a crucial role in promoting the concept of sustainable communities by facilitating a comprehensive understanding of the intricate relationship between humans and the environment within social discourse (Godemann & Michelsen, 2011) [4]. Sustainability communication covers various topics, such as climate change, biodiversity, consumption, production, and mobility, and finds expression through sustainability and green advertising, sustainability reporting, and the phenomenon of greenwashing (Golob et al., 2023) [1]. Various terms are utilized to capture different dimensions of environmental awareness and understanding. These terms include environmental knowledge, sustainability literacy (Chen et al., 2022) [35], carbon literacy, energy literacy,

and ecological literacy (Oriade et al., 2021) [36]. They reflect the importance of developing knowledge, skills, and awareness among individuals and communities to effectively address sustainability challenges.

Scholars have identified three distinct modes of sustainability communication: communication of sustainability (CoS), communication about sustainability (CaS), and communication for sustainability (CfS) (Genç, 2017; Weder et al., 2021) [2,34]. CoS involves one-way transmission of information about a sustainability issue to decision makers or the public (Genç, 2017, p. 515) [34]. CaS focuses on the exchange and discussion of information, interpretations, and opinions related to sustainability issues (Genç, 2017, p. 514) [34]. CfS, on the other hand, is a call to action primarily led by non-governmental organizations (NGOs) and grassroots movements. It aims to mobilize people to act for sustainability by emphasizing concrete actions and "societal transformation based on normative sustainable development goals" (Genç, 2017, p. 515) [34]. By employing these modes of sustainability communication, communication professionals can effectively promote the multi-dimensional nature of sustainability and engage individuals in sustainable living.

Recent studies revealed important factors influencing green purchase intentions, such as the perceived seriousness of environmental problems (Moon et al., 2021) [37]. Effective sustainability communication has been highlighted as a key factor in engaging university students and motivating them to embrace sustainable living (Altomont et al., 2016) [38].

University students possess a distinctive and educated perspective on sustainability issues and frequently take a leading role in environmental and social justice movements. As future professionals, leaders, and agents of change (Handayani, 2019; Robertson, 2017) [39,40], they hold the potential to contribute significantly to the development of sustainable policies and practices, both within their campuses and in the broader community upon graduation. To maximize the impact of sustainability communication, it is important to tailor messages to the specific needs and values of the target audience, in this case, university students.

Higher Education Institutions (HEIs) are widely recognized as crucial facilitators in promoting sustainability (Karatzoglou, 2013) [41]. They play a vital role in integrating sustainability into the curriculum, providing opportunities for sustainable practices, cultivating a culture of sustainability on campus, and developing socio-cultural values (Handayani, 2019) [39] HEIs have the potential to act as platforms and mechanisms for social debate and meaningful change by actively engaging young people and participating in social advocacy efforts (McInroy & Beer, 2022) [42], including participating in community projects, collaborating with local organizations, and advocating for sustainable policies and practices.

Many universities in the UAE, for example, have responded to the growing interest in sustainability by offering courses and programs specifically focused on sustainability and promoting research and innovation in sustainable practices (Ahmed, 2023) [43]. These initiatives are likely to have positive results in terms of enhancing university students' knowledge of the programs and activities conducted by the Universities. Moreover, they foster a positive attitude towards these efforts and the importance of supporting sustainable practices (Radwan & Khalil, 2021)) [44].

2.3. Sustainable Living Knowledge, Benefits, and Attitudes

In the past few decades, there has been a notable increase in people's awareness of environmental issues (Calculli et al., 2021; Scerri, 2009) [45,46]. Individuals from various countries have become more informed about how their actions can impact the social and economic dimensions of the environment. Consequently, many countries and citizens have taken proactive measures to address and mitigate the negative consequences of environmental change (Hofman-Bergholm, 2018) [14]. Scholars emphasize the importance of environmental awareness, education, and access to information as significant predictors of more sustainable modes of living (e.g., Nikolić et al., 2022; Rajapaksa et al., 2018) [47,48]. People's awareness and knowledge about sustainability can serve as a driving force for incorporating sustainable practices.

In this study's context, perceived sustainable living knowledge refers to students' perceived assessment of their understanding and awareness of sustainable living practices. It encompasses knowledge about environmentally friendly behaviors, resource conservation, and sustainable community development. Higher levels of perceived sustainable living knowledge have been associated with a greater likelihood of engaging in sustainable behaviors (Amoako et al., 2020; Raggat et al., 2018) [49,50]. Therefore, perceived sustainable living knowledge is an appropriate independent variable to examine with respect to its impact on subsequent mediators and the intention to live in sustainable communities. Intention to live in a sustainable community can be a key predictor of actual behavior in community development. It represents students' perceived intention to live and adopt sustainable practices within a community context.

While boosting awareness and knowledge about sustainability is important in sustainability communication, less is understood about how it may affect behavioral changes. For example, Kollmuss and Agyeman (2002) pointed out that, while education is important for a community to understand sustainability, raising awareness and knowledge may not be enough to affect behavioral change. Although raising awareness may be the initial step in encouraging changes in sustainable behavior, raising awareness and delivering knowledge by itself may not result in substantial behavior changes (Kollmuss and Agyeman, 2002) [51]. Such discussion, however, suggests that there are other variables that facilitate the relationship between sustainable knowledge and behavioral outcomes (Heeren et al., 2016) [52].

For example, research showed a positive relationship between the perceived benefits of sustainable living and the willingness to live in sustainable communities. In Bhyan et al. (2021) [53], residents who perceived the benefits of sustainable living were more likely to adopt sustainable practices. Bhyan et al. (2021) [53] found that the perceived benefits of sustainable living significantly influenced the willingness to adopt sustainable housing practices. Research also showed that the perceived benefits of sustainable living had a positive effect on the willingness to participate in environmentally-friendly behaviors (Hofman-Bergholm, 2018). Furthermore, individuals are more likely to engage in pro-environmental behavior, such as sustainable living practices, when they perceive the benefits to be greater than the costs (Gifford, 2011) [54]. The results of the research on the relationship between awareness and knowledge of sustainable living benefits and intention to live in a sustainable living environment is consistent with the economic theory of decision making, which posits that people are rational and will make decisions that maximize their utility (Thaler & Sunstein, 2008) [55].

In this study, we expect that perceived sustainable living benefits will mediate the relationship between sustainable living knowledge and the intention to live in a sustainable living community. Thus, we proposed the following mediation hypothesis:

H1: *Perceived sustainable living benefits mediate the relationship between perceived sustainable living knowledge and intention to live in a sustainable community, such that higher sustainable living knowledge will lead to increased perceived benefits, which, in turn, will result in higher intention to live in a sustainable community.*

Research has shown increasing evidence that perceptions and attitudes about sustainability influence people's actual behavior in their daily lives (e.g., Balakrishnan, et al., 2020) [56]. In this study's context, attitude represents students' evaluative judgments and feelings towards living in sustainable communities. It reflects their positive or negative assessments of the desirability and value of sustainable living practices within a community. Attitudes are influenced by perceived sustainable living knowledge, as they provide the cognitive and affective foundations for evaluating the importance and relevance of sustainable community living (Heeren et al., 2016) [52]. Such attitudes are expected to capture the mediating role in linking perceived knowledge and intention to live in a sustainable community. Thus, the following mediation hypothesis was proposed:

H2: *A perceived sustainable living attitude mediates the relationship between perceived sustainable living knowledge and intention to live in a sustainable community, such that higher sustainable living knowledge will lead to a positive sustainable living attitude, which, in turn, will result in higher intention to live in a sustainable community.*

Understanding the cumulative effects of perceived sustainable living knowledge, benefits, and attitude on students' intention to live in a sustainable community can better illustrate the students' complex process leading to the intention to engage in actual behaviors pertaining to sustainability. For example, students with higher levels of perceived sustainable living knowledge are likely to recognize and understand the potential benefits of sustainable living, such as environmental conservation, reduced ecological footprint, and improved personal well-being. Further, students who perceive sustainable living benefits are more likely to develop positive attitudes toward the concept of a sustainable living community due to the alignment between their personal values, environmental concerns, and such communities' sustainable practices.

Specifically, higher perceived knowledge will lead to higher perceived benefits and positive attitude and, in turn, lead to higher intention to live in a sustainable living community. We therefore advanced the following serial mediation hypothesis (see Figure 1 for illustration):
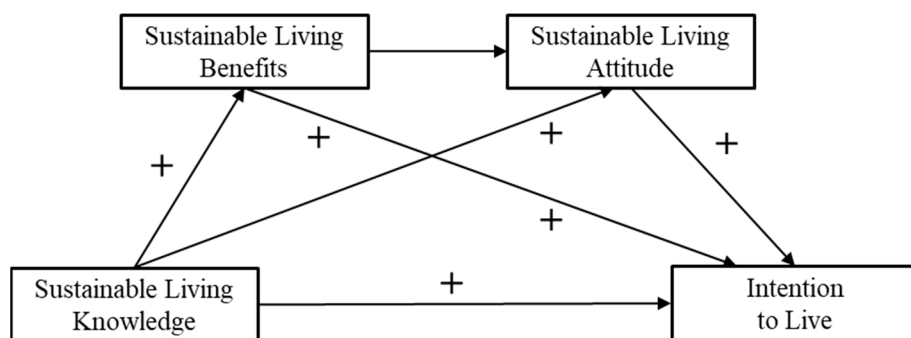

Figure 1. Hypothesized serial medial model.

H3: *Sustainable living knowledge has a positive serial indirect effect on intention to live in a sustainable community through perceived sustainable living benefits and attitude.*

By proposing a serial mediation model with perceived knowledge about sustainable living as the independent variable, perceived benefits and attitude as mediators, and perceived intention to live in a sustainable community as the outcome variable, we can better understand the underlying processes and mechanisms through which these variables interact. This model highlights the importance of knowledge as the foundation, followed by the influence of perceived benefits on shaping attitudes, and, subsequently, the impact of attitude on individuals' intention to engage in sustainable behaviors. Thus, the proposed model provides a comprehensive framework to explore the complex relationships between these variables and offers insights for designing effective interventions to promote sustainable communication.

3. Methodology

The study employed an online survey method among students in a major UAE university using the Qualtrics survey platform. The online survey link was active for less than one month and the data collection was finished in early April of 2023.

3.1. Study Sample and Data Collection

The data were collected by sending the survey link to registered undergraduate and graduate students with the help of the university's Sustainability Department. The survey

took approximately 5 min to complete. The data were downloaded from the Qualtrics server and first inspected by the researcher; incomplete responses were excluded at this stage. As a result, after data cleaning and inspection, a total of 221 effective responses were collected for data analysis.

3.2. Questionnaire Development and Measures

A pilot questionnaire written in English was first developed and administered to a sample of 13 students in the university. Participants were asked to provide feedback on the comprehensibility of the questionnaire and its relevance pertaining to the research questions. After the pilot study, minor modifications were carried out.

The questionnaire consisted of two main sections. The first section included demographic questions such as age, gender, nationality, educational level, income, government subsidy, and residence type. The second section included the questions to measure the variables in the study and consisted of four parts. First, sustainable living knowledge (SLK) was assessed by four items measured on a seven-point bipolar scale anchored by not at all familiar (0)/very familiar (7), not very knowledgeable/very knowledgeable, not very informed/very informed, and not very understanding/very understanding ($\alpha = 0.96$), with a question "How would you evaluate your knowledge about the concept of sustainable living?" Sustainable living benefits (SLB) were assessed by four items measured on a seven-point Likert scale anchored by strongly disagree (0)/strongly agree (7) ($\alpha = 0.90$). These items asked participants' perception about financial benefits, economic benefits, health benefits, and social benefits pertaining to sustainable living. Participants' sustainable living attitude (SLA) was assessed by three items measured on a seven-point bipolar scale anchored by bad (0)/good (7), unfavorable/favorable, and unsatisfactory/satisfactory ($\alpha = 0.95$), e.g., Goldsmith et al., 2001, with a question "How would you feel about sustainable living?" Lastly, participants' intention to live (ITL) in a sustainable living community was assessed by three items measured on a seven-point bipolar scale anchored by unlikely (0)/likely (7), uncertain/certain, and improbable/probable ($\alpha = 0.90$), with a question "In the future, how likely are you to live in a sustainable living community?" e.g., Bearden et al., 1984.

3.3. Data Transformation and Analysis

The data analysis for this study was performed using IBM SPSS. The dataset was imported from the Qualtrics server. The data analysis process was as follows. First, the computation of descriptive statistics was performed to provide an overview of the demographic characteristics of the survey participants. Then, the four variables (i.e., SLK, SLB, SLA, ITL) were computed based on the survey responses, followed by the scale reliability of each computed variable as well as correlations between variables. To test the independence of each variable, multicollinearity and autocorrelation tests were performed. Lastly, to test the hypotheses, simple mediation analyses (H1 and H2) and a serial mediation analysis (H3) were performed, using the PROCESS procedure (Hayes, 2022) in SPSS.

4. Results

4.1. Sample Characteristics

Table 1 shows the demographic characteristics of the survey participants. The mean age of the participants was 22.52 years, and the majority of participants was female (52.5%), while 47.5% were male. Of the participants, 23.5% were of UAE nationality, while 76.5% were of other nationalities. In terms of academic standing, the sample included a range of students from different levels, with freshmen making up the largest proportion (29.0%) and graduate students making up the smallest (21.3%). Household income varied among the sample, with 22.6% reporting an income of less than AED 5000 and 5% reporting an income of over AED 90,000. In terms of residence type, almost half of the participants lived in a single-family house/villa (48.9%) or an apartment/flat (48.9%). The majority of participants did not receive government subsidies to own or rent a house (73.8%).

Table 1. Demographic characteristics of survey participants (*N* = 221).

		(Mean/SD)
Age		22.52/5.63
		Frequency (%)
Gender	Male	105 (47.5)
	Female	116 (52.5)
Nationality	UAE	52 (23.5)
	Other	124 (56.1)
Semester Standing	Freshman	64 (29.0)
	Sophomore	30 (13.6)
	Junior	41 (18.6)
	Senior	39 (17.6)
	Graduate	47 (21.3)
Household Income	Less than AED 5000	50 (22.6)
	AED 5001–10,000	46 (20.8)
	AED 10,001–20,000	40 (18.1)
	AED 20,001–30,000	33 (14.9)
	AED 30,001–40,000	12 (5.4)
	AED 40,001–50,000	13 (5.9)
	AED 50,001–60,000	5 (2.3)
	AED 60,001–70,000	5 (2.3)
	AED 70,001–80,000	4 (1.8)
	AED 80,001–90,000	2 (0.9)
	AED 90,001 and over	11 (5.0)
Residence Type	Single-family house/villa	108 (48.9)
	Duplex/townhouse	2 (9)
	Apartment/flat	108 (48.9)
	Other	3 (1.4)
Government Subsidy to Own/Rent House	Yes	58 (26.2)
	No	163 (73.8)

4.2. Correlations between Variables

Table 2 shows means, standard deviations, and correlation coefficients among the study variables. The correlation results revealed significant relationships among the variables. Perceived SLK had a positive and significant correlation with perceived SLB (*r* = 0.249, *p* < 0.001), SLA (*r* = 0.566, *p* < 0.001), and ITL (*r* = 0.517, *p* < 0.001). Additionally, perceived SLB showed positive and significant correlations with SLA (*r* = 0.439, *p* < 0.001) and ITL (*r* = 0.462, *p* < 0.001). SLA exhibited a strong positive correlation with ITL (*r* = 0.787, *p* < 0.001). These results indicate that there were positive associations between the variables in the study.

Table 2. Means, standard deviations, and correlation coefficients among study variables.

	Variables	**Mean**	**SD**	**1**	**2**	**3**
1	SLK	4.62	1.62			
2	SLB	4.97	1.5	0.249 **		
3	SLA	5.43	1.64	0.566 **	0.439 **	
4	ITL	5.3	1.52	0.517 **	0.462 **	0.787 **

** *p* < 0.01; SLK: sustainable living knowledge, SLB: sustainable living benefits, SLA: sustainable living attitude, ITL: intention to live in a sustainable community.

These findings highlight the importance of knowledge about sustainable living in shaping individuals' perceptions of benefits, attitude, and intention to live in a sustainable community. This suggests that interventions targeting knowledge and perceived benefits may be effective in promoting positive attitudes and intentions toward sustainable living.

4.3. Hypothesis Testing

A serial mediation analysis was conducted to examine the relationships between SLK as the independent variable, SLB as the first mediator, SLA as the second mediator, and ITL as the dependent variable. The mediation analysis was performed using the PROCESS procedure (Hayes, 2022) [57] in SPSS. The multicollinearity test results indicated no severe multicollinearity among the predictor variables (VIF values ranged from 1.224 to 1.687). The condition indices were all below the threshold of 10, indicating acceptable levels of collinearity (condition indices ranged from 1.000 to 10.884). Additionally, the Durbin–Watson statistic was calculated as 1.972, suggesting no significant issue of positive autocorrelation in the residuals. These findings indicate that the predictor variables were not highly correlated with each other and that the assumption of no autocorrelation in the residuals was met.

H1 predicted that SLB would mediate the relationship between SLK and ITL, such that higher SLK would lead to higher SLB, which, in turn, would result in higher ITL. The data analyses showed that the total effect of SLK on ITL was significant (β = 0.4860, SE = 0.0544, t = 8.9276, *p* < 0.001, 95% CI [0.3787, 0.5933]) (Table 3).

Table 3. Total, direct, and indirect effects for a serial mediation model (*N* = 221).

Model	Effect	*SE*	*t*-Test	*p*-Value	95% BC CI
Total effects of SLK on ITL	0.4860	0.0544	8.9276	<0.0000	[0.3787, 0.5933]
Direct effect of SLK on ITL	0.0986	0.0462	2.1311	0.0342	[0.0074, 0.1897]
Total indirect effect	0.3875	0.0548		0.5031	[0.2848, 0.5031]
Indirect effects					
SLK-SLB-ITL	0.0339	0.0189			[0.0055, 0.0783]
SLK-SLA-ITL	0.3042	0.0499			[0.2094, 0.4061]
SLK-SLB-SLA-ITL	0.0493	0.0224			[0.0143, 0.1021]

Note: *SE*: standard error; BC CI = bias-corrected confidence interval. SLK: sustainable living knowledge, SLB: sustainable living benefits, SLA: sustainable living attitude, ITL: intention to live in a sustainable community.

The direct effect of SLK on ITL was also significant (β = 0.0986, SE = 0.0462, t = 2.1311, *p* = 0.0342, 95% CI [0.0074, 0.1897]). Additionally, the indirect effects were significant, indicating that SLB mediated the relationship between SLK and ITL. The indirect effect through BENE2 was 0.0339 (BootSE = 0.0189, BootLLCI = 0.0055, BootULCI = 0.0783), suggesting a significant mediation pathway: SLK → SLB → ITL. These results supported H1.

H2 predicted that SLA would mediate the relationship between SLK and ITL, such that higher SLK would lead to a positive SLA, which, in turn, would result in higher ITL. The total effect of SLK–ITL was significant (β = 0.4860, SE = 0.0544, t = 8.9276, *p* < 0.001, 95% CI [0.3787, 0.5933]). The direct effect of SLK on ITL was also significant (β = 0.0986, SE = 0.0462, t = 2.1311, *p* = 0.0342, 95% CI [0.0074, 0.1897]). Furthermore, the indirect effect through SLA was significant, indicating that SLA mediated the relationship between SLK and ITL. The indirect effect through SLA was 0.3042 (BootSE = 0.0499, BootLLCI = 0.2094, BootULCI = 0.4061), suggesting a significant mediation pathway: SLK → SLA → ITL. These results supported H2.

H3 predicted that SLK would have a positive serial indirect effect on ITL through SLB and SLA. The total effect of SLK on ITL was significant (β = 0.4860, SE = 0.0544, t = 8.9276, *p* < 0.001, 95% CI [0.3787, 0.5933]). The direct effect of SLK on ITL was also significant (β = 0.0986, SE = 0.0462, t = 2.1311, *p* = 0.0342, 95% CI [0.0074, 0.1897]). Moreover, the indirect effects through both SLB and SLA were significant, indicating a significant serial mediation pathway: SLK → SLB → SLA → ITL. The indirect effect through SLB and SLA combined was 0.0493 (BootSE = 0.0224, BootLLCI = 0.0143, BootULCI = 0.1021). These results supported H3.

5. Conclusions

The present study aimed to investigate UAE students' perceptions, attitudes, and intentions about sustainable living using a survey method. The results demonstrated the significance of knowledge about sustainable living and its influence on attitudes and intentions. The findings supported the proposed mediation model, indicating that perceived benefits and attitudes play important roles in the relationship between sustainable living knowledge and intention to live sustainably. The study contributes to understanding the underlying mechanisms through which sustainable living knowledge influences individuals' intention to live sustainably.

The results revealed that higher levels of sustainable living knowledge are associated with increased perceived benefits, which, in turn, lead to a higher intention to live in a sustainable community. This highlights the importance of perceived benefits as a mechanism through which knowledge influences individuals' intention to engage in sustainable behaviors. Additionally, the study found that positive attitudes mediate the relationship between sustainable living knowledge and intention to live sustainably. Attitudes were shown to be a pathway through which knowledge influences individuals' intentions to live in a sustainable community.

Specifically, the data analysis results supported H1 and revealed a significant indirect effect through SLB, suggesting that higher levels of SLK are associated with increased perceived benefits, which, in turn, lead to higher intention to live in a sustainable community. This highlights the importance of perceived benefits as a mechanism through which knowledge influences students' intention to live sustainably.

H2 was also supported, showing that SLA mediates the relationship between SLK and ITL. The analysis demonstrated a significant indirect effect through SLA, indicating that higher levels of SLK are related to more positive attitudes, which, in turn, result in higher intention to live in a sustainable community. This emphasizes the role of attitude as a pathway through which knowledge influences individuals' intention to engage in sustainable behaviors.

Furthermore, H3, which proposed a serial mediation model involving SLB, SLA, and ITL, was also supported. The results revealed a significant serial indirect effect, indicating that SLK has a positive influence on ITL through both SLB and SLA. This underscores the importance of considering the combined influence of perceived benefits and attitude in understanding the impact of knowledge on students' sustainable intentions. The findings align with previous research emphasizing the importance of knowledge as a precursor to sustainable behavior change (e.g., Edsand & Broich, 2020) [58].

The theoretical implications of this study contribute to the understanding of sustainable behavior adoption by examining the underlying mechanisms through which sustainable living knowledge influences individuals' intention to live sustainably. The findings support the social–ecological systems theory, which emphasizes the interconnectedness of social and ecological dimensions in promoting sustainability. They highlight the role of knowledge in shaping attitudes and perceived benefits, which in turn influence individuals' intentions to engage in sustainable behaviors. The study also aligns with resilience theory, emphasizing the importance of adaptive responses to promote sustainable living. Additionally, the study underscores the relevance of the TBL theory in sustainability. The TBL framework recognizes the importance of considering economic, social, and environmental dimensions in decision-making. In the context of this study, promoting sustainable living aligns with the social dimension of the TBL, as it addresses the well-being and attitudes of individuals and communities. By integrating social, ecological, and economic considerations, policymakers, educators, and sustainability advocates can develop comprehensive strategies to promote sustainable living practices among UAE students and beyond.

From a practical standpoint, the findings have important implications for promoting sustainable living especially among university students. The results of the study emphasize the significance of increasing knowledge about sustainable living as a means to foster

positive attitudes and perceived benefits, which could ultimately lead to a higher intention to live sustainably. Thus, the study highlights the importance of educational initiatives and awareness campaigns that provide accurate and accessible information about sustainable living practices. By emphasizing the benefits of sustainable living and cultivating positive attitudes, interventions can effectively influence individuals' intentions to adopt sustainable behaviors.

This study has several limitations that should be addressed. Firstly, the reliance on self-reported measures introduces the potential for common method biases, response biases, and measurement errors. Future research could employ objective measures or utilize multiple data collection methods to enhance the validity of the findings. Additionally, the cross-sectional design of the study limited the ability to establish causal relationships among the variables. Longitudinal or experimental designs would provide stronger evidence for the proposed mediation model and enable the examination of temporal dynamics and causality. Such designs would also capture potential changes in perceptions and intentions over time. Another limitation is the relatively small sample size, which may have restricted the generalizability of the findings to other populations. Replicating the study with larger and more diverse samples would enhance the generalizability and robustness of the results. Lastly, the study focused solely on the serial mediation model of sustainable living knowledge, benefits, attitudes, and intention to live sustainably. Other factors, such as personal values, social norms, and external barriers, may also significantly influence sustainable behavior adoption. Future research should consider exploring additional variables and their interactions within a more comprehensive theoretical framework, to provide a more holistic understanding of sustainable behavior adoption.

In conclusion, this study provides valuable insights into the complex pathways through which perceived sustainable living knowledge influences individuals' intention to live in a sustainable community. The findings underscore the importance of educating the university student population about sustainable living behaviors and community development for this critical segment of the population of the UAE. The implications of this research can inform the design of interventions and educational programs that aim to foster sustainable behavioral change among university students and beyond. By targeting knowledge, perceived benefits, and attitude, these initiatives can contribute to the advancement of sustainable practices and the creation of more environmentally conscious communities.

References

1. Golob, U.; Podnar, K.; Zabkar, V. Sustainability communication. *Int. J. Advert.* **2023**, *42*, 42–51. [CrossRef]
2. Weder, F.; Karmasin, M.; Krainer, L.; Voci, D. Sustainability communication as critical perspective in media and communication studies—An introduction. In *The Sustainability Communication Reader: A Reflective Compendium*; Springer: Berlin/Heidelberg, Germany, 2021; pp. 1–12.

3. Steyn, B.; Niemann, L. Strategic role of public relations in enterprise strategy, governance and sustainability—A normative framework. *Public Relat. Rev.* **2014**, *40*, 171–183. [CrossRef]

4. Godemann, J.; Michelsen, G. Sustainability communication–an introduction. In *Sustainability Communication*; Godemann, J., Michelsen, G., Eds.; Springer: Dordrech, The Netherlands, 2011; pp. 3–11.

5. Kuhlman, T.; Farrington, J. What is sustainability? *Sustainability* **2010**, *2*, 3436–3448. [CrossRef]

6. Shayan, N.; Mohabbati-Kalejahi, N.; Alavi, S.; Zahed, M. Sustainable development goals (SDGs) as a framework for corporate social responsibility (CSR). *Sustainability* **2022**, *14*, 1222. [CrossRef]

7. United Nations. Transforming Our World: The 2030 Agenda for Sustainable Development. 2015. Available online: https://sdgs.un.org/2030agenda (accessed on 22 July 2023).

8. Al-Naqbi, A.K.; Alshannag, Q. The status of education for sustainable development and sustainability knowledge, attitudes, and behaviors of UAE University students. *Int. J. Sustain. High. Educ.* **2018**, *19*, 566–588. [CrossRef]

9. Dabija, D.C.; Bejan, B.M.; Dinu, V. How sustainability oriented is Generation Z in retail? A literature review. *Transform. Bus. Econ.* **2019**, *18*, 140–155.

10. Yamane, T.; Kaneko, S. Is the younger generation a driving force toward achieving the sustainable development goals? Survey experiments. *J. Clean. Prod.* **2021**, *292*, 125932. [CrossRef]

11. Leal Filho, W.; Will, M.; Salvia, A.L.; Adomssent, M.; Grahl, A.; Spira, F. The role of green and Sustainability Offices in fostering sustainability efforts at higher education institutions. *J. Clean. Prod.* **2019**, *232*, 1394–1401. [CrossRef]

12. Han, H.; Ahn, S.W. Youth mobilization to stop global climate change: Narratives and impact. *Sustainability* **2020**, *12*, 4127. [CrossRef]

13. Aledo-Ruiz, M.D.; Martínez-Caro, E.; Santos-Jaén, J.M. The influence of corporate social responsibility on students' emotional appeal in the HEIs: The mediating effect of reputation and corporate image. *Corp. Soc. Responsib. Environ. Manag.* **2022**, *29*, 578–592. [CrossRef]

14. Hofman-Bergholm, M. Changes in thoughts and actions as requirements for a sustainable future: A review of recent research on the Finnish educational system and sustainable development. *J. Teach. Educ. Sustain.* **2018**, *20*, 19–30. [CrossRef]

15. Alshuwaikhat, H.M.; Abubakar, I. An integrated approach to achieving campus sustainability: Assessment of the current status of sustainability at the University of Bahrain. *J. Clean. Prod.* **2008**, *16*, 1952–1962. [CrossRef]

16. Hardin, G. The tragedy of the commons. *Science* **1968**, *162*, 1243–1248. [CrossRef] [PubMed]

17. Berkes, F.; Folke, C.; Colding, J. (Eds.) *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*; Cambridge University Press: Cambridge, UK, 2000.

18. Folke, C.; Carpenter, S.R.; Walker, B.; Scheffer, M.; Chapin, T.; Rockström, J. Resilience thinking: Integrating resilience, adaptability and transformability. *Ecol. Soc.* **2010**, *15*, 20. [CrossRef]

19. Elkington, J. Partnerships from cannibals with forks: The triple bottom line of 21st-century business. *Environ. Qual. Manag.* **1998**, *8*, 37–51. [CrossRef]

20. Bugden, D. Technology, decoupling, and ecological crisis: Examining ecological modernization theory through patent data. *Environ. Sociol.* **2022**, *8*, 228–241. [CrossRef]

21. Mol, A.P.; Spaargaren, G. Ecological modernisation and industrial transformation. In *A Companion to Environmental Geography*; Wiley: Hoboken, NJ, USA, 2009; pp. 253–265.

22. Flint, R.W. *Practice of Sustainable Community Development: A Participatory Framework for Change*; Springer Science & Business Media: Berlin/Heidelberg, Germany, 2012.

23. Ryan, B.J.; Coppola, D.; Canyon, D.V.; Brickhouse, M.; Swienton, R. COVID-19 community stabilization and sustainability framework: An integration of the Maslow hierarchy of needs and social determinants of health. *Disaster Med. Public Health Prep.* **2020**, *14*, 623–629. [CrossRef]

24. World Commission on Environment and Development (WCED). *Our Common Future*; Oxford University Press: Oxford, UK; New York, NY, USA, 1987. Available online: https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf (accessed on 22 July 2023).

25. Alexander, R.; Jacovidis, J.; Sturm, D. Exploring personal definitions of sustainability and their impact on perceptions of sustainability culture. *Int. J. Sustain. High. Educ.* **2022**, *23*, 686–702. [CrossRef]

26. Boyer, R.H.; Peterson, N.D.; Arora, P.; Caldwell, K. Five approaches to social sustainability and an integrated way forward. *Sustainability* **2016**, *8*, 878. [CrossRef]

27. Giddings, B.; Hopwood, B.; O'brien, G. Environment, economy and society: Fitting them together into sustainable development. *Sustain. Dev.* **2002**, *10*, 187–196. [CrossRef]

28. Glasby, G.P. Sustainable development: The need for a new paradigm. *Environ. Dev. Sustain.* **2002**, *4*, 333–345. [CrossRef]

29. Purvis, B.; Mao, Y.; Robinson, D. Three pillars of sustainability: In search of conceptual origins. *Sustain. Sci.* **2019**, *14*, 681–695. [CrossRef]

30. Callaghan, E.G.; Colton, J. Building sustainable & resilient communities: A balancing of community capital. *Environ. Dev. Sustain.* **2008**, *10*, 931–942.

31. Shareef, S.; Altan, H. Sustainability at an Urban Level: ACase Study of a Neighborhood in Dubai, U.A.E. *Sustainability* **2021**, *13*, 4355. [CrossRef]

32. Saad al-sumaiti, A.; Ahmed, M.H.; Salama, M.M. Smart home activities: A literature review. *Electr. Power Compon. Syst.* **2014**, *42*, 294–305. [CrossRef]

33. Aliero, M.S.; Qureshi, K.N.; Pasha, M.F.; Jeon, G. Smart Home Energy Management Systems in Internet of Things networks for green cities demands and services. *Environ. Technol. Innov.* **2021**, *22*, 101443. [CrossRef]

34. Genç, R. The importance of communication in sustainability & sustainable strategies. *Procedia Manuf.* **2017**, *8*, 511–516.

35. Chen, C.; An, Q.; Zheng, L.; Guan, C. Sustainability Literacy: Assessment of Knowingness, Attitude and Behavior Regarding Sustainable Development among Students in China. *Sustainability* **2022**, *14*, 4886. [CrossRef]

36. Oriade, A.; Osinaike, A.; Aduhene, K.; Wang, Y. Sustainability awareness, management practices and organisational culture in hotels: Evidence from developing countries. *Int. J. Hosp. Manag.* **2021**, *92*, 102699. [CrossRef]

37. Moon, M.A.; Mohel, S.H.; Farooq, A. I green, you green, we all green: Testing the extended environmental theory of planned behavior among the university students of Pakistan. *Soc. Sci. J.* **2021**, *58*, 316–332. [CrossRef]

38. Altomonte, S.; Logan, B.; Feisst, M.; Rutherford, P.; Wilson, R. Interactive and situated learning in education for sustainability. *Int. J. Sustain. High. Educ.* **2016**, *17*, 417–443. [CrossRef]

39. Handayani, M.N. Integration sustainable development into higher education curriculum. *J. Sustain. Dev. Educ. Res.* **2019**, *3*, 43–50. [CrossRef]

40. Robertson, M. *Sustainability Principles and Practice*; Taylor & Francis: Milton Park, UK, 2017.

41. Karatzoglou, B. An in-depth literature review of the evolving roles and contributions of universities to education for sustainable development. *J. Clean. Prod.* **2013**, *49*, 44–53. [CrossRef]

42. McInroy, L.B.; Beer, O.W. Wands up! Internet-mediated social advocacy organizations and youth-oriented connective action. *New Media Soc.* **2022**, *24*, 724–740. [CrossRef]

43. Ahmed, A. Developing Strategy for Integrating Sustainability in UAE Higher Education Institutions towards UAE Strategic Initiative Net Zero 2050. In Proceedings of the 2023 International Conference on Computational Intelligence and Knowledge Economy (ICCIKE), Dubai, United Arab Emirates, 9–10 March 2023; pp. 370–375.

44. Radwan, A.F.; Khalil, E.M.A.S. Knowledge attitude practice toward sustainability among university students in, U.A.E. *Int. J. Sustain. High. Educ.* **2021**, *22*, 964–981. [CrossRef]

45. Calculli, C.; D'Uggento, A.M.; Labarile, A.; Ribecco, N. Evaluating people's awareness about climate changes and environmental issues: A case study. *J. Clean. Prod.* **2021**, *324*, 129244. [CrossRef]

46. Scerri, A. Paradoxes of increased individuation and public awareness of environmental issues. *Environ. Politics* **2009**, *18*, 467–485. [CrossRef]

47. Nikolić, T.M.; Paunović, I.; Milovanović, M.; Lozović, N.; Đurović, M. Examining Generation Z's attitudes, behavior and awareness regarding eco-products: A Bayesian approach to confirmatory factor analysis. *Sustainability* **2022**, *14*, 2727. [CrossRef]

48. Rajapaksa, D.; Islam, M.; Managi, S. Pro-environmental behavior: The role of public perception in infrastructure and the social factors for sustainable development. *Sustainability* **2018**, *10*, 937. [CrossRef]

49. Amoako, G.K.; Dzogbenuku, R.K.; Abubakari, A. Do green knowledge and attitude influence the youth's green purchasing? Theory of planned behavior. *Int. J. Product. Perform. Manag.* **2020**, *69*, 1609–1626. [CrossRef]

50. Raggatt, M.; Wright, C.J.; Carrotte, E.; Jenkinson, R.; Mulgrew, K.; Prichard, I.; Lim, M.S. "I aspire to look and feel healthy like the posts convey": Engagement with fitness inspiration on social media and perceptions of its influence on health and wellbeing. *BMC Public Health* **2018**, *18*, 1002. [CrossRef] [PubMed]

51. Kollmuss, A.; Agyeman, J. Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environ. Educ. Res.* **2002**, *8*, 239–260. [CrossRef]

52. Heeren, A.J.; Singh, A.S.; Zwickle, A.; Koontz, T.M.; Slagle, K.M.; McCreery, A.C. Is sustainability knowledge half the battle? An examination of sustainability knowledge, attitudes, norms, and efficacy to understand sustainable behaviours. *Int. J. Sustain. High. Educ.* **2016**, *17*, 613–632. [CrossRef]

53. Bhyan, A.P.; Shrivastava, B.; Kumar, N. Behavioural Factors Affecting the Adoption of Sustainable Housing Practices: Indian Context. *Adv. Asp. Eng. Res.* **2021**, *14*, 92–97.

54. Gifford, R. The dragons of inaction: Psychological barriers that limit climate change mitigation and adaptation. *Am. Psychol.* **2011**, *66*, 290. [CrossRef] [PubMed]

55. Thaler, R.H.; Sunstein, C.R. *Nudge: Improving Decisions about Health, Wealth, and Happiness*; Yale University Press: London, UK, 2008.

56. Balakrishnan, B.; Tochinai, F.; Kanemitsu, H. Perceptions and attitudes towards sustainable development among Malaysian undergraduates. *Int. J. High. Educ.* **2020**, *9*, 44–51. [CrossRef]

57. Hayes, A.F. PROCESS Procedure for SPSS (Version 4.2) [Computer software]. 2022. Available online: www.afhayes.com (accessed on 24 June 2023).

58. Edsand, H.E.; Broich, T. The impact of environmental education on environmental and renewable energy technology awareness: Empirical evidence from Colombia. *Int. J. Sci. Math. Educ.* **2020**, *18*, 611–634. [CrossRef]