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Bridging awareness and action: How students in higher education view climate change

Ahmad Qablan [1*], Maxwell Opoku [1], Ahmed Alkaabi [1], AlJazia BinMadi [2], Ayesha Alkhaja [2], Naila Al Dhanhani [3], Aisha Alketbi [4]

[1] College of Education, United Arab Emirates University, Al Ain, UNITED ARAB EMIRATES
[2] College of Science, United Arab Emirates University, Al Ain, UNITED ARAB EMIRATES
[3] College of Engineering, United Arab Emirates University, Al Ain, UNITED ARAB EMIRATES
[4] College of Medicine, United Arab Emirates University, Al Ain, UNITED ARAB EMIRATES

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Abstract

Universities can build climate literacy and foster student participation in mitigation and adaptation, yet evidence that directly informs curriculum and pedagogy remains limited. This study examined university students' perceptions of climate change occurrence and attribution, their level of concern, and their intended involvement in mitigation and adaptation. A cross-sectional survey captured responses from 1,002 students and included measures of perceived occurrence and causes of climate change, perceived risk, and intention to engage in mitigation and adaptation activities. Analyses included descriptive statistics, independent-samples t-tests, one-way analysis of variance, and multiple regression. Results indicated generally moderate awareness of climate change and high concern about associated risks. A smaller subgroup reported low awareness and low concern. These findings suggest curricular strategies that enhance climate literacy, foster evidence-based reasoning about mechanisms and impacts, and provide structured opportunities for practice-oriented action, with targeted outreach to students who exhibit low awareness. The study advances understanding of student perceptions that matter for course and program design. It outlines actionable directions for universities that seek to embed climate competencies across general education and discipline-specific pathways.

Keywords: climate change, university students, awareness, concern, mitigation, adaptation, curriculum development

INTRODUCTION

Sustainable development goal 11 and sustainable development goal 13 call on nations to implement climate action that safeguards ecosystems and human well-being. Climate change threatens progress across the sustainable development goals and requires coordinated action across sectors. Evidence suggests a persistent gap between objective risk and public perception, which can limit support for effective responses. Targeted awareness and education can help narrow this gap and prepare populations to participate in mitigation and adaptation efforts. Universities have a distinctive mandate in this effort. Scholarship has identified its responsibility to advance sustainable development through teaching, research, operations, and partnerships (Barth & Rieckman, 2013). Studies have reported that institutions can reduce carbon emissions through campus greening initiatives developed in collaboration with local partners (Dutra & Guerra, 2023) and can enhance the capacity of communities through outreach and training (Shiel et al., 2015).

Campuses also function as living laboratories that pilot and evaluate mitigation and adaptation strategies (Hadfield et al., 2023). University climate-change curricula have aimed to develop foundational and advanced knowledge, skills, dispositions, and pro-environmental behaviors that persist beyond graduation

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✉ qablan@uaeu.ac.ae **(*Correspondence)** ✉ Maxwell.p@uaeu.ac.ae ✉ ahmed.alkaabi@uaeu.ac.ae ✉ 202218087@uaeu.ac.ae ✉ 202212176@uaeu.ac.ae ✉ 202205260@uaeu.ac.ae ✉ 202214002@uaeu.ac.ae

Contribution to the literature

- This study contributes region-specific evidence from the United Arab Emirates (UAE), addressing a gap in higher education climate literacy research. Grounded in social cognitive theory (SCT), it explains how awareness, concern, and behavioral intentions interact among university students.
- The findings highlight the gap between awareness and action, offering practical implications for embedding climate engagement into university curricula.
- In line with EJMSTE's focus on sustainability and curriculum innovation, the study provides recommendations for integrating climate competencies across academic programs.

and influence subsequent generations (Choi et al., 2017; United Nations [UN], 1992; United Nations Educational, Scientific and Cultural Organization [UNESCO], 2010). Prior research showed that well-designed instruction and co-curricular programming can foster climate literacy and self-efficacy. Those outcomes support informed energy decisions and sustained engagement in mitigation and adaptation (Cordero et al., 2020; Cotton et al., 2016). These roles position higher education as a pivotal lever for societal transition toward sustainability.

A substantial literature has examined university students' perceptions of climate change (Huang & Shaw, 2025; Kaya & Aladağ, 2024; Leal Filho et al., 2023; Prasad & Mkumbachi, 2021). Studies documented variation across disciplines and as a function of personal exposure to climate-related risks and to online and global media sources (Agboola & Emmanuel, 2016; Ayanlade & Jegede, 2016; Beck et al., 2013; Freije et al., 2017; Mugambiwa & Dzomonda, 2018; Myers et al., 2012; Ojomo et al., 2015). Evidence indicated that attitudes and understanding, including views on causes and impacts, reflected both formal instruction and informal learning. Akrofi et al. (2019) demonstrated that participation in climate workshops and campaigns increased knowledge. They also found that attitudes and behaviors correlated with awareness. Akrofi et al. (2019) argued that education is crucial for increasing awareness and promoting active engagement throughout society.

Although a growing body of research has examined university students' knowledge and perceptions of climate change, important questions remain. Studies conducted in different national settings have shown that students generally recognize climate change as a serious issue, but their understanding of its causes, consequences, and possible responses often varies across disciplines and educational contexts (Haq & Ahmed, 2020; Leal Filho et al., 2023). Conceptual misunderstandings may persist even among students preparing for education-related careers, highlighting the need to examine specific aspects of climate knowledge rather than relying only on general measures of concern (Fayzullina et al., 2024). Evidence from universities in the UAE remains comparatively limited, particularly research that examines students from a broad range of academic disciplines. Previous studies have also tended to consider climate knowledge, concern, and willingness to act separately, providing less insight into how these dimensions may be related. Moreover, relatively few studies have used evidence about students' perceptions to identify specific curricular and co-curricular priorities. The present study addresses these gaps by examining students' views about the occurrence and causes of climate change, their awareness and concern, their information sources, and their willingness to participate in climate-related activities.

Accordingly, universities hold a pivotal role. They can motivate students and staff to confront climate challenges, contribute research, design solutions for mitigation and adaptation, and assume leadership roles in policy arenas (Molthan-Hill et al., 2019). The literature supported the establishment of educational programs that strengthen climate literacy and build the knowledge and skills required for sustainability efforts (Burkholder et al., 2017). Despite this progress, systematic evaluation of students' perceptions and of the degree to which higher education integrates climate-related content remained limited. Assessing students' views can inform curriculum design and reform. The present study addressed this gap by examining university students' perceptions of climate change to inform climate education at national and international levels.

This study included several variables, such as gender, field of study, academic level, and age, because students' experiences with climate change may vary according to their personal and educational backgrounds. International evidence indicates that climate awareness and perceptions can differ according to students' disciplinary fields, gender, age, and level of education (Leal Filho et al., 2023). Field of study is particularly relevant because students in some disciplines encounter climate science, sustainability, and environmental risk more frequently in their coursework than students in other disciplines. Haq and Ahmed (2020), for example, examined climate perceptions among students from different academic disciplines and showed the importance of considering students' educational backgrounds when interpreting their responses. Academic level may similarly reflect accumulated exposure to relevant coursework, research, or university activities. Age may be associated with differences in experience and information practices, while gender has been linked in previous research to differences in

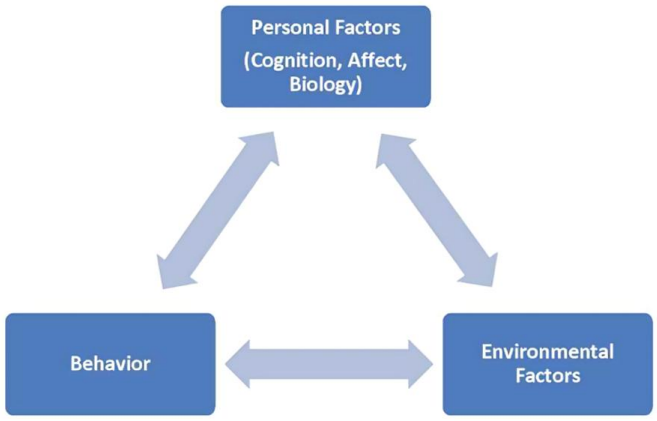

Figure 1. Social foundations of thought and action: A SCT (Bandura, 1986)

environmental concern and risk perception. Examining these variables can therefore help identify groups of students who may benefit from more focused climate-learning and engagement opportunities.

Based on that, this study came to address the following two questions:

1. What are students' levels of awareness of climate change and their primary information sources?
2. Do levels of awareness differ by gender, field of study, academic level, and age?

Social Cognitive Theory

This study applies SCT to examine environmental behavior. SCT integrates several sciences (i.e., psychology, sociology, and political science), and it highlights the roles of observational processes and cognition in learning and action (Glanz et al., 2015). Bandura (1986) posited that behavior emerges from triadic reciprocal causation among personal factors, behavior, and environment. He also argued that people can shape environmental conditions to advance individual and collective goals (Bandura, 1986). The theory situates thought and action within social foundations, thereby supporting analyses of contextual and interpersonal influences across medical and environmental settings (Bandura, 1986; Glanz et al., 2008). Observational learning functions as a core mechanism: exposure to others' actions and to the consequences of those actions facilitates the acquisition of behaviors, cognitions, and affective responses (Bandura, 1977, 1986). Later formulations treated behavior, social influences, and environmental conditions as elements of a unified model of learning and development (Bandura, 1986, 1998, 2000).

SCT explains the acquisition and maintenance of behavior, guiding engagement strategies (Bandura, 1998). Behavioral change arises from reciprocal influences among personal, environmental, and behavioral factors (see **Figure 1**; Bandura, 1986). Cognitive processes shape the environments that people select and interpret. Those environments, in turn, inform perception and action. Subsequent actions modify later environmental exposures, which completes the cycle of reciprocal determinism. Within this framework, opinions, attitudes, and knowledge mediate the effects of external stimuli on behavior. The environment exerts both social and physical influences. Families, peers, and colleagues occupy the social sphere, whereas features such as space constraints, temperature, and food availability define the physical sphere (Parraga, 1990). SCT further distinguishes situations as cognitive representations of the environment that shape behavior through perceived cues, temporal constraints, physical characteristics, and ongoing activities (Glanz et al., 2002).

According to social cognitive theorists, observational learning and modeling supply the pathways through which individuals acquire a broad repertoire of responses. Bandura's (1977, 1986) early experiments underscored the role of vicarious reinforcement and punishment in shaping behavior. In this account, people attend to models on their social networks and to models presented through media. They then form expectations about outcomes, evaluate their own capabilities, and choose actions that reflect those expectations and capabilities. Bandura (1977) emphasized the centrality of self-efficacy within this process. Perceived self-efficacy influences choice of activities, effort, persistence, and emotional reactions. As people master tasks or observe credible models who succeed, their efficacy beliefs strengthen, and subsequent behaviors become more robust and more persistent in the face of obstacles (Bandura, 1977, 1998).

SCT also clarifies how environments and situations maintain or alter behavior over time. The environment offers models for behavior, provides incentives and constraints, and supplies feedback that people use to update beliefs and strategies. Individuals respond to these conditions with actions that either reproduce or modify the environment. This mutual influence establishes an evolving system rather than a unidirectional causal chain. In environmental contexts, the social sphere includes norms and practices within families, workplaces, and peer groups. In contrast, the physical sphere includes design features, resource availability, and exposure to cues that prompt or inhibit particular choices (Parraga, 1990). Situational appraisals link these spheres to behavior through attention, interpretation, and memory (Glanz et al., 2002).

Researchers frequently apply SCT to examine self-regulated learning because it specifies interactions among beliefs of self-efficacy, value-based goals, outcome expectations, and environmental enablers or constraints. This literature posits perceived self-efficacy as a central determinant of motivation, emotion, and behavior, treating value-based goals as self-generated incentives that guide adaptive and health-supportive actions (Bandura, 1986, 1998). These principles extend to

environmental behavior. Individuals evaluate their capabilities, anticipate the likely outcomes of conservation-related actions, and operate within enabling or constraining social and physical conditions. By drawing on these mechanisms, the present study analyzes participants' environmental behavior within their social and physical contexts. It interprets opinions, attitudes, and knowledge as mediators that connect external conditions to observed actions.

SCT provides a useful framework for understanding the variables examined in this study. Students' awareness, beliefs about the causes of climate change, and level of concern represent personal cognitive and affective factors that may influence their responses. University curricula, information sources, peer activities, and opportunities for participation form part of the educational and social environment in which these responses develop. Students' willingness to participate in climate-related activities represents the behavioral dimension of the framework. These personal, environmental, and behavioral dimensions may influence one another through reciprocal interactions (Bandura, 1986, 1998). From this perspective, climate engagement may develop through the interaction of what students know and believe, the educational environments they experience, and the opportunities available for meaningful participation. Nevertheless, because the present study used a cross-sectional design, the observed relationships are interpreted as associations rather than evidence of causal effects.

Climate Change Education in UAE Higher Education Institutions

The UAE's location in the Middle East is characterized by persistently high temperatures, which drive its national response to climate change. Accordingly, the political leadership has launched several initiatives to address this global challenge. A key policy, the UAE green agenda 2015-2030, outlines five strategic objectives that place education and awareness at the center (United Arab Emirates Government, 2015; UAE Ministry of Climate Change and Environment, 2021). The agenda calls for sponsoring university research on green initiatives, providing environmental scholarships and training for green jobs, and conducting public awareness campaigns about sustainable transportation. Furthermore, the national climate change plan 2017-2050 emphasizes that a transition to a knowledge-based green economy requires capacity building within the national labor force (United Arab Emirates Government, 2017; UAE Ministry of Climate Change and Environment, 2021). The plan notes that universities play a critical role in achieving this goal because they offer nearly 20 undergraduate and postgraduate courses focused on sustainability. To strengthen these efforts, the UAE Ministry of Climate Change and Environment (2021) established the national climate change research Network, which unites climate scientists across governmental and nongovernmental sectors to promote collaboration and knowledge sharing. Such research is vital for monitoring environmental changes and assessing their impacts to inform effective adaptation and mitigation strategies.

This strategic focus is evident in the academic sector, where most national universities have created departments dedicated to environmental sciences and management. For example, Zayed University (2016) offers a Bachelor of Science in environmental science and sustainability, which addresses the social, political, and economic dimensions. In collaboration with the government and UN agencies, the university also hosted the 2016 forum "Climate change negotiation: the road from Paris," which assessed the impact of COP21 on the Gulf Region. Likewise, Khalifa University (2025) offers a Master of Science in water and environmental engineering designed to address societal and environmental challenges within a sustainable development framework. At the United Arab Emirates University (2024), research teams are encouraged to address climate action directly, for example, by examining crop genotype performance under environmental stresses such as drought and salinity.

METHODOLOGY

Data were collected using an online questionnaire adapted primarily from the instrument developed through the inter-university sustainable development research program and reported by Leal Filho et al. (2023). That instrument was designed to examine university students' attitudes and perceptions of climate change across different geographical and educational contexts. The questionnaire addressed students' views about the occurrence and causes of climate change, their level of concern and awareness, their information sources, their exposure to climate-related content at university, and their willingness to participate in climate-related activities. Some items were retained from the original instrument, while others were adapted to improve their relevance to the UAE higher-education context. The research team reviewed the wording, content, and organization of the items before the questionnaire was evaluated by five specialists in climate education and sustainability. The specialists considered the relevance, clarity, and contextual appropriateness of the items, and their feedback was used to prepare the final 21-item questionnaire.

The climate-change awareness scale consisted of six items rated on a five-point scale ranging from 1, "not at all," to 5, "to a great extent." The items assessed students' awareness of adaptation and mitigation, current climate debates, conferences of the parties, sustainable development goal 13, the Fridays for future movement, and involvement in climate-related

Table 1. Significance levels and descriptive statistics for variables related to students' climate change outcomes

Categories	f	P (%)
Gender		
Female	160	16
Male	842	84
t	.17	
Effect size	.02	
Age		
18-25 years	935	94
26-35 years	43	4
At least 36 years	24	2
F	1.70	
Effect size	.003	
College		
Education	69	7
Arts and humanities	10	1
Social sciences	162	16
Business	66	7
Natural sciences	150	15
ICT	124	12
Engineering	178	18
Agriculture	23	2
Law	119	12
Medicine	101	10
F	2.72**	
Effect size	.02	
Level of study		
Undergraduate	924	92
Masters	48	5
PhD	30	3
F	3.14*	
Effect size	.01	
Occurrence		
Definitely changing	754	75
Probably changing	144	14
I am not sure	74	7
Probably not changing	18	2
Definitely not changing	12	1
F	.15	
Effect size	.001	
Causes		
Caused entirely by human activity	153	15
Causes mainly human activity	500	50
Caused by natural processes	253	25
Caused entirely by natural processes	86	9
Definitely not happening	10	1
F	2.37*	
Effect size	.01	
Concerns		
Extremely worried	135	14
Very worried	181	18
Somewhat worried	408	41
Not very worried	214	21
Not at all worried	57	6
Climate change is not happening	7	0.7
F	7.22**	
Effect size	.04	

Note. P: Percentage

activities. An overall awareness score was calculated by averaging responses across the six items, with higher scores indicating greater awareness. The scale demonstrated acceptable internal consistency in the present study (Cronbach's alpha = .80).

Context of the Study

This study took place at the largest institution in the UAE. The university is a federal institution that enrolls approximately 15,000 students across various majors. Established in 1972, it maintains its main campus in Al Ain. It comprises 10 colleges and offers 28 undergraduate programs, 25 master's programs, and 12 doctoral programs (see **Table 1**).

Procedure

Following ethical approval from the university, all enrolled students were invited to participate through messages sent to their institutional email accounts. Each message briefly explained the purpose of the study and included a link to the online questionnaire. Students were informed that participation was voluntary and that their responses would remain confidential. Electronic consent was obtained before participants accessed the questionnaire. Reminder messages were sent during the data-collection period, which extended from June 16 to September 30, 2024. A total of 1,002 complete questionnaires were included in the analysis.

Data Analysis

Data were analyzed using IBM SPSS statistics. The data met the assumptions of normality, which justified the use of parametric analyses. For research question 1, means (Ms) and frequencies (fs) were used to examine students' sources of information and awareness of climate change. For research question 2, t-tests and ANOVA were conducted to assess differences between participant groups, and effect sizes were reported. Finally, linear regression was performed to identify predictors of climate change awareness among students.

RESULTS

This section presents findings for four informational dimensions related to climate change occurrence, knowledge of climate change causes, concern about the issue, and the climate change awareness scale (Cronbach's alpha = .80)—as well as for climate change engagement.

Participants' Demographic Information

Table 1 shows that 84% of participants were male and approximately 16% were female, with a majority of participants being undergraduate students aged 18-25. Participants represented all colleges at the university: engineering (18%), social sciences (16%), natural sciences

Table 2. Participants' sources of information about climate change (N = 1,002)

Categories	f	P (%)
TV		
Yes	426	53
No	526	57
Radio		
Yes	99	10
No	903	90
Newspaper		
Yes	178	18
No	824	82
Social media		
Yes	820	82
No	182	18
University		
Yes	394	39
No	608	61
Family		
Yes	329	33
No	673	67
Students' club		
Yes	0	0
No	1,002	100
NGOs		
Yes	110	11
No	892	89
Scientific database		
Yes	146	15
No	856	85
International symposium		
Yes	238	24
No	764	76

Note. P: Percentage

Table 3. Summary of the differences between participants on climate change awareness

Categories	t/F
Gender	
t	.17
Effect size	.02
Age	
F	1.70
Effect size	.003
College	
F	2.72**
Effect size	.02
Level of study	
F	3.14*
Effect size	.01
Occurrence	
F	.15
Effect size	.001
Causes	
F	2.37*
Effect size	.01
Concerns	
F	7.22**
Effect size	.04

(15%), information and communication technology (ICT; 12%), law (12%), medicine (10%), business (7%), education (7%), agriculture and veterinary medicine (2%), and arts and humanities (1%).

Consistent with findings reported in international samples (Leal Filho et al., 2023), most students (75%) were confident that the climate is changing, and 14% believed it is probably changing. Students who expressed doubt may require additional informational support to recognize the reality of climate change. Half of the participants attributed climate change primarily to human activity, 25% attributed it to natural processes, and 15% attributed it entirely to human activity. These results indicate a need for curricular alignment that addresses causal attributions and strengthens students' understanding of the drivers of climate change. Students with accurate knowledge of causation can play influential roles within their universities and communities, regardless of academic discipline.

In terms of concern, 41% of participants were somewhat worried, 18% were very worried, and 14% were extremely worried about climate change risks, whereas 6% were not at all concerned. Differences in concern levels may reflect variation in exposure to climate-related risks. Although awareness is important, excessive worry can discourage engagement and impair effective responses, while an overly optimistic outlook can hinder understanding of the issue's severity and potential consequences.

Sources of Climate Change Information

Participants rated their sources of information on climate change. Social media was the most frequently used source (82%), whereas student clubs were the least used source (see **Table 2**). These findings suggest a need to realign the university's information and social media channels to increase students' awareness and understanding of climate change.

Group Differences in Climate Change Awareness

Independent samples t-tests and one-way ANOVA were conducted to examine differences in climate change awareness across demographic groups. T-tests were used for two-level demographics, and one-way ANOVA was used for demographics with three or more levels (see **Table 3**). For the level of study, the omnibus test indicated a difference among groups, $F(2, 999) = 3.14$, $p = .04$, partial $\eta^2 = .01$ (small). Post hoc comparisons revealed no pairwise differences: undergraduate ($M = 2.55$, standard deviation [SD] = 0.83), master's ($M = 2.70$, $SD = 0.79$), and PhD students ($M = 2.88$, $SD = 0.84$). By college of study, the omnibus test indicated a difference, $F(9, 992) = 1.84$, $p = .004$, partial $\eta^2 = .02$ (minor). Post hoc comparisons showed higher awareness among students in agriculture and

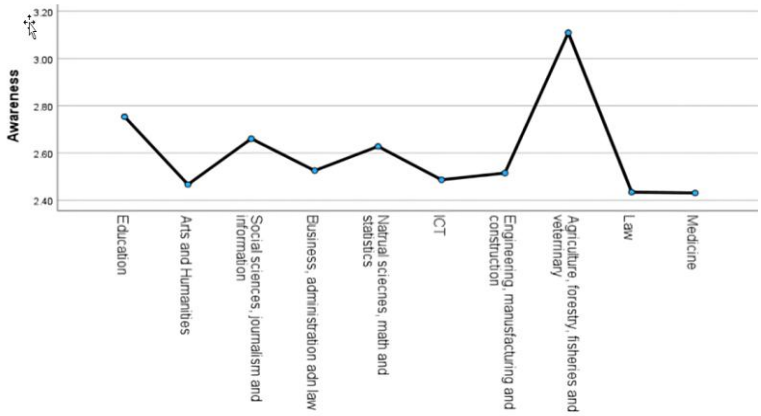

Figure 2. Group differences in climate change awareness by college (created by the authors using SPSS software)

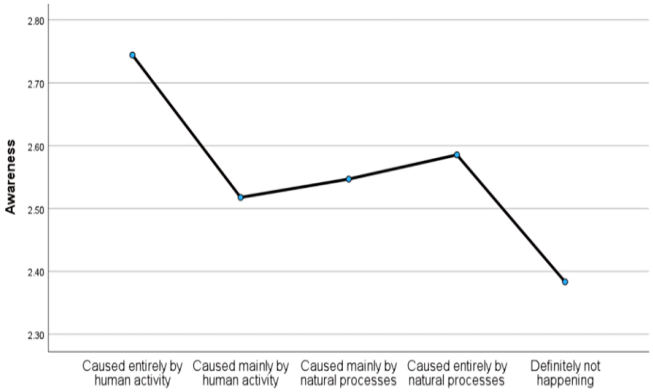

Figure 3. Differences in climate change awareness by cause attribution (created by the authors using SPSS software)

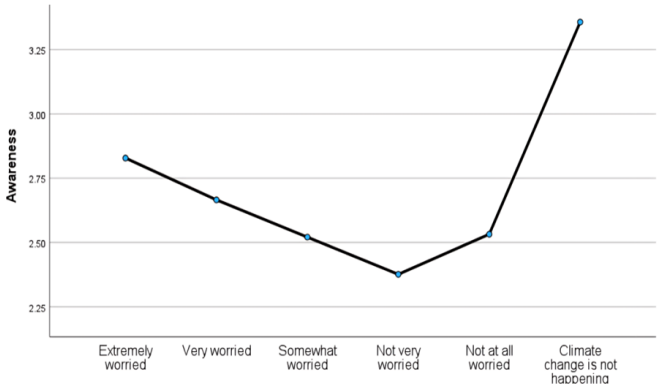

Figure 4. Group differences in climate change awareness by concern level (created by the authors using SPSS software)

veterinary medicine (M = 3.11, SD = 0.95) than among students in information and communication technology (M = 2.49, SD = 0.83), engineering (M = 2.52, SD = 0.81), law (M = 2.43, SD = 0.72), and medicine (M = 2.43, SD = 0.86). Students in agriculture and veterinary medicine did not differ from education (M = 2.75, SD = 0.88), arts and humanities (M = 2.47, SD = 0.91), social sciences (M = 2.66, SD = 0.81), or natural sciences (M = 2.63, SD = 0.84) (see **Figure 2**).

Differences also emerged by cause attribution, F (4, 997) = 2.37, p = .05, partial η^2 = .01 (small). Post hoc comparisons indicated higher awareness among students who attributed climate change entirely to human activity (M = 2.74, SD = 0.85) than among those who attributed it mainly to human activity (M = 2.52, SD = 0.83). Neither of these groups differed from those who attributed climate change mainly to natural processes (M = 2.55, SD = 0.81), entirely to natural processes (M = 2.58, SD = 0.78), or believed it is definitely not happening (M = 2.38, SD = 1.00) (see **Figure 3**).

Group Differences in Awareness by Concern Level

An omnibus one-way ANOVA indicated differences in climate change awareness across concern levels, F (5, 996) = 7.22, p = .001, partial η^2 = .04 (small). Post hoc comparisons revealed that students who were extremely worried (M = 2.83, SD = 0.93) reported higher awareness than those who were somewhat worried (M = 2.52, SD = 0.76) and not very worried (M = 2.38, SD = 0.82). Students who were not very worried also differed from those who were very worried (M = 2.67, SD = 0.82). Students who were not at all worried (M = 2.53, SD = 0.90) did not differ significantly from the other groups. Participants who indicated that climate change is not happening had an M awareness score of 3.36 (SD = 0.64) (see **Figure 4**).

Overall Awareness of Climate Change

The M score for overall awareness of climate change was 2.56 (SD = 0.83), indicating a negative perception, as the scale midpoint is three and higher values indicate greater awareness (see **Table 4**).

Predictors of Awareness

Multiple regression analysis was conducted to identify predictors of students' climate change awareness. Demographic variables explained 3% of the variance, R^2 = .03, F (7, 994) = 4.84, p = .001. At the predictor level, only college of study (β = -0.11, p = .001) and concern about climate change (β = -0.13, p = .001) were significant (see **Table 5**).

Table 4. The M scores for climate change awareness items

	Items	M (SD)
a	To what extent are you aware of the differences between climate change adaptation and mitigation?	2.85 (1.06)
b	To what extent are you update on the climate change debate?	2.67 (1.06)
c	To what extent are you aware of the discussions and outcomes of the conferences of the parties?	2.53 (1.18)
d	To what extent are you aware of the targets of the sustainable development goal 13?	2.58 (1.22)
e	To what extent are you aware of the movement Fridays for the future?	2.21 (1.22)
f	To what extent are you involved in the climate change movement?	2.54 (1.13)

Note. 1: Not at all; 2: Disagree; 3: Neutral; 4: Agree; & 5: Agree to a great extent

Table 5. Predictors of awareness of climate change

	Unstandardized Beta	Standard error	Beta	t	p
Gender	.03	.07	.01	.40	.69
Age	.02	.09	.01	.23	.82
College	-.03	.01	-.11	-3.48	.001**
Level of study	.15	.08	.07	1.88	.06
Occurrence	.02	.03	.02	.58	.56
Causes	.003	.02	.004	.13	.90
Concerns	-.10	.03	-.13	-3.80	.001**

DISCUSSION

Climate change constitutes a critical global challenge that necessitates synchronized, high-level responses. Similar cross-national studies have been documented by Leal Filho et al. (2023), who found comparable differences in students' awareness and concerns across geographical regions and academic subjects. Results of those studies indicated that university students' awareness of climate change reflects a complex interplay of economic conditions, demographic variables, cultural context, educational background, and direct experience with risks caused by climate change (Almusalami et al., 2024; Alqawasmi et al., 2025; Al-Tkhayneh & Ashour, 2024; Haque et al., 2025; Hayek et al., 2023; Leal Filho et al., 2023; Magembe et al., 2024; Shariff et al., 2024). Despite variation in these influences, students occupy a vital position in global efforts to address climate change through education and advocacy. Students, therefore, play an instrumental role in advancing adaptation and mitigation within their communities. To enable them to fulfill this role, institutions must provide high-quality education that addresses the causes, consequences, and solutions of the climate crisis. Such preparation requires the realignment of university curricula so that students acquire relevant knowledge, practical skills, and proactive attitudes that support effective climate action and have a positive influence within their societies.

Assessing the awareness and attitudes of university students toward climate change can guide curricular alignment and help students understand the adverse impacts of climate change across domains of life. This study assessed perceptions of the occurrence and causes of climate change, levels of concern, and intended future participation in climate interventions. Findings indicated that most participants demonstrated a moderate level of awareness (M = 2.56) and that 73% expressed substantial concern about associated risks. A smaller subgroup exhibited low awareness and consequently low concern, a pattern consistent with prior work (Akrofi et al., 2019). The analysis revealed no difference in awareness by academic level (undergraduate vs. graduate), which contradicted the findings of AbuQamar et al. (2015). However, consistent with Mugambiwa and Dzomonda (2018), students enrolled in agriculture, information technology, engineering, law, and medicine reported greater awareness than peers in other colleges. This pattern suggested that many programs do not adequately address climate issues. Targeted curriculum interventions that integrate climate-related content could elevate awareness among university students (Wachholz et al., 2014).

The findings suggest that providing students with additional information may be necessary, but information alone may not be sufficient to encourage meaningful engagement. Shackley (2021) found that emphasizing the local effects of climate change did not necessarily increase students' willingness to engage in pro-environmental behavior, illustrating the difficulty of translating awareness into action. Climate education may therefore be more effective when it combines scientific understanding with opportunities for discussion, evidence-based reasoning, and practical participation. Namdar and Topbas (2024), for example, demonstrated that online argumentation activities could strengthen pre-service science teachers' awareness of climate-change content, impacts, and possible responses. Similarly, Fayzullina et al. (2024) highlighted the need to address specific conceptual gaps in pre-service teachers' understanding of climate change. Universities could build on these findings by allowing students to evaluate evidence, discuss competing claims, develop possible solutions, and participate in projects through which climate knowledge can be applied in meaningful contexts.

The impact of curricular revision on awareness and concern remains uncertain. Prior work indicated that engagement with environmental organizations did not consistently align with attributing climate change to human activity (Mobley et al., 2010), and such engagement may legitimize non-scientific narratives that weaken perceptions of human agency in addressing the crisis.

The findings also revealed that male students were significantly more likely than female students to attribute climate change primarily to human activity. Social media emerged as the most preferred source of information about climate change, and no participants reported learning about the issue through university clubs or analogous organizations. This absence invites scrutiny of the role and effectiveness of such clubs in campus climate education. All variables except age and gender showed significant positive relationships with engagement in climate initiatives. The strongest associations involved perceived causes of climate change, level of concern, and level of study. These patterns suggested that concern relates to intentional behavior designed to address perceived environmental risks (Grothmann & Patt, 2005; van Valkengoed & Steg, 2019). Because changes in perceptions and attitudes require time, universities should provide sustained exposure to climate issues to support durable engagement. Clear linkages between causes and effects appear critical for motivating active participation (Akrofi et al., 2019).

The factors highlighted in this study should prompt stakeholders in higher education to reconsider the content and pedagogy of climate literacy. Diverse educational approaches can engage students with climate change risks and contribute to enhancing their societies' literacy about climate change. Universities are well-positioned to lead these efforts by incorporating student perceptions and patterns of engagement into curriculum development. At the national level, priorities should include strengthening students' knowledge and awareness of climate change issues, which can lead to increased engagement with these issues. Larger international studies could clarify whether curricular reform is necessary to ensure that university graduates understand the scientific roots of climate change. Amid ongoing debates on global governance, insights from international student surveys can inform climate education policy at both national and international levels. They may foster the behavioral changes necessary among the next generation of decision-makers to advance decarbonization and climate resilience.

Climate education should also respond to the needs of different academic disciplines. Students are more likely to recognize the relevance of climate change when it is connected to the professional and social issues they are likely to encounter in their fields. In medical education, for example, Silverwood et al. (2026) found strong interest among students and faculty in incorporating climate-related health content into the curriculum, although participants also identified practical challenges to implementation. Such findings suggest that a single university-wide approach may not be sufficient. General education courses can provide foundational climate literacy, while discipline-specific courses can help students examine how climate change relates to health, engineering, law, education, agriculture, business, and other professional contexts.

This study contributes to the literature by providing evidence from students across a range of disciplines at a large university in the UAE. Previous studies have demonstrated that university students' climate perceptions are shaped by their educational and disciplinary contexts (Haq & Ahmed, 2020; Leal Filho et al., 2023), while more focused research has identified knowledge gaps among pre-service teachers and a demand for climate education within professional programs (Fayzullina et al., 2024; Silverwood et al., 2026). The present findings extend this literature by examining students' awareness, concern, information sources, and intended engagement within the same institutional context. They also identify areas in which students may require further support, particularly in developing a more detailed understanding of climate processes and connecting that understanding with meaningful action. These findings can help universities design climate education that responds more closely to students' existing knowledge, concerns, disciplinary backgrounds, and educational experiences.

CONCLUSION

This study examined university students' awareness of climate change and identified three principal findings. Many students demonstrated only a modest awareness of climate risks, recognizing human activities as the primary cause rather than natural processes (Leal Filho et al., 2023). Social media served as a trusted source for information about these risks, suggesting a need to reassess university curricula so that they address climate change more effectively. The study also found that students' level of concern closely aligned with their knowledge and that participation in climate-related events partly shaped that knowledge. Knowledge varied across demographic groups, with relevant factors including gender, age, field of study, and academic level. A higher proportion of male respondents than female respondents attributed climate risks to human activity. Younger students tended to exhibit greater awareness, and students enrolled in environmental programs reported higher knowledge levels than their peers in other disciplines.

This study had several limitations. Although the survey yielded many undergraduate responses, a larger graduate student sample would have provided more

robust insights into awareness trends. Self-selection bias also posed a concern because participation was likely skewed toward individuals already motivated to engage with the topic, a common issue in survey research (e.g., Bethlehem, 2010). Nonetheless, the study provided valuable insight into university students' perceptions of climate change. Future research should examine students' awareness of specific climate themes and compare academic perspectives with those from other sectors, such as industry. These findings are expected to stimulate work that enhances institutional prioritization of climate change and develops rigorous models of environmental psychology and behavior. The ultimate objective is to foster a more engaged student body equipped to confront the complex challenges of climate change.

The value of this study lies in showing that recognizing climate change does not necessarily mean that students possess a detailed understanding of its causes, consequences, and possible responses. This distinction is important because gaps in specific climate knowledge can persist even among university students and future educators (Fayzullina et al., 2024). The findings also highlight differences in students' educational exposure and their strong reliance on social media for climate information. Addressing these patterns will require more than simply increasing the amount of information available to students. Universities should combine foundational climate knowledge with discipline-specific applications, evidence-based discussion, and structured opportunities for participation, as recommended in recent work on climate education and student engagement (Namdar & Topbas, 2024; Shackley, 2021; Silverwood et al., 2026).

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AI statement: The authors declare that no generative AI or AI-assisted technologies were used in the preparation of this manuscript.

Declaration of interest: No conflict of interest is declared by the authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

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APPENDIX A: STUDY INSTRUMENT

Section 1 – Climate Change: Attitudes and Perceptions of University Students Questionnaire

1. Country: _____
2. Sex:
   ( ) F
   ( ) M
3. Age group:
   ( ) 18-25
   ( ) 26-35
   ( ) 36-50
   ( ) 51+
4. Study area:
   ( ) Education
   ( ) Arts and humanities
   ( ) Social sciences, journalism, and information
   ( ) Business, administration, and law
   ( ) Natural sciences, mathematics, and statistics
   ( ) Information and communication technologies
   ( ) Engineering, manufacturing, and construction
   ( ) Agriculture, forestry, fisheries, and veterinary
   ( ) Health and welfare
   ( ) Services
   ( ) Other: _____
5. Current study level:
   ( ) Undergraduate
   ( ) Master's
   ( ) Doctoral
6. Climate is …
   ( ) Definitely changing
   ( ) Probably changing
   ( ) I am not sure
   ( ) Probably not changing
   ( ) Definitely not changing

Section 2 – Attitudes and Perceptions about Climate Change

7. Climate change is…
   ( ) Caused entirely by human activity
   ( ) Caused mainly by human activity
   ( ) Caused equally by human activity and natural processes
   ( ) Caused mainly by natural processes
   ( ) Caused entirely by natural processes
   ( ) Definitely not happening
8. How worried are you about climate change?
   ( ) Extremely worried
   ( ) Very worried
   ( ) Somewhat worried

( ) Not very worried
( ) Not at all worried
( ) Climate change is not happening

9. Where do you obtain information on climate change (multiple answers possible)?
( ) TV
( ) Radio
( ) Newspapers
( ) Social media
( ) University
( ) Family
( ) Student clubs/associations
( ) NGOs
( ) Scientific databases, e.g., Scopus
( ) International symposiums or events
( ) Other: _____

10. Perception and information on climate change. On the scale below, mark your level of perception and information about climate change (*1 = not at all, 2 = a little, 3 = somewhat, 4 quite a bit, 5 = to a great extent*):

Table A1. Perception and information on climate change

	1	2	3	4	5
To what extent are you aware of the differences between climate change adaptation and mitigation?					
To what extent are you update on the climate change debate?					
To what extent are you aware of the discussions and outcomes of the conferences of the parties?					
To what extent are you aware of the targets of the sustainable development goal 13?					
To what extent are you aware of the movement Fridays for the future?					
To what extent are you involved in the climate change movement?					

11. Is climate change present as a topic/subject in your course/teaching program?
( ) Yes
( ) No

12. How much emphasis does your course place on climate change-related topics?
( ) The topic is very well covered with plenty of information
( ) The topic is covered with enough information
( ) The topic is not as well covered as we would like it to be
( ) The topic is poorly covered
( ) The topic is poorly covered
( ) I do not know/I am not sure

13. More information about climate change in your university should come from (multiple answers possible):
( ) Mandatory courses
( ) Optional courses
( ) Student projects
( ) Publications
( ) Placements in companies
( ) Student clubs/associations
( ) University strategic plans
( ) Career centers
( ) Other: _____

14. In your opinion, which are the three main impacts caused by climate change (multiple choices possible)?
    ( ) Damage to biodiversity
    ( ) Increase in the number of non-native species
    ( ) Increase in poverty
    ( ) Increase in conflict
    ( ) Sea-level rises
    ( ) Increase in the number and severity of storms
    ( ) Increase in the number and severity of droughts
    ( ) Melting of glaciers
    ( ) Flooding
    ( ) Increase in water-borne disease
    ( ) Increase in the displacement of communities
    ( ) Damage to infrastructure and superstructure
    ( ) Other: _____
15. Those most responsible for causing climate change are:
    ( ) Those in the Global North
    ( ) Those in the Global South
    ( ) The world's wealthiest people, regardless of geographic location
    ( ) Other: _____
16. The global temperature increase due to the greenhouse effect will affect the life of:

Table A2. The global temperature increase due to the greenhouse effect will affect the life of:

	Positively	Neutrally	Negatively
Your generation	( )	( )	( )
The next generation	( )	( )	( )
Generations far into the future	( )	( )	( )

17. Which of the following problems hinder communication on climate change (multiple choices possible)?
    ( ) No problem at all
    ( ) The issue is too scientific
    ( ) The issue is too abstract
    ( ) The issue is too complex
    ( ) The issue has no connection with reality
    ( ) The issue does not affect me
    ( ) Impacts are too long-term
    ( ) Other: _____
18. Would you like to participate in (more) activities related to climate change?
    ( ) Yes
    ( ) No
19. If so, in which ones?
    ( ) Student movements/protests for climate change awareness
    ( ) Training/capacity-building workshops
    ( ) Volunteerism/community activities
    ( ) Research on climate change
    ( ) More content about it in my course/teaching program
    ( ) Other: _____

20. Which themes do you need further information on (multiple choices possible)?
    ( ) Approaches to climate change mitigation
    ( ) Approaches to climate change adaptation
    ( ) Climate change causes and impacts
    ( ) Technologies that reduce climate change
    ( ) Sustainable development goal 13
    ( ) Other: _____
21. Fatima Khaled is a 17-year-old UAE student who has initiated school strikes for climate worldwide to raise awareness among the public and politicians about the climate change crisis. How do you feel about her efforts (choose the best three options)?
    ( ) I am not aware of her actions
    ( ) I fully support her actions
    ( ) I have attended/organized school strikes for climate
    ( ) I wish I dared to do the same
    ( ) I feel that her actions have been successful
    ( ) I feel that her actions have not been successful
    ( ) I feel that she is doing all this to gain popularity
    ( ) I feel that she is being manipulated to serve the interests of others
    ( ) I feel that she is poorly informed about the complex nature of climate change
    ( ) Other (please specify)

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