Kızıldeniz, T., Bozkurt, F. (2024). Evaluating Climate Change Knowledge, Attitudes, and Behaviors (KAB) in Agricultural Sciences and Technologies Education. *The Black Sea Journal of Sciences*, 14(2), 619-633.

The Black Sea Journal of Sciences, 14(2), 619-633, 2024. DOI: 10.31466/kfbd.1400642

KFBD

Karadeniz Fen Bilimleri Dergisi
The Black Sea Journal of Sciences
ISSN (Online): 2564-7377 https://dergipark.org.tr/tr/pub/kfbd

Araştırma Makalesi / Research Article

Evaluating Climate Change Knowledge, Attitudes, and Behaviors (KAB) in Agricultural Sciences and Technologies Education

Tefide KIZILDENİZ[1*], Fatma BOZKURT[2]

Abstract

The aim of this study is to determine the levels of knowledge, attitudes, and behaviors (KAB) regarding climate change among undergraduate and postgraduate students enrolled into the Agricultural Sciences and Technologies in Niğde province. The research involved 200 students at both undergraduate and postgraduate levels, encompassing Turkish and English speakers. Research data were obtained through a personal information form designed to assess students' knowledge levels, behaviors, and attitudes toward climate change. The survey consists of four sections measuring students' demographic characteristics, behavioral traits related to climate change, attitudes toward climate change, and knowledge about the subject. Descriptive statistics, including percentages for categorical variables and mean ± standard deviation for continuous variables, were used in data analysis to transparently illustrate the distribution of background variables such as age, gender, and education. Focusing on knowledge about climate change, 66% of students indicated that they attribute climate change to human activities. It was observed that students' awareness of environmental issues, specifically recycling, is at a rate of 22.5%. In conclusion, when examining the knowledge, attitudes, and behaviors of students are studied Agricultural Sciences and Technologies regarding climate change, the study highlights the need for more effective education and awareness programs on environmental issues.

Keywords: Agriculture, Attitude, Behavior, Climate Change, Education, KAB Analyze, Knowledge Level.

Tarım Bilimleri ve Teknolojileri Eğitiminde İklim Değişikliği Bilgi, Tutum ve Davranışlarının (KAB) Değerlendirilmesi

Öz

Bu çalışmanın amacı, Niğde ilinde Tarım Bilimleri ve Teknolojileri alanında öğrenim gören lisans ve yüksek lisans öğrencilerinin iklim değişikliği konularına yönelik bilgi düzeyleri, tutum ve davranışlarını (KAB) belirlemek için yapılmıştır. Bu araştırmada 200 lisans ve yüksek lisans (Türkçe-İngilizce) öğrencilerine yapılmıştır. Araştırma verileri öğrencilerin iklim değişikliği konularına yönelik bilgi düzeyi, davranış ve tutumlarını belirlemeye yönelik kişisel bilgi formundan elde edilmiştir. Anket çalışması; öğrencilerin demografik özelliklerini, iklim değişikliğine yönelik davranış özelliklerini, tutumlarını ve bilgi birikimlerini ölçmek üzere 4 bölümden oluşmaktadır. Verilerin analizinde yaş, cinsiyet ve eğitim gibi arka plan değişkenlerinin dağılımını açık bir şekilde göstermek amacıyla tanımlayıcı istatistiklerle beraber kategorik değişkenler yüzdelik olarak, sürekli değişkenler ise ortalama ± standart sapma şeklinde gösterilmiştir. İklim değişikliğine dair bilgi birikimine odaklandığımızda, öğrencilerin %66'sı iklim değişikliğini insan faaliyetlerinden kaynaklandığını belirtmişlerdir. Öğrencilerin çevresel konularda geri dönüşümde farkındalıklarının %22,5 oranında olduğu görülmüştür. Sonuç olarak, Tarım Bilimleri ve Teknoloji Fakültesi öğrencilerinin iklim değişikliği konusundaki bilgi düzeyi, tutumları ve davranış özellikleri incelendiğinde, çevresel konularda daha etkili eğitim ve farkındalık programlarına ihtiyaç olduğu ortaya çıkmaktadır.

Anahtar Kelimeler: Bilgi Düzeyi, Davranış, Eğitim, İklim Değişikliği, KAB Analizi, Tarım, Tutum.

[1]Niğde Ömer Halisdemir University, Faculty of Agricultural Sceiences and Technologies, Biosystems Engineering Department, Niğde, Türkiye, tkizildeniz@ohu.edu.tr
[2]Niğde Ömer Halisdemir University, Institute of Science, Department of Plant Production and Technologies, Niğde, Türkiye bozkurt.f.1500@gmail.com

[*]Sorumlu Yazar/Corresponding Author
Geliş/Received: 05.12.2023 **Kabul/Accepted:** 11.05.2024 **Yayın/Published:** 18.06.2024

1. Introduction

1.1. Climate Change and Issues Related to Climate Change

Climate change denotes the long-term transformations occurring in global climate systems due to the disruption of the natural balance caused by human activities. It is associated with the increased concentration of greenhouse gases in the atmosphere, leading to a rise in average temperatures worldwide (Kurnaz, 2023). Climate change is defined as "*changes in the average state of the climate or in its variability, persisting for several decades or longer, regardless of the cause*" (IPCC, 2021). Without substantial reductions in CO_2 and other greenhouse gas emissions in the coming years, global warming is projected to exceed 1.5°C and 2°C in the 21st century (IPCC, 2021; Matthews and Wynes, 2022). The Intergovernmental Panel on Climate Change (IPCC), a group of independent experts, provides information about climate change based on scientific research, predictions, and reports.

These reports highlight that the increase in average surface temperatures on the planet (Yoro and Daramola, 2020; Kurniawan et al., 2022) and resulting seasonal changes (Cardoso et al., 2017) are attributed to the escalating greenhouse gas emissions due to fossil fuel use, deforestation, land-use changes, and industrialization (Özkaya, 2013). The IPCC reports warns that if comprehensive measures to combat climate change are not taken, there will be an increase in hurricanes, droughts, and rising sea levels (IPCC, 2014; 2018). The predictions in the report emphasize that Türkiyeour country, surrounded by seas on three sides, is at significant risk if these projections materialize (IPCC, 2014).

Climate change results in significant deviations in precipitation quantity and patterns, leading to increased intensity and frequency of disasters such as droughts, floods, and storms (Ali and Mohamed, 2023; Rawat et al., 2023). Additionally, it causes a rise in salinity and acidification in the oceans (Özkaya, 2013; Li et al., 2023; Possenti et al., 2023). The climate change induced by human activities extends beyond natural climate fluctuations, encompassing more frequent and intense extreme events, resulting in widespread adverse consequences and subsequent losses and damages to both the environment and humans (Naela et al., 2023; Bedeke, 2023). While some mitigation and adaptive efforts have reduced the effectiveness of these impacts (Aigwi et al., 2023), imbalances are observed among different sectors and regions, particularly affecting vulnerable individuals such as socio-economically disadvantaged groups, elderly or infirm individuals, children and youth, indigenous or minority populations and individuals with disabilities ext. and systems (Erdoğan and Cantürk, 2022).

1.2. Knowledge and Climate Attitude: What Are Behavioral Expressions?

Knowledge, Attitude and Behavior, refers KAB, suggests that it must be addressed with the aim to advocate pro-environmental initiatives as well as sustainability throughout individuals (Kollmuss and Agyeman, 2002). The term "*attitude*" is used to describe “a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor” (Eagly & Chaiken, 1993). Moreover, "*knowledge*" is defined as "all kinds of ideas and actions accepted by one or more social groups or communities; ideas and actions about facts that they themselves and others consider true" (McCarthy, 2002; Aydoğdu, 2021). The term "knowledge level" signifies the amount and depth of knowledge an individual or a community possesses about a specific subject, field, or topic. This term is often defined as the assessment of an individual's or group members' knowledge levels in a particular area (Uçak, 2010; Newell, 1982; Mondak and Davis, 2001; Dietterich, 1986).

Climate change attitude may manifest as believing in the existence of climate change, believing in the role of human activities in this change, expressing concerns, and supporting policies aimed at reducing climate change (Rode et al., 2021). Regardless of a number of attempts of KAB, knowledge transfer and eventual application of knowledge, attitudes, values, and so on into actual conduct have yet to be accomplished. This has also been observed by students of agricultural sciences and technology.

Even though sustainable and climate-friendly activities are a rather extensively researched issue, daily life implementation of Climate Change Education (CCE) and Education for Sustainable Development (ESD) components has yet to be effectively applied.

1.3. The Importance of Universities in Analyzing and Addressing the Concept of Climate Change

Various national and international initiatives have been put into motion to alleviate the detrimental impacts of global climate change on a global scale, confront its challenges, and maximize positive outcomes. At the forefront of these efforts is the imperative to raise awareness among individuals and communities. The key is to ensure that the measures taken in response to climate change seamlessly integrate into the fabric of everyday life (Ay and Erik, 2020). It is crucial to ensure that the measures taken to combat climate change are seamlessly integrated into everyday life (Ay and Erik, 2020).

In everyday life, universities are institutions that come to mind when discussing knowledge production and dissemination, playing a pivotal role in creating and communicating knowledge to all segments of society (Althbach, 2007), especially in the hot topics such as climate changes (Prokopy

et al., 2017; Barreda, 2018). Our era is characterized by the prominence of knowledge, and societies that effectively produce and utilize knowledge advance with developments. The primary purpose of universities is to generate knowledge, and it is crucial that the knowledge produced is unbiased, reliable, and meets the requirements of the era (Demir, 2023).

In the process of knowledge production, universities must adhere to ethical principles by considering these considerations. Knowledge production is a professionally demanding activity requiring expertise, and this reality should not be overlooked. In addition to having qualified academicians, universities are obliged to undertake tasks such as providing access to necessary technological infrastructure in this context (Demir, 2023; Reimers, 2021).

Universities play a significant role in the fight against climate change, and they contribute to our better understanding of climate change by analyzing its causes, effects, and potential solutions (Molthan-Hill et al., 2022). Moreover, they educate students on this crucial topic, raising awareness among the future leaders about climate change (Reimers, 2021).

1.4. The Significance of Universities in Climate Change Education and Action

Universities possess the potential to lead innovative solutions and research projects related to climate change (McCowan et al., 2021; Benayas et al., 2010). They can also enhance societal awareness by providing scientific guidance in the policy-making process (Dilling and Lemos, 2011). Therefore, the efforts of universities on climate change are of great importance and should be supported (Filho et al., 2018; McCowan, 2023).

The university system can be perceived as an institution that imparts profound knowledge, educates, and guides students. Particularly concerning climate change education, universities aim to involve students in research activities through learning science, understanding climate change (Baricco et al., 2018), contributing to climate change studies and projects (Sanni et al., 2011), and participating in various local and international workshops, seminars, and conferences (Filho, 2010; Manroe et al., 2019).

Universities play a crucial role in addressing climate change challenges (Molthan-Hill et al., 2019; Hart et al., 2015; Knuth et al., 2007). They contribute to a better understanding of climate change by analyzing its causes, effects, and potential solutions. Simultaneously, they educate students on this crucial topic, raising awareness among future leaders about climate change.

To provide a more extensive learning experience on climate change, global universities should expend more effort on creating advanced curricula, developing programs, increasing capacity, and fostering collaboration across different disciplines (Filho et al., 2021). In this context, it is necessary to raise awareness among Agriculture Science and Technology Faculty undergraduate and

postgraduate students about the complexity of climate change-related issues, as well as the need for personal involvement and action.

Universities are especially encouraged to enhance their efforts to educate local residents about climate change. In this regard, universities play an essential role in supporting solutions in terms of climate change adaptation and mitigation issues. Guiding students to be active members of society and creating awareness about climate change reflects the unique position of universities (Hung, 2022). Young people, considered the leaders of the future, are nurtured in universities. Therefore, the approaches of young individuals toward resources, the environment, and quality of life are crucial. Climate change and related challenges, climate awareness, attitudes, and behaviors should be prioritized by universities. Universities should implement various methods to integrate climate change topics into students' education. This allows students to gain a closer understanding of the complexity and significance of climate change. Universities should create climate change education programs to deepen students' knowledge in this field. Additionally, by offering research opportunities, universities can enhance students' potential contribution to climate change awareness (Filho et al., 2021).

Furthermore, by organizing environmental awareness activities and sustainability projects, universities can encourage students to take an active role in this field (Lukman and Glavič, 2007; Chawla and Cushing, 2007). Collaborating with the community, universities can help students develop practical solutions to climate change issues (Gibb, 2016). These approaches represent methods that universities can use to allow students to experience climate change topics more closely and increase their awareness in this area (Filho, 2010; Filho et al., 2021).

Therefore, the aim of this study is to assess the knowledge levels of undergraduate and postgraduate students at the Niğde Ömer Halisdemir University in Turkey regarding climate change and to examine their attitudes and behaviors on this subject. From this perspective, the study focuses on analyzing the knowledge levels, attitudes, and behaviors of undergraduate students are studied Agricultural Sciences and Technologies and postgraduate students in the Agricultural Sciences programs (conducted in both Turkish and English).

2. Materials and Methods

2.1. Research Design

The type of this study is planned to be qualitative, employing the interview method as one of the qualitative research methods. This research was conducted with both local and international undergraduate and master students studying in Niğde Ömer Halisdemir University, Agricultural

Sciences and Technologies (Departments of Plant Production and Technologies, Biosystems Engineering, Animal Production and Technologies, and Agricultural Genetic Engineering) during the academic year 2023-2024 in both Turkish and English programmes. The sample size comprises 200 students. The survey application period for the research was from September to November 2023.

2.2. Data Collection Instruments

The research questions are categorized into three categories: i) Behavioral characteristics of students are studied in the Agricultural Sciences and Technologies regarding to climate change issues, ii) Attitudes of students in the Faculty of Agricultural Sciences and Technologies toward climate change issues, and iii) Knowledge levels of students in the Faculty of Agricultural Sciences and Technologies regarding to climate change issues. Questions in the first and second categories were adapted from Likert-scale tested questions, as employed by Budak et al. (2005). Questions in the third category were derived from questions tested and applied in the cross-sectional research scale in the study by Karami and Shobeiri (2017).

The survey includes 6 questions related to demographic characteristics, 8 questions assessing behavioral characteristics regarding climate change, 7 questions examining attitudes toward climate change, and 14 questions measuring knowledge about climate change.

2.3. Data Collection and Analyses

The research is planned to employ the qualitative research method of interview. Additionally, data was gathered using a combination of a personal information form and a survey method. The survey consists of four sections aimed at measuring students' demographic characteristics, behavioral traits related to climate change, attitudes towards climate change, and knowledge about climate change. The questionnaire, comprising a total of 35 questions, was conducted online through "*Google Forms*".

Descriptive statistics were employed in the analysis of the data to transparently illustrate the distribution of background variables such as age, gender, and education. While categorical variables were expressed in percentage terms, continuous variables were presented as mean ± standard deviation.

2.4. Ethical Aspect of the Research

This study has been deemed ethically appropriate by the Scientific Research and Publication Ethics Committee of Niğde Ömer Halisdemir University. The necessary ethical committee approval was granted, as stated in the letter dated July 5, 2023, with the reference number E-86837521-050.99-381235 from the Niğde Ömer Halisdemir University Rectorate.

3. Results and Discussion

3.1. Demographic Characteristics of Students

In this study, interviews were conducted with 200 students consisting of 180 bachelors from the Faculty of Agricultural Sciences and Technologies and 20 master students registered to Graduate School of Natural and Applied Sciences and actively taking courses and practices in the Faculty of Agricultural Sciences and Technologies, regardless of their department, comprising 102 males and 98 females. The distribution of students based on age, gender, and educational level is presented in Table 1.

Table 1. Demographic characteristics of students.

	Categories	**Number of Respondents**	**% Percentage of Respondents**
Age	18-20	57	28.5
	21-23	93	46.5
	24-26	37	18.5
	27 and over	12	6
	Unanswered	1	0.5
Gender	Woman	98	49
	Man	102	51
Education level	Bachelor	180	90
	Master	20	10
Bachelor' s degree	1st Year	100	50
	2nd Year	25	12.5
	3rd Year	22	11
	4th Year	33	16.5
Master's degree			
	1st Year	13	6.5
	2nd Year	7	3.5

3.2. Knowledge Levels of Students in the Faculty of Agricultural Sciences and Technologies Regarding Climate Change

While 66% of the participants in the survey believe that climate change is caused by human activities, 22% consider it a natural process (Table 2). Only 34% of the students believe they have knowledge about the global average temperature increasing by 0.8°C in the last 160 years (Table 2). Detailed responses regarding the students' knowledge levels are presented in (Table 2).

Table 2. Student's Knowledge on Climate Change

	Never %	**Occasionally %**	**Sometimes %**	**Often %**	**Always %**	**Average mean ± S.D.**
Climate change is a natural process.	16.5	21.5	37	13.5	8.5	2.8 ± 1.16
Using fossil fuels such as coal, oil, and natural gas causes changes in the Earth's climate.	1.5	7	15.5	29.5	44.5	4.1 ± 1.01
Poor industrial practices impact climate change.	1	6	16.5	21	55.5	4.3 ± 0.98
In the last 160 years, the global average temperature has increased by 0.8°C; do you have any information about this?	20.5	18.5	25.5	19.5	14.5	2.9 ± 1.34
The rise in sea levels is a result of climate change.	2	9.5	17.5	26.5	42.5	4.0 ± 1.09
Temperature increases are related to climate change.	1	6.5	15	27.5	48	4.2 ± 0.98
Economic losses are linked to climate change.	2	11	29	24.5	30	3.7 ± 1.08
There is an impact of climate change on health crises	3	12.5	22.5	31.5	29.5	3.7 ± 1.11
Climate change is caused by human activities.	1	6	22	34	32	3.9 ± 0.95
There is a difference between naturally occurring greenhouse effects and anthropogenically induced greenhouse effects.	2.5	9	22.5	30.5	32.5	3.8 ± 1.07

Focusing on the knowledge about climate change, it was found that the majority of students believe that climate change is caused by human activities. This result is consistent with the findings of a similar study conducted by Karami et al. (2017) targeting teachers. Furthermore, the results of the survey conducted by Güloğlu and Bulut (2016) on students of the Faculty of Forestry at Kastamonu University, indicating a high percentage attributing climate change to human activities, were confirmed in this study. Additionally, Emecen and Erdem's (2022) research supports a similar perspective that climate change is caused by human activities.

In this research on the relationship between health pandemics and climate change, it has been revealed that health problems are affected by climate change at a rate of 61%. However, it is important to note that only 34% of the students are aware of the increase in the global average temperature in the last 160 years. These results emphasize the general lack of knowledge about climate change, indicating the need for more awareness and education for students.

3.3. Attitudes of Students in the Faculty of Agricultural Sciences and Technologies Towards Climate Change

The results of the survey revealed that 84% of the students find water conservation important, with only 5.5% expressing disagreement. Additionally, 7.5% of the students indicated that they had no opinion on this matter. In response to the question regarding opposition to any environmental regulations that might restrict their lifestyle, 31% of the students agreed, while 31.5% disagreed (Table 3). The results showed average scores of 4.48, 2.95, and 3.22, respectively. Detailed responses regarding students' attitudes toward climate change are presented in (Table 3).

Table 3. Students Attitudes Towards Climate Change

	Never %	Occasionally %	Sometimes %	Often %	Always %	Average mean ± S.D.
I am concerned about the issue of deforestation.	1.5	10	14.5	28.5	43.5	4.04 ± 1.06
Water conservation is important to you.	1	4.5	7.5	18	66	4.48 ± 0.90
More regulation should be applied to industry and agriculture to preserve environmental quality.	0.5	5.5	8.5	18.5	63.5	4.44 ± 0.91
There are enough laws to protect the environment.	20	38	25	8.5	4	2.35 ± 1.04
I oppose any environmental regulation that would restrict lifestyle.	13	18.5	34	21.5	9.5	2.95 ± 1.16
I enjoy watching TV programs about environmental issues.	11.5	20.5	32.5	17.5	13.5	3.01 ± 1.20
If you don't turn off the lights in the classroom, it will be noticed because many lights on campus are in use.	8.5	14.5	22.5	18.5	31	3.51 ± 1.32

In examining students' perspectives on climate change, a widespread understanding emerges regarding the importance of water conservation.However, it is important to highlight the significant proportion of students opposing environmental regulations that would restrict their lifestyle. This indicates that environmental responsibilities vary among individuals, and efforts to raise awareness on environmental issues need to continue.

3.4. Behavioral Characteristics of Students in the Faculty of Agricultural Sciences and Technologies Towards Climate Change

According to the survey results, 70.5% of the students responded that they turn off lights when not in use for electricity conservation. 12% answered no to this question. Regarding discussing what they can do to address environmental issues, 36% of the students responded affirmatively, stating that they talk to their family and friends. 31% answered no (Table 4).

Table 4. Behavioral Characteristics of Students Towards Climate Change.

	Never %	Occasionally %	Sometimes %	Often %	Always %	Average mean ± S.D.
I turn off the lights when they are not in use for electricity saving.	1	11	11.5	24.5	46	4.1 ± 1.08
I buy overly packaged products.	6	24	45	12.5	7.5	2.91 ± 0.97
When people harm the environment, I talk to persuade them to stop such activities.	5.5	31.5	26	21	14.5	3.07 ± 1.16
I recycle paper, glass, plastic, and metal waste products at home.	18	27.5	28	15	7.5	2.65 ± 1.17
I buy organic fruits and vegetables.	4	10.5	21	28	34	3.79 ± 1.15
I let the water run a lot while brushing my teeth.	44.5	30.5	13.5	4.5	4	1.89 ± 1.07
I use paper towels.	2.5	15	25	29	24	3.59 ± 1.10
I talk with my family and friends about what they can do to solve environmental issues.	5.5	25.5	31	19.5	16.5	3.16 ± 1.15

Regarding the behavioral characteristics related to climate change, students were observed to exhibit conscious behaviors on environmental issues such as electricity conservation and recycling. However, considering the significant lack of awareness about water consumption while brushing teeth, it is concluded that students need more information on water conservation, and awareness of environmental impacts should be increased.

4. Conclusions and Recommendations

This research, which assesses the knowledge levels, attitudes, and behavioral characteristics of students in the Faculty of Agricultural Sciences and Technologies regarding climate change, provides a significant perspective on sensitivity to climate-related issues. When examining the demographic characteristics of the 200 participants in the study, it was observed that the majority of the participants received undergraduate education in the 21-23 age range, and the gender distribution was almost equal. Most students believe that human activities are the main cause of climate change. This view is consistent with previous studies conducted among teachers and forestry students, as well as recent research findings. This research examines the connection between health pandemics and climate change, revealing a significant impact on health problems. However, it also highlights a lack of awareness among students regarding the increase in global average temperature over the past century and a half. These findings underscore the need for enhanced education and awareness initiatives

regarding climate change. In assessing students' attitudes toward climate change, there is a widespread acknowledgment of the importance of water conservation. Yet, it's crucial to note a substantial portion of students opposing environmental regulations that could impact their lifestyle. This suggests varying levels of environmental responsibility among individuals, emphasizing the ongoing need for awareness-raising efforts on environmental issues. Students show conscious behaviors in areas like electricity conservation and recycling, but lack awareness about water consumption while brushing teeth, highlighting the need for more education on water conservation and increased awareness of environmental impacts.

In conclusion, when examining the knowledge levels, attitudes, and behavioral characteristics of students in the Faculty of Agricultural Sciences and Technologies regarding climate change, there is a need for more effective education and awareness programs on environmental issues. It is expected that these efforts will contribute to future generations fulfilling their environmental responsibilities more effectively. When evaluated based on students' knowledge levels, a high participation rate (74%) is observed in the judgment that the use of fossil fuels such as coal, oil, and natural gas causes changes in the Earth's climate. In this context, these results, parallel to a study conducted on teachers by Karami et al. (2017), indicate that students have a general awareness of the potential effects of fossil fuels, especially coal, oil, and natural gas, on the Earth's climate. This significant finding emphasizes that awareness of the impact of fossil fuels on climate change is widely shared among a large student population. From this perspective, associating fossil fuels with climate change contributes effectively to education and informational activities.

Based on the conclusion provided, it is recommended to develop targeted education and awareness programs for students in the Faculty of Agricultural Sciences and Technologies. These programs should cover topics such as the causes and effects of climate change, water conservation, and individual roles in mitigating climate challenges. Encouraging interdisciplinary collaboration, integrating climate change education into existing courses, fostering active participation, and providing resources and support systems are essential. Implementing these recommendations can enhance students' understanding and readiness to address environmental challenges effectively.

Acknowledgements

The authors are acknowledged the students and academic staff of Niğde Ömer Halisdemir University.

Authors' Contributions

TK contributed to the experimental design, interpretation of the results, reviewed and elaborated the final manuscript. FB performed the data collection and analysis and elaborated the first draft of the manuscript.

Statement of Conflicts of Interest

There is no conflict of interest between the authors.

Statement of Research and Publication Ethics

The author declares that this study complies with Research and Publication Ethics. The necessary ethical committee approval was granted, as stated in the letter dated July 5, 2023, with the reference number E-86837521-050.99-381235 from the Niğde Ömer Halisdemir University Rectorate.

References

Aigwi, I. E., Duberia, A., & Nwadike, A. N. (2023). Adaptive reuse of existing buildings as a sustainable tool for climate change mitigation within the built environment. Sustainable Energy Technologies and Assessments, 56, 102945.

Ajzen, I & Fishbein, M. (2000). Attitudes and the attitude-behavior relation: Reasoned and automatic processes. European review of social psychology, 11(1), 1-33.

Ali, A. M. S., & Mohamed, M. O. (2023). Climate change-induced floods and storms: Impacts of changing rainfall patterns in Somalia.

Altbach, P. G. (2007). Empires of knowledge and development. World class worldwide: Transforming research universities in Asia and Latin America, 1-28.

Ay, F., & Erik, N. Y. (2020). Üniversite Öğrencilerinin Küresel Isınma ve İklim Değişikliğine Yönelik Bilgi ve Algı Düzeyleri. *Cumhuriyet Üniversitesi Sosyal Bilimler Dergisi*, *44*(2).

Aydoğdu, O. K. (2021). Bilgi Nedir? Bilmek İçin İnanmak Mı Gerekir? *Maksima Bilim, Kültür, Sanat ve Edebiyat Dergisi*, 5-6, Retrieved from https://philarchive.org/archive/AYDBNB

Baricco, M., Tartaglino, A., Gambino, P., Dansero, E., Cottafava, D., & Cavaglia, G. M. C. (2018). University of turin performance in UI GreenMetric energy and climate change. In E3S web of conferences (Vol. 48, pp. 03003-03003).

Barreda, A. B. (2018). Assessing the level of awareness on climate change and sustainable development among students of Partido State University, Camarines Sur, Philippines. Journal of sustainability education, 17, 1-17.

Bedeke, S. B. (2023). Climate change vulnerability and adaptation of crop producers in sub-Saharan Africa: A review on concepts, approaches and methods. Environment, Development and Sustainability, 25(2), 1017-1051.

Benayas, J., Alonso, I., Alba, D., & Pertierra, L. (2010). The impact of universities on the climate change process. Universities and Climate Change: Introducing Climate Change to University Programmes, 47-65.

Budak, D.B, Budak, F., Zaimoglu, Z., Kekec, S., & Sucu, MY (2005). Behaviour and attitudes of students towards environmental issues at faculty of agriculture, Turkey. *Journal of Applied sciences*, *5*(7), 1224-1227.

Bush, S.S., & Clayton, A. (2023). Facing change: Gender and climate change attitudes worldwide. *American Political Science Review*, *117*(2), 591-608.

Cardoso, A. D. S., Brito, L. D. F., Janusckiewicz, E. R., Morgado, E. D. S., Barbero, R. P., Koscheck, J. F. W., ... & Ruggieri, A. C. (2017). Impact of grazing intensity and seasons on greenhouse gas emissions in tropical grassland. Ecosystems, 20, 845-859.

Chawla, L., & Cushing, D. F. (2007). Education for strategic environmental behavior. Environmental education research, 13(4), 437-452.

Demir, G. (2023). Yükseköğretimde etik ilkelerin gelişimi ve önemi. *Rumelide Dil ve Edebiyat Araştırmaları Dergisi*, (34), 403-420.

Dietterich, T. G. (1986). Learning at the knowledge level. *Machine Learning*, *1*, 287-315.

Dilling, L., & Lemos, M. C. (2011). Creating usable science: Opportunities and constraints for climate knowledge use and their implications for science policy. Global environmental change, 21(2), 680-689.

Eagly, A. H., & Chaiken, S. (1993). *The psychology of attitudes*. Harcourt brace Jovanovich college publishers.

Emecen, Y., & Erdem, N. (2022). İklim Değişikliğine Yönelik Farkındalığın Üniversite Öğrencisi Bakış Açısıyla Değerlendirilmesi: Ondokuz Mayıs Üniversitesi Mimarlık Fakültesi Örneği. *Meriç Uluslararası Sosyal ve Stratejik Araştırmalar Dergisi*, *6*(16), 206-224.

Erdoğan Z. & Cantürk S., (2022). İklim-Çatışma-Göç Bağını Anlamak: İklim-Çatışma Bölgelerinden Türkiye'ye Göç. *Siyasal: Journal of Political Sciences*, *31*(1), 137-155.

Filho, L.W. (Ed.), (2010). *Universities and climate change*. Springer, ss 21-30

Filho, W. L. (2010). Climate change at universities: results of a world survey. *Universities and Climate Change: Introducing Climate Change to University Programmes*, 1-19.

Gibb, N. (2016). Getting climate ready: A guide for schools on climate action and the whole-school approach. UNESCO Publishing.

Güloğlu, Y., & Bulut, A. (2016). İklim değişikliği konusunda orman fakültesi öğrencilerinin bilgi düzeylerinin belirlenmesi (Kastamonu Üniversitesi Orman Fakültesi örneği). *Kastamonu Üniversitesi Orman Fakültesi Dergisi*, *16*(2), 640-654.

Hart, D. D., Bell, K. P., Lindenfeld, L. A., Jain, S., Johnson, T. R., Ranco, D., & McGill, B. (2015). Strengthening the role of universities in addressing sustainability challenges: The Mitchell Center for Sustainability Solutions as an institutional experiment. Ecology and Society, 20(2).

Hung, C. C. (2022). Climate change education: Knowing, doing and being. Taylor & Francis.

IPCC, (2021). Climate change widespread, rapid, and intensifying,, Retrieved from https://www.ipcc.ch/2021/08/09/ar6-wg1-20210809-pr/, (Date Accessed: 19 November 2023).

IPCC (2014). Climate Change, AR5 Synthesis Report, Retrieved from https://www.ipcc.ch/report/ar5/syr/, 2014, (Date Accessed: 19 November 2023).

IPCC (2018). Global warming of 1.5°C: An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, J. B. R. Matthews, Ed. (World Meteorological Organization, Geneva, Switzerland, 2018).

Karami, M. L. (2023). İklim Değişikliği ve Uyum Süreçlerinde Türkiye. *Resilience*, *7*(1), 199-208.

Karami, S., Shobeiri, S. M., Jafari, H., & Jafari, H. (2017). Assessment of knowledge, attitudes, and practices (KAP) towards climate change education (CCE) among lower secondary teachers in Tehran, Iran. *International Journal of Climate Change Strategies and Management*, *9*(03), 402-415.

Knuth, S., Nagle, B., Steuer, C., & Yarnal, B. (2007). Universities and climate change mitigation: Advancing grassroots climate policy in the US. Local Environment, 12(5), 485-504.

Kollmuss, A., & Agyeman, J. (2002). Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior?. Environmental education research, 8(3), 239-260.

Kurniawan, K., Supriatna, J., Sapoheluwakan, J., Soesilo, T. E. B., Mariati, S., & Gunarso, G. (2022). The analysis of forest and land fire and carbon and greenhouse gas emissions on the climate change in Indonesia. AgBioForum, 24(2), 1-11.

Leal Filho, W., Morgan, E. A., Godoy, E. S., Azeiteiro, U. M., Bacelar-Nicolau, P., Avila, L. V., ... & Hugé, J. (2018). Implementing climate change research at universities: Barriers, potential and actions. *Journal of cleaner production*, *170*, 269-277.

Leal Filho, W., Sima, M., Sharifi, A., Luetz, J. M., Salvia, A. L., Mifsud, M., ... & Lokupitiya, E. (2021). Handling climate change education at universities: an overview. *Environmental Sciences Europe*, *33*, 1-19.

Li, M., Guo, Y., Cai, W. J., Testa, J. M., Shen, C., Li, R., & Su, J. (2023). Projected increase in carbon dioxide drawdown and acidification in large estuaries under climate change. Communications Earth & Environment, 4(1), 68.

Lukman, R., & Glavič, P. (2007). What are the key elements of a sustainable university?. Clean Technologies and Environmental Policy, 9, 103-114.

Matthews, H. D., & Wynes, S. (2022). Current global efforts are insufficient to limit warming to 1.5 C. Science, 376(6600), 1404-1409.

McCarthy, E. D., & Yılmaz, A. F. (2002). *Bilgi külürü: yeni bilgi sosyolojisi*. Çiviyazıları.

McCowan, T. (2023). The climate crisis as a driver for pedagogical renewal in higher education. *Teaching in Higher Education*, *28*(5), 933-952.

McCowan, T., Leal Filho, W., & Brandli, L. (2021). Universities facing climate change and sustainability.

Molthan-Hill, P., Blaj-Ward, L., Mbah, M. F., & Ledley, T. S. (2022). Climate change education at universities: Relevance and strategies for every discipline. In Handbook of climate change mitigation and adaptation (pp. 3395-3457). Cham: Springer International Publishing.

Molthan-Hill, P., Worsfold, N., Nagy, G. J., Leal Filho, W., & Mifsud, M. (2019). Climate change education for universities: A conceptual framework from an international study. Journal of Cleaner Production, 226, 1092-1101.

Mondak, J. J., & Davis, B. C. (2001). Asked and answered: Knowledge levels when we will not take "don't know" for an answer. *Political Behavior*, *23*, 199-224.

Monroe, M. C., Plate, R. R., Oxarart, A., Bowers, A., & Chaves, W. A. (2019). Identifying effective climate change education strategies: A systematic review of the research. Environmental Education Research, 25(6), 791-812.

Neale, P. J., Williamson, C. E., Banaszak, A. T., Häder, D. P., Hylander, S., Ossola, R., ... & Zepp, R. (2023). The response of aquatic ecosystems to the interactive effects of stratospheric ozone depletion, UV radiation, and climate change. Photochemical & Photobiological Sciences, 1-35.

Newell, A. (1982). The knowledge level. *Artificial intelligence*, *18*(1), 87-127.

Özkaya, S. Y. (2013). İklim değişikliği ve etik prensipler. *Ulusal Ekonomik Sorunlar Dergisi*, 46, 123-132.

Possenti, L., Reichart, G. J., de Nooijer, L., Lam, F. P., de Jong, C., Colin, M., ... & von der Heydt, A. (2023). Predicting the contribution of climate change on North Atlantic underwater sound propagation. PeerJ, 11, e16208.

Prokopy, L. S., Bartels, W. L., Burniske, G., & Power, R. (2017). Agricultural extension and climate change communication. In Oxford Research Encyclopedia of Climate Science.

Rawat, A., Kumar, D., & Khati, B. S. (2023). A review on climate change impacts, models, and its consequences on different sectors: a systematic approach. Journal of Water and Climate Change, jwc2023536.

Reimers, F. M. (2021). The role of universities building an ecosystem of climate change education. Education and climate change: The role of Universities, 1-44.

Reimers, F. M. (2021). *Education and climate change: The role of universities* (p. 201). Springer Nature.

Rode, J. B., Dent, A. L., Benedict, C. N., Brosnahan, D. B., Martinez, R. L., & Ditto, P. H. (2021). Influencing climate change attitudes in the United States: A systematic review and meta-analysis. *Journal of Environmental Psychology*, *76*, 101623.

Sanni, M., Adejuwon, J. O., Ologeh, I., & Siyanbola, W. O. (2011). Path to the Future for Climate Change Education: University Project Approach (pp. 693-702). Springer Berlin Heidelberg

Uçak, N. Ö. (2010). Bilgi: Çok yüzlü bir kavram. *Türk Kütüphaneciliği*, *24*(4), 705-722.

Yoro, K. O., & Daramola, M. O. (2020). CO2 emission sources, greenhouse gases, and the global warming effect. In Advances in carbon capture (pp. 3-28). Woodhead Publishing.