Knowledge and Awareness of Global Warming and Its Effect on the Environment among Applied Science Private University Students

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Abstract: - The purpose of this study was to investigate global warming awareness among Applied science Private University students. A total of 365 students were tested using a questionnaire covering four aspects of global warming including causes, effects, evidence, and solutions. The study included students of science and humanities faculties in all academic years of both sexes, and a significant dependency ratio ($p < 0.05$) was recorded. The results showed that female students had greater knowledge of the global warming effect than male students, that academically superior students with excellent grades had more knowledge of the four aspects covered by the questionnaire than their lower-level peers, and that students from science colleges were more familiar than humanities students with the causes. and solutions related to global warming. In addition, students who received environmental development courses at the university were more knowledgeable than the rest of the students about the effect, cause, and evidence of global warming, which indicates a direct positive effect of university education.

Key-Words: Global warming, Sustainability; Education Level; Applied Science Private University (ASU).

Received: January 2, 2023. Revised: April 21, 2023. Accepted: May 24, 2023. Published: June 12, 2023.

1 Introduction

The public's knowledge of major environmental issues has grown around the world. There have been several discussions, both locally and internationally, about the proper approach to environmental challenges. To meet this unique global challenge, three decades of effort have resulted in a substantial evolution of actor networks, rule-making mechanisms, and regulations from international to local levels of governance. Despite this, global greenhouse gas emissions continue to rise year after year. In, [1], Jordan, as a developing country, continues to expand significantly in terms of technology and production. Valid environmental principles in business are still overlooked, even though numerous laws and policies stress environmental conservation. The younger generations, particularly the kids, are the ones who will influence Jordan's environment in the future. As a result, future generations will need to expand their knowledge and environmental consciousness to better understand the current state of the globe, [2]. Environmentally educated persons are thought to be more inclined to engage in responsible behavior (REB) for environmental security, [3], [4], because education has the potential to improve a person's sense of citizenship in a variety of ways, employing sustained awareness as a primary mitigation technique, [5], [6]. Universities can act as high-quality sustainability models, with facilities to assist students in developing new media. This is vitally significant for the progress of environmental studies, knowledge, education, and research in Jordan for the Applied Science Private University (ASU), a key institution of higher education. The University of Applied Sciences is a private university of

sustainable development innovation and the Center for Environmentally Responsible Sustainability Education. Despite several educational endeavors, environmental education reforms and programs are lacking. As a result, this study aims to determine the impact of socio-economic demographic factors such as gender, academic level, and GPA on their knowledge of the causes, clues, and solutions to the global warming problem among undergraduate university students based on an assessment of their attitudes and behaviors about global warming.

Global warming is described as the recent and ongoing rise in the earth's surface temperature, according to the Environmental Protection Agency (EPA). The most significant contributors to climate change are greenhouse gases. Water vapor (H2O) and carbon dioxide (CO2) are examples of greenhouse gases (GHGs) (CO2), Fluorinated gases, methane (CH4), and nitrous oxide (N2O)HFCs, perfluorocarbons, and other hydrofluorocarbons Sulfur hexafluoride (SHF) and poly-fluorocarbons (PFCs) (SF6). The dangers of global warming are one of the most serious and important problems of the world, [7], [8], [9].

Managing this event has become a challenge. As a result of the development of industrial systems and human-managed energy systems, this is a very challenging task in the 21st century. In addition to emissions from homes, [10], [11], [12]. Human health has also been endangered explicitly and implicitly as a result of recent global warming, [13]. It can also have negative consequences.

Droughts, crop failures, and an increase in vector-borne diseases are on the rise, and water-borne infections are having an indirect impact on people's health, [10], [14]. In addition to rising water levels due to melting glaciers, there are more threats, such as flooding in coastal cities.

Global warming also has several negative effects on the health of the environment. As infectious diseases affecting plants and animals are more widespread, it is necessary to understand global warming and the issues surrounding it. Health consequences will guide policies aimed at raising public awareness and developing adaptation solutions to global warming, and including them can help students define their public perception of the health impacts of climate change, which is important for mitigation, [15], [16]. Globally, college students are familiar with environmental issues.

It is expected that the understanding of global warming and its implications will be among the highest among students in the educational pyramid, and an important indicator of general population knowledge, [17].

2 Materials and Methods

The study's instrument was based on a primary survey using a questionnaire, [18], by [19], [20]. This survey included true-false and multiple-choice questions. The questionnaire has a total of 40 questions: 20 multiple-choice and 20 true/false. The inquiries explored four facets of global warming, including its causes, effects, proof, and solutions. Questions 12،13،14،15،17،18،19،20 from the true /false type and questions 2,4,5,16,17,18,19,20 from multiple choice questions taken from, https://climate.nasa.gov/evidence and questions. Questions 7, and 11 from the true /false type and question 7 from_multiple choice questions were replaced from the original questionnaire.

2.1 Sample and Data Collection

The study was conducted during the second semester of the 2020/2021 academic year as a campus-wide sample of undergraduate students across all faculties at ASU. It was comprised of 365 students the percentage of females is 28.5% and the percentage of males is 71.5%. The percentage of participants whose GPA varies between 60 and 67.9 in the sample is 2.7%, the percentage of participants whose GPA varies between 68 and 75.9 in the sample is 15.6%, the percentage of participants whose GPA varies between 76 and 83.9 in the sample is 32.6%, and the percentage of participants whose GPA is greater than or equal to 84 in the sample is 49%. Also, the percentage of participants at the first level in the sample is 51%, the percentage of participants at the second level in the sample is 17.3%, the percentage of participants at the third level in the sample is 18.4%, the percentage of participants at the fourth level in the sample is 10.4% and the percentage of participants at the fifth level in the sample is 3%. While the percentage of participants in the scientific faculties in the sample is 43% and the percentage of participants in the faculties of humanities in the sample is 57%. Finally, the percentage of participants who attended university courses related to the environment during their undergraduate studies in the sample is 28.2% as shown in Figure 1. The Questionnaire statements are presented in Table 1.

Table 1. Questionnaire statements [C = Cause, E= Evidence I = Impact, S = Solution].

True/ false questions (n =20) 1. The average global sea level has increased over the past years. I yes 2. The global use of solar energy is accelerating the exacerbation of global warming. S no 3 Carbon dioxide is the gas most contributing to the exacerbation of global warming. C yes 4. During recent years, the ice cover in the polar regions has increased. I no 5. Global warming will not lead to population displacement. I yes 6. Over time, the global average temperature will increase further. I yes 7. Carbon dioxide increases in the atmosphere mainly due to the combustion of fossil fuels. C yes 8. Public transportation can help to reduce global warming more than driving private cars. S yes 9. Solar energy use makes global warming worse. S no 10. Greenhouse gases allow solar radiation to pass through and do not allow infrared rays (heat) to go out into space. C yes 11- The Kyoto Protocol is concerned with the reduction of greenhouse gases and thus the reduction of global warming. S yes 12-An increase in forest fires is expected around the world. I yes 13- Tropical storms are expected to decrease in terms of degree and intensity. I no 14-An increase in the length of the germination season is expected. I yes 15- Changes in rain patterns are expected. I yes 16- Increased heat waves and droughts are expected. C yes 17- Hurricanes are expected to become stronger and more intense. I yes 18- sea level rise of 1 to 8 feet is expected by the year 2100. I yes 19- Floods are expected to decrease around the world. I no 20- The Arctic Ocean is expected to become ice-free in summer	3. Global warming is best described as C **a. an increase in the ground's warmth.** b. The atmospheric gas emissions that contribute to global warming c. Researching how humans affect the environment d. Excessive gas emissions. 4- It is considered the basis for helping scientists know the extent of the exacerbation of global warming. E a. cars b. airplanes **c. satellites** d. spacecraft. 5- Scientists have determined that the main cause of global warming is: C **a. human activities** b. animal activities c. volcanoes d. Earthquakes 6. Increased Emission of Gases from Burning Fossil Fuels: C a. It causes the greenhouse effect (greenhouse). b. It causes global warming. c. Prevent the sun's rays from leaving the atmosphere after it is reflected from the Earth **d. All that is beyond** 7. Of the greenhouse gases that negatively affect global warming: c **A. Carbon dioxide and methane**. b. hydrogen and nitrogen c. Oxygen d. ammonia 8. If global warming continues, what risk will we face? I a. Increase the ice fields **b. drought and desertification** c. Water desalination d. low sea level 9. In your opinion, what can we do individually at home to reduce global warming? S **a. Reduce electricity consumption** b. Use non-recyclable products	12. The following human behaviors all contribute to global warming, except C **a. Using hydrogen as an energy source** b. Wastage of non-renewable energy resources c. forest destruction d. fossil fuel consumption 13. Due to global warming and significant climate change, all of the following can happen except I a. Excessive heat waves b. wind storms c. Deadly floods and forest fires **d. abnormal diseases** 14. Which of the following gases contributes the most to the greenhouse effect, which accounts for approximately 80% of the effect: C a. helium b. ozone **c. Carbon Dioxide** d. nitrous oxide 15. Greenhouse gases: C **a. Absorption of infrared radiation, which leads to the heating of the Earth's surface and an increase in the heat of the atmosphere.** b. Infrared reflection, thus heating the Earth's surface and increasing the heat of the atmosphere. c. Absorption of ultraviolet rays, thus heating the Earth's surface and increasing the heat of the atmosphere. d. Reflection of ultraviolet rays, thus heating the Earth's surface and increasing the heat of the atmosphere. 16- The temperature of the atmosphere has increased since the end of the ninth century until now about E a. 0.25°C **b. 1.4°C** c. 2.25 degrees Celsius d. 5 degrees Celsius 17- Evidence of global warming: E **a. An increase in the temperature of the oceans.** b. increase in gasoline prices. c. a decrease in the temperature of the oceans. d. Low gasoline prices 18- Evidence of global warming: E

before the middle of this century. I yes **Multiple choice questions (MCQ) n = 20** 1- 1. The main environmental issue now that contributes to global warming is C a. radioactive waste b. acid rain c. Water Pollution **d. air pollution** 2- Most research and studies indicate that the incidence of global warming: E a. 25% b. 45% c. 55% **d. 95%**	c. Increased water consumption d. Increased waste products (garbage) 10. From your point of view, what can we do to reduce the greenhouse effect as individuals outside the home? S **a. Use public transportation or share private transportation** b. Use sunscreen c. the use of trains based on fossil fuels. d. steamships. 11- The cause of recent climate change is C a. Earth's polar ice cap melting **b. human activities** c. Average Sea level rises around the world d. population displacement	a. Increasing ice masses in the polar regions. b. Increasing salinity in ocean waters. **c. decrease in ice masses in the polar regions.** d. a decrease in salinity in ocean waters. 19- One of these phenomena is not considered evidence of global warming: E a. Ice retreat in the polar regions. b. sea level rise. c. extreme events. **d. earthquakes** 20- The effect of global warming on the surface of the oceans: I a. Increased salinity of the ocean surface. b. A decrease in the salinity of the ocean surface. **c. Increased acidity of the ocean surface.** d. Decrease in the acidity of the ocean surface

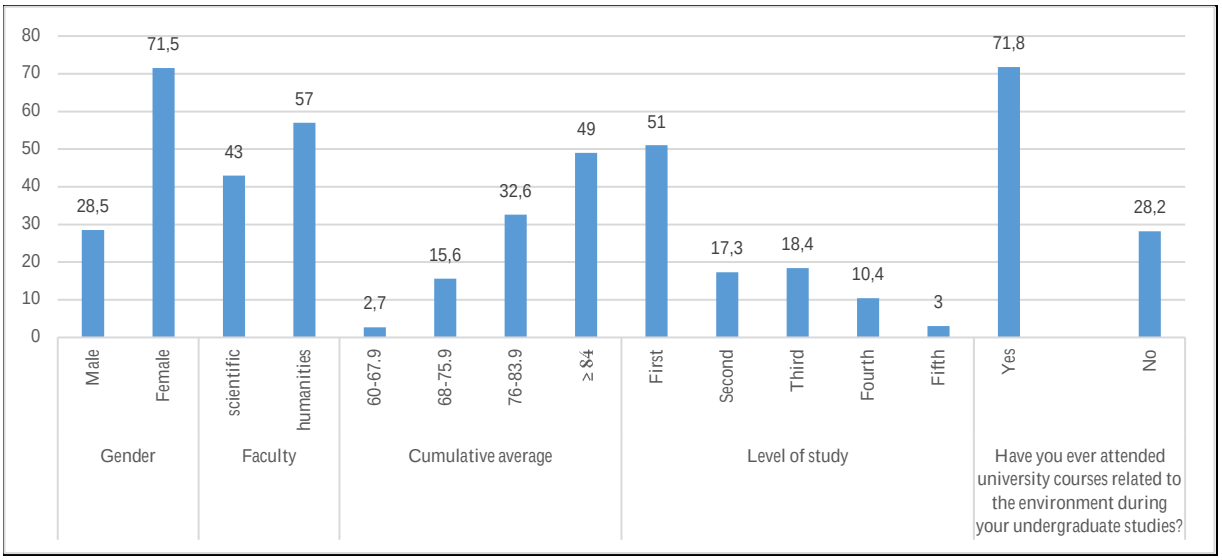

Fig. 1: Percentage of students according to demographic criteria

2.2 Data Analysis

The statistical data analysis will be conducted as follows: Main sample characteristics are presented to describe the participants' personal information (i.e., gender, level of education, and faculty). Reliability analysis will be conducted to determine if the instrument is consistent and reliable in achieving the study objectives or not. Main descriptive statistics (means and standard deviations) for global warming impacts, causes, evidence, and solution are presented also. Finally, hypotheses testing results will be presented. Parametric variables were analyzed using Mann-Whitney Test, and Kruskal-Wallis Test. All reported P values were made based on 2-sided tests and compared to a significance level of 5%; differences which were considered statistically significant at $P < 0.05$.

2.3 Reliability Analysis

Reliability is a very important aspect of selecting a questionnaire instrument. Reliability refers to the

degree of consistency or stability in study results if it is conducted for the same respondents several times.

To evaluate the reliability, Cronbach's alpha values will be calculated. Cronbach's alpha (α), developed by Lee Cronbach in 1951 is the most common estimate of reliability, [21]. It is based on the inter-correlations of the observed indicator variables. Cronbach's alpha results in values between 0 and 1. Its acceptable range is between 0.7 and 1. Our data has passed the reliability test as Cronbach's Alpha value is equal to 0.785 which is within the acceptable value implying that the instrument was consistent and reliable in achieving the study objectives.

2.4 Descriptive Statistics

There are three main types of descriptive statistics: frequencies, measures of central tendency (also called averages), and measures of variability. Frequency tables simply count the number of times that each variable occurs. Measures of central tendency give one number that represents the entire set of values, such as the mean and the median. Measures of variability indicate the degree to which values differ around the average such as the variance and the standard deviation.
This section presents the main descriptive statistics (frequency tables, means, and standard deviations) for participants' answers regarding global warming impacts, causes, evidence, and solution.

3 Results

Hypotheses Testing

The researchers aim to determine if there is a significant difference in participants' answers regarding impacts, causes, evidence, and solution questions according to gender, GPA, level of education, faculty, and studying environmental courses or not.

Table 2 shows that there is a significant difference in the participants' answers regarding the greenhouse impact questions according to gender, as the significance value is less than 0.05, as it appears that females had more correct answers related to the impact than males. The researcher used Mann-Whitney Test.

There is no significant difference in participants' answers regarding global warming causes, evidence, and solution questions according to gender as the significance values are more than 0.05.

Table 3 demonstrates that there is a significant difference in participants' answers regarding global warming impact, causes, evidence, and solution questions according to GPA as the significance values are less than 0.05. as it appears that the students who have cumulative average greater than or equal to 84 had more correct answers related to the impact, cause, evidence, and solution than others. The researcher used Kruskal-Wallis Test.

Table 4 demonstrates that there is no significant difference in participants' answers regarding global warming impact, causes, evidence, and solution questions according to the level of education as the significance values are more than 0.05.

Table 5 illustrates that there is a significant difference in participants' answers regarding global warming causes and solution questions according to faculty as the significance values are less than 0.05 as it appears that the students who belong to science had more correct answers than students who belong to Humanities. The researcher used Mann-Whitney Test. There is no significant difference in participants' answers regarding global warming impact and evidence questions according to faculty as the significance values are more than 0.05.

Table 6 shows that there is a significant difference in the participants' answers regarding global warming effect, causes, and evidence questions according to the Environmental Cycles Study as significance values are less than 0.05. We note that the students who have learned an environmental course are better than those who did not take an environmental course before concerning impact causes and evidence. The researcher used the Mann-Whitney test.
There is no significant difference in participants' answers regarding global warming solution questions according to studying environmental courses as the significance value is more than 0.05.

Table 2. Variation in Participants' Answers Regarding Impacts, Causes, Evidence, and Solution Questions according to Gender

	Statistic	Significance
Impact	11689.000	0.037
Causes	12138.000	0.111
Evidence	12852.000	0.417
Solution	12571.500	0.262

Table 3. Variation in Participants' Answers Regarding Impacts, Causes, Evidence, and Solution Questions according to GPA

	Statistic	Significance
Impact	15.404	0.002
Causes	19.140	0.000
Evidence	25.881	0.000
Solution	23.887	0.000

Table 4. Variation in Participants' Answers Regarding Impacts, Causes, Evidence and Solution Questions according to the Level of Education

	Statistic	Significance
Impact	2.889	0.577
Causes	2.652	0.618
Evidence	4.536	0.338
Solution	2.451	0.654

Table 5. Variation in Participants' Answers Regarding Impacts, Causes, Evidence and Solution Questions according to Faculty

	Statistic	Significance
Impact	16286.000	0.966
Causes	14062.000	0.022
Evidence	15731.500	0.540
Solution	13419.000	0.003

Table 6. Variation in Participants' Answers Regarding Impacts, Causes, Evidence and Solution Questions according to Environmental Courses

	Statistic	Significance
Impact	10164.000	.000
Causes	9889.500	.000
Evidence	11617.500	.034
Solution	12002.000	.093

4 Discussion

One of the most pressing issues facing the world today is global warming. The negative effects of global warming can be catastrophic, and pose a threat to the survival of humanity. It is therefore important for everyone, especially in the scientific community, to have a comprehensive understanding of the problem in terms of causes, evidence, and effects as well as potential remedies so that they can implement necessary changes in the economy, resource consumption, behavior, and general attitude toward nature, [22].

Students' understanding of environmental topics and their ability to apply this understanding to real-world problems, such as global warming, are among the most important goals of environmental science education and courses.

The researchers in [23], found that as climatology expertise expanded, so did the level of consensus on human causality. Anthropogenic greenhouse gases (GHGs) are the major driver of recent global warming, according to 90% of

respondents with more than 10 climate-related peer-reviewed publications (about half of all respondents). The ability of responders to quantify their GHG contribution appears to be heavily reliant on their assessment or understanding of the cooling effect of aerosols. The attribution statement of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (AR4), which made a minimum contribution of isolated greenhouse gases, may have underestimated the role of greenhouse gases in recent warming. We also report respondents' opinions on additional causes contributing to global warming, the most important of which are land use and land cover change (LULCC). Respondents who described the human impact on climate as insignificant reported receiving more frequent media coverage regarding their views on climate change.

The international community has identified global warming as an imminent crisis that poses a serious threat to life on Earth. In response, participants in the Paris Agreement (2015) agreed to keep the average global temperature rise below 1.5°C above pre-industrial levels between 1950 and 1990. Given that the Paris Agreement prioritizes the protection of human life, the natural capacities to protect Human beings from extreme environmental events must be at the center of a comprehensive and multifaceted response to global warming.

Heat and thermoregulation, according to scientists, played a crucial part in the evolution of life and remain a key mechanism that allows humans to explore, work, and thrive in hostile environments. International efforts to combat global warming, on the other hand, have primarily focused on environmental protection and greenhouse gas reduction through changes in human behavior, industrial practices, and government policies, with little regard for the nature and design of the human thermoregulatory system.

Global warming is expected to push human thermoregulation to its limits, which can be enhanced by combining intrinsic human thermo-plasticity with relevant behavioral modifications and technological advances. This review assumes that sleep/wake cycles tend toward a semi-nocturnal pattern, especially for outdoor activities, to avoid the heat of the day, which is a fundamental behavioral adaptation. In terms of technology, the current idea of air conditioning inside a room is likely to turn into a cooling of the target body surface, which can be used to raise awareness of our students about this fact, [24].

the Arctic is warming two to three times faster than the rest of the world, causing the hydrological cycle to intensify in the High North. In the 21st century, increased regional evaporation and moisture transport in the Arctic have contributed to a 50-60% increase in Arctic precipitation. The physical and dynamic limits that drive the shift to the rain-dominated Arctic are unknown. As for the students' answers in this regard, a high share of knowledge, [25].

The results also reveal that the media has a negative role in raising environmental awareness about water pollution. This study provides policymakers with a scientific perspective on expected future conditions to find solutions that meet sustainability goals, [26].

Previous studies were conducted in secondary schools where the curricula had a major role in improving literacy on climate change. In [27], we note that public secondary school students in Enugu State, Nigeria show that geography students have the highest level of awareness of climate change along with that the student’s gender, location, age, and class are variables that greatly affect their awareness. Climate change. Students who have studied geography are more likely to have moderate or high knowledge of climate change and this is consistent with our students who have taken environmental courses.

We also note, according to the study conducted in Turkey, that female students have a high degree of awareness and this is consistent with our results that females have more knowledge than males about global warming, [27]. This article compares the level of climate literacy observed between college students enrolled in different academic courses, showing that students studying natural sciences or engineering degrees and those in the later years of their degree course should be more proficient with the questions directed at them than students studying social sciences or sciences. Humanity and those who are at the beginning of their university studies, and this is consistent with the answers of our students, which showed us that students of scientific faculties are more knowledgeable than students of humanities faculties about the causes and solutions to global warming, [28].

5 Conclusion

The results showed that female students had greater knowledge of the global warming effect than male

students that academically superior students with excellent grades had more knowledge of the four aspects covered by the questionnaire than their lower-level peers, and that students from science colleges were more familiar than humanities students with the causes. and solutions related to global warming.

In addition, students who received environmental development courses at the university were more knowledgeable than the rest of the students about the effect, cause, and evidence of global warming, which indicates a direct positive effect of university education. Therefore, the study recommended integrating environmental concepts into university curricula for all students regardless of their academic major to increase environmental awareness.

Practical implications: We call on all policymakers to form coordinated efforts that will help mitigate the effects of global warming on global risks by spreading environmental awareness and education among high school and university students.

Acknowledgments:
The authors are grateful to the students who participated in this study. The researchers acknowledge the Applied Science Private University, Amman, Jordan, for the full financial support granted to this research article.

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Contribution of Individual Authors to the Creation of a Scientific Article (Ghostwriting Policy)

The authors equally contributed in the present research, at all stages from the formulation of the problem to the final findings and solution.

Sources of Funding

No funding was received for conducting this study.

Conflict of Interest

The authors have no conflict of interest to declare.